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**ABSTRACTS**

The peer-review process for SRNT's annual meeting entails review by society members of abstract submissions. Criteria for acceptance/rejection are based upon methodological rigor and not the funding source or research findings. The views expressed by conference presenters are the authors' own and do not necessarily represent that of SRNT.



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## 2018 SYMPOSIA

### SYM1

#### HEALTH EFFECTS OF ELECTRONIC CIGARETTES AND RECOMMENDATIONS FOR RESEARCH: THE 2018 REPORT OF THE NATIONAL ACADEMIES OF SCIENCE, ENGINEERING, AND MEDICINE FOR THE FDA CENTER FOR TOBACCO PRODUCTS

Gideon St.Helen, PhD, University of California, San Francisco, CA, USA; Sharon McGrath-Morrow, MD, MBA, Johns Hopkins School of Medicine, MD, USA; Adam Leventhal, PhD, University of Southern California, CA, USA; Maciej Goniewicz, PhD, PharmD, Roswell Park Cancer Institute, NY, USA; David Mendez, PhD, University of Michigan, MI, USA

In 2016, the U.S. Congress directed the FDA Center for Tobacco Products (CTP) "to conduct an in-depth evaluation of the available evidence of health effects from e-cigarettes." CTP contracted with the National Academies of Sciences, Engineering, and Medicine (NASEM) to conduct a comprehensive and systematic review of the literature on short- and long-term health effects of e-cigarettes and to identify future needs for federally funded research. NASEM convened the Committee on the Review of the Health Effects of Electronic Nicotine Delivery Systems, a multi-disciplinary panel of scientists that included several SRNT members, which met 5 times from January to August 2017. The Committee's report is expected to be released to the public in January 2018. This symposium will summarize the newly-released report's findings and its recommendations for future research. Panel members will each briefly summarize the evidence and the panel's conclusions and research recommendations in 5 areas: (1) exposure to the physical and chemical characteristics of e-cigarette devices, solutions, and aerosols (Gideon St. Helen, UCSF); (2) short- and long-term health effects in e-cigarette users (human, animal and in vitro data; Ana Navas-Acien, Columbia / Sharon McGrath-Morrow, Johns Hopkins); (3) effect on smoking initiation and cessation (Adam Leventhal, USC / Nancy Rigotti, Harvard Medical School); (4) harm reduction (Maciej Goniewicz, Roswell Park Cancer Institute); and (5) a computer model of net population effects of e-cigarettes (David Mendez, University of Michigan). Discussant: Mitchell Zeller, Director of FDA CTP. [Please note: the report's results and findings are confidential until its release in early 2018. Therefore, the abstracts for the proposed symposium can discuss only the general methods used for the review. The conclusions and recommendations cannot be revealed in these abstracts but will be discussed in detail at the meeting if this symposium proposal is accepted. We are confident that the Report's findings will be of considerable interest to SRNT membership.]

**JUSTIFICATION:** This symposium will summarize newly-released findings from a report requested by the FDA's Center for Tobacco Products to summarize the current state of evidence about the effects of e-cigarettes on human health and tobacco use behavior.

**FUNDING:** Federal

**CORRESPONDING AUTHOR:** Nancy Rigotti, nrigotti@partners.org

### SYM1A

#### PHYSICAL AND CHEMICAL CHARACTERISTICS OF E-CIGARETTES AND EXPOSURES AMONG USERS AND NONUSERS: FINDINGS FROM A REPORT OF THE U.S. NATIONAL ACADEMIES OF SCIENCES, ENGINEERING, AND MEDICINE

Gideon St.Helen\*, University of California, San Francisco, CA, USA

It is believed that the potential short- and long-term health effects of electronic cigarettes (e-cigarettes) are determined, in part, by the physical and chemical characteristics of the e-liquids and aerosols emitted. It is also believed that the level of systemic exposure to e-cigarette aerosol constituents among e-cigarette users and non-users may play critical roles in the development of health effects. As part of the National Academies of Sciences, Engineering, and Medicine's (NASEM) comprehensive and systematic review of the literature on short- and long-term health effects of e-cigarettes, the committee reviewed the known physical and chemical characteristics of e-liquids and e-cigarette aerosols. The committee also reviewed what is known about levels of systemic exposure to nicotine, humectants, and potentially toxic substances in both e-cigarette users and non-users, as well as how e-cigarette device characteristics influence exposures. Dozens of published manuscripts were included in this review, including lab-based characteriza-

tion of the chemical constituents of e-liquids and aerosols, studies on e-cigarette aerosol physical characteristics such as particle size and concentration, studies of changes in exposure biomarkers from use of e-cigarettes in controlled research settings or from long-term use in their naturalistic environments, and studies of non-users exposed to e-cigarette aerosol constituents. In addition, gaps in the science base related to the physical and chemical characteristics of e-cigarettes and systemic exposure to e-cigarette aerosol constituents were identified and recommendations for future tobacco regulatory science research given. An overview of the committee's major findings, conclusions, and recommendations, which are confidential until January 2018, will be presented and discussed.

**FUNDING:** Federal

**CORRESPONDING AUTHOR:** Gideon St.Helen, PhD, University of California, San Francisco, CA, USA

### SYM1B

#### THE HEALTH EFFECTS OF E-CIGARETTES: FINDINGS FROM A REPORT OF THE U.S. NATIONAL ACADEMIES OF SCIENCE, ENGINEERING, AND MEDICINE

Sharon McGrath-Morrow<sup>\*1</sup>, Ana Navas-Acien<sup>2</sup>, Anthony Alberg<sup>3</sup>, David Savitz<sup>4</sup>, <sup>1</sup>Johns Hopkins School of Medicine, MD, USA, <sup>2</sup>Columbia University Mailman School of Public Health, NY, USA, <sup>3</sup>Hollings Cancer Center - Medical University of South Carolina, SC, USA, <sup>4</sup>Brown University, RI, USA

The relationship between e-cigarette use and adverse health effects is just beginning to be elucidated. Age of the individual, prior history of combustible tobacco use, and underlying health conditions may influence the short and long-term health effects of E-cigarette use. Established tobacco smokers with and without chronic cardiovascular or respiratory diseases or cancer may benefit from switching to e-cigarettes since reportedly, e-cigarette aerosols have fewer toxicants than tobacco smoke. However uncertainty surrounds other toxicants, such as carbonyls and metals, which can be emitted from e-cigarette and can vary with voltage and temperature. Substitution of combustible tobacco products with e-cigarettes may also prolong nicotine addiction and increase risk of relapse. E-cigarette use among adolescents may increase respiratory symptoms in ever users. Several endpoints related to cardiovascular disease have been investigated comparing to both combustible tobacco cigarette and control groups. The health effects of e-cigarettes on offspring born of mothers who were users during pregnancy are also of concern. A Committee convened by the U.S. National Academies of Sciences, Engineering, and Medicine was asked to review the evidence available regarding the health effects of e-cigarettes, with a special focus on e-cigarette users who are (1) adults with underlying chronic diseases, (2) youths, or (3) pregnant women (and fetus). The Committee systematically reviewed and synthesized evidence from comprehensive meta-analytic reviews and original empirical articles addressing these topics with a focus on respiratory disease, cardiovascular disease, cancer and early life effects. Evidence on potential mechanisms was also reviewed. Following the evidence review, the committee made research recommendations on how the short- and long-term health risks associated with e-cigarette initiation and ongoing use should be evaluated. These focused on current gaps and needs, particularly related to FDA's regulation of e-cigarettes. The Committee's conclusions and research recommendations, which are confidential until the Report's release in January 2018, will be presented.

**FUNDING:** Federal

**CORRESPONDING AUTHOR:** Sharon McGrath-Morrow, MD, MBA, Johns Hopkins School of Medicine, MD, USA

## SYM1C

### THE EFFECT OF E-CIGARETTE USE ON COMBUSTIBLE CIGARETTE SMOKING INITIATION AND CESSATION: FINDINGS FROM A REPORT OF THE U.S. NATIONAL ACADEMIES OF SCIENCES, ENGINEERING, AND MEDICINE

Adam Leventhal<sup>\*1</sup>, Nancy Rigotti<sup>2</sup>, <sup>1</sup>University of Southern California, CA, USA, <sup>2</sup>Harvard Medical School, MA, USA

A critical determinant of the public health impact of e-cigarettes is whether and to what extent e-cigarette use influences combustible cigarette smoking. To date, two types of transitions between e-cigarette use and combustible tobacco smoking have been investigated, each of which were reviewed in-depth by a Committee convened by the U.S. National Academies of Sciences, Engineering, and Medicine: (1) The effect of e-cigarette use on smoking initiation and progression among adolescents and young adults; and (2) The effect of e-cigarette use on smoking cessation among adults. For initiation and progression as well as for cessation, the Committee systematically reviewed and synthesized evidence from comprehensive meta-analytic reviews and original empirical articles addressing these topics. Dozens of articles were identified, which addressed a collective evidence base including various types of studies. For cessation, evidence included (but was not limited to) randomized controlled trials testing the effects of e-cigarette use on smoking cessation outcomes. For cessation as well as initiation and progression, evidence included observational studies that investigated the association of e-cigarette use with combustible tobacco use. For the observational studies, the Committee considered a number of methodological factors when considering the strength of evidence, including the e-cigarette and combustible cigarette use assessment strategy, method of addressing potential confounding influences on the association, and the conceptual plausibility of the association. Population trends in the prevalence of combustible tobacco and e-cigarette use across time were also considered. Based on the totality of evidence, the Committee rendered conclusions regarding the effect of e-cigarette use on smoking initiation and progression as well as on cessation. Research recommendations were provided. An overview of the committee's major findings, conclusions, and recommendations, which are confidential until January 2018, will be presented and discussed by Drs. Leventhal (initiation) and Rigotti (cessation).

FUNDING: Federal

CORRESPONDING AUTHOR: Adam Leventhal, PhD, University of Southern California, CA, USA

## SYM1D

### E-CIGARETTES AS A HARM REDUCTION TOOL: FINDINGS FROM A REPORT OF THE U.S. NATIONAL ACADEMIES OF SCIENCE, ENGINEERING, AND MEDICINE

Maciej Goniewicz\*, Roswell Park Cancer Institute, NY, USA

Although smoking cessation is currently the only guaranteed way to reduce the harm caused by tobacco smoking, a secondary tobacco control approach may be to reduce the harm from continued nicotine use amongst smokers unable or unwilling to quit. In general, harm reduction policies attempt to diminish the damaging effects of a particular behavior without aiming to eliminate the behavior itself. Switching to modified risk tobacco products (MRTPs), including e-cigarettes, is a prevalent reduction/cessation approach among smokers of combustible tobacco cigarettes. The report by a Committee convened by the National Academies of Sciences, Engineering, and Medicine addresses issues related to e-cigarette use to reduce the harms associated with cigarette smoking. The Committee reviewed studies that prospectively evaluated changes in health outcomes, including pulmonary and cardiovascular functions, among smokers who switched from combustible tobacco cigarettes to e-cigarettes. Both longitudinal observational and cross-over experimental studies were included in the review. Cross-sectional and longitudinal studies that compared exposure to nicotine and toxicants in tobacco smokers who substituted their combustible tobacco cigarettes with e-cigarettes were also reviewed. The Committee also evaluated evidence from in vitro and animal studies on the toxic and harmful effect of e-cigarettes compared to combustible tobacco cigarette. Toxicant levels in e-cigarette aerosol and tobacco smoke were also compared. Following the evidence review, the committee made conclusions about the harm reduction potential of e-cigarettes and offered research recommendations focused on current gaps and needs, with an aim to inform FDA's regulation of ENDS. The Committee's conclusions and research recommendations, which are confidential until the Report's release in January 2018, will be presented.

FUNDING: Federal

CORRESPONDING AUTHOR: Maciej Goniewicz, PhD, PharmD, Roswell Park Cancer Institute, NY, USA

## SYM1E

### MODELLING THE PUBLIC HEALTH EFFECTS OF ELECTRONIC CIGARETTES: FINDINGS FROM A REPORT OF THE U.S. NATIONAL ACADEMIES OF SCIENCE, ENGINEERING, AND MEDICINE

David Mendez\*, University of Michigan, MI, USA

The emergence of electronic cigarettes (e-cigarettes) in the market has created controversy among the public health community. Some think that they represent a much less harmful alternative to combustible tobacco and can be used as an effective smoking cessation aid. Others claim that these products are inducing to smoke youths who otherwise would not start the behavior. Additionally, some argue that the uncertainty about the future potential harm of e-cigarettes is too big to deem these products harmless or even substantially less harmful than combustible tobacco. This work does not intend to address the validity of these different points of view, but rather to explore their combined effect on a single population health metric: future life-years saved or lost due to e-cigarettes. As part of the U.S. National Academies of Science, Engineering and Medicine's Report on e-cigarettes, we used a well-established population dynamics model of smoking prevalence and health effects to consider a set of scenarios, varying the relative risk and smoking initiation and cessation effects of e-cigarettes within a range of possible values supported by the literature. For smoking initiation effects, we consider scenarios ranging from 0% to 50% increase in the smoking initiation rate due to e-cigarettes. For smoking cessation effects, we consider scenarios ranging from a 5% decrease to a 15% increase in the smoking cessation rate due to e-cigarettes. And for mortality risk, we consider scenarios ranging from e-cigarettes being totally harmless up to imposing 50% of the risk of combustibles. In total, we produce eighty five different scenarios combining these assumptions and compute cumulative population size by the years 2050 and 2070. We then compare these figures to those under a scenario where e-cigarettes do not exist and report the differences. The results, which will be presented, will be helpful to the public and policy-makers in understanding the range of potential future health effects of electronic cigarettes on the population.

FUNDING: Federal

CORRESPONDING AUTHOR: David Mendez, PhD, University of Michigan, MI, USA

## SYM2

### COMMUNICATING SCIENCE TO POLICYMAKERS

David Holtgrave, PhD, Johns Hopkins Bloomberg School of Public Health, MD, USA; Kenneth Warner, PhD, University of Michigan School of Public Health, MI, USA; Betsy Brock, MPH, Association for Nonsmokers-Minnesota, MN, USA; Natalie Hemmerich, JD, Ohio State University, OH, USA

Evidence-based public health is manifest in the field of tobacco control, especially given FDA's imperative to generate science-based tobacco regulatory policy. This symposium will provide an overview of how to frame research for policymakers as well as three case studies on how the translation of science has informed policy decisions. First, Dr. Holtgrave will address gaps from the dissemination of science in academia and provide an overview of how science can be developed and interpreted in order to inform policymakers through quantitative policy analyses. Second, Dr. Warner will provide details on how science successfully influenced Congress to retain the federal excise tax on cigarettes and to increase excises tax at the state-level. Third, Ms. Brock will discuss the campaign that advocacy groups in Minnesota founded to restrict the sale of menthol tobacco products and the ways in which science was used to advocate for these restrictions. Fourth, Ms. Hemmerich will provide evidence-based findings on how emotions influence the decision-making process of consumers and how behavioral researchers and public health lawyers can work together to uphold evidence in court, especially in the field of tobacco regulatory science. Finally, Mr. Jensen, the discussant, will summarize the main points of each presentation, discuss how tobacco professionals across disciplines can collaborate, and provide future directions on how science can be used to inform policy.





**JUSTIFICATION:** This symposium utilizes a broad conceptual framework as well as three case studies on how science can be developed, disseminated, and translated to be more informative to tobacco control policy decision-making.

**FUNDING:** Unfunded

**CORRESPONDING AUTHOR:** Nicole Nicksic, nenicksic@vcu.edu

## SYM2A

### FRAMING RESEARCH FOR PUBLIC HEALTH POLICYMAKERS

David Holtgrave\*, Johns Hopkins Bloomberg School of Public Health, MD, USA

Evidence-based public health is manifest in the field of tobacco control, especially given FDA's imperative to generate science-based tobacco regulatory policy. Gaps remain, however, in the ways in which science is developed and disseminated in traditional academic settings and what is needed by policy and other decision makers. The goal of this presentation is to provide a broad conceptual framework of the ways in which science can be developed, disseminated, and translated to be more informative to policy decision-making, using examples from tobacco control and other fields (e.g., HIV). This framework outlines the rationale for incorporating quantitative policy analytic tools (including evidence synthesis, cost, and cost-effectiveness analysis) in translation and dissemination activities of a research study. Using quantitative policy analysis as a bridge between basic scientific information and policy and programmatic decision makers facilitates the technology transfer process by directly incorporating the information needs of these decision makers in the process.

**FUNDING:** Unfunded

**CORRESPONDING AUTHOR:** David Holtgrave, PhD, Johns Hopkins Bloomberg School of Public Health, MD, USA

## SYM2B

### CIGARETTE TAXATION: A HISTORIC TOBACCO CONTROL SCIENCE-TO-POLICY SUCCESS STORY

Kenneth Warner\*, University of Michigan School of Public Health, MI, USA

Prior to the mid-1980s, public health professionals strongly opposed using taxation to discourage smoking. They believed smokers should respond to intrinsic considerations – especially their own health – rather than extrinsic considerations such as cigarette price. As well, they believed that smokers were addicted and would not quit due to a higher price. Two economic studies in the early '80s presented evidence to the contrary, but as technical papers, they received little attention in the public health and policy communities. What followed represents one of the most successful science-to-policy stories in tobacco control history, one directly involving SRNT members at all stages. A Harvard institute held a cigarette excise tax conference in April 1985 in Washington, DC. The conference included a paper that translated the findings from the technical economic studies for a broader lay audience. The paper concluded that hundreds of thousands of deaths would result from halving the federal excise tax, legislated by Congress to take effect in October. Immediately before a Senate hearing on the tax in September, the Harvard institute delivered the conference report to all members of Congress. Media coverage was extensive the day before the hearing. Led by the Coalition on Smoking and Health, tobacco control advocates had been activated to lobby Congress and the media. The compelling message, along with carefully orchestrated political pressure, contributed to a vote by Congress to maintain the tax. Subsequent publication of the conference paper in JAMA created additional publicity on the utility of the tax. States employed the paper's methods to support state excise tax increases. Led by the Non-Smokers' Rights Association, Canadian activists used the US evidence to successfully promote provincial and federal tax increases. Since then, the research and analytical methods and the lobbying strategies have been adopted in scores of countries. The value of excise taxation in reducing smoking has been enshrined in the FCTC. Science, and its effective communication to policy makers, has made tobacco taxation a first principle of tobacco control worldwide.

**FUNDING:** Unfunded

**CORRESPONDING AUTHOR:** Kenneth Warner, PhD, University of Michigan School of Public Health, MI, USA

## SYM2C

### RESEARCH IN ACTION: USING DATA TO ADVOCATE FOR A MENTHOL TOBACCO RESTRICTION IN MINNEAPOLIS

Betsy Brock\*<sup>1</sup>, Kristen Werner<sup>1</sup>, LaTrisha Vetaw<sup>2</sup>, Molly Moilanen<sup>3</sup>, Barbara Schillo<sup>3</sup>, <sup>1</sup>Association for Nonsmokers-Minnesota, MN, USA, <sup>2</sup>NorthPoint Health and Wellness Center, MN, USA, <sup>3</sup>ClearWay Minnesota, MN, USA

In August 2017, the Minneapolis City Council voted to restrict the sale of menthol tobacco products to adult-only tobacco and liquor stores. This policy, which will go into effect in August 2018, was the result of a two-year campaign led by a diverse coalition of community advocates. The campaign, Beautiful Lie Ugly Truth, was well grounded in data that made the case for 1) why a menthol restriction was needed and 2) how the policy would impact tobacco use and tobacco retailers. The campaign for a menthol sales restrictions used data collected from a wide variety of sources. National and state prevalence data were used to make the case for how menthol tobacco impacts the health of diverse communities. Data from the tobacco document archives were used to illustrate how the tobacco companies specifically targeted African Americans with menthol marketing. An online survey data of local menthol smokers assessed the potential impact of menthol restrictions on purchasing behavior. An analysis of convenience store data on national and regional trends of tobacco sales compared to store profit as well as to other top categories such as packaged food and beverages was conducted to counter opposition arguments that the policy would irreparably harm local businesses. Tobacco industry and convenience store lobbyists aggressively opposed this policy and partnered heavily with local retailers to block its passage. The contribution of data to the successful passage of this landmark local policy will be shared and lessons learned will be discussed. Examples of campaign materials will be shared to illustrate how data were used in a real world policy setting to influence policy makers and counter opposition arguments. An overview of planned future evaluation efforts to assess the impact of the policy will be provided.

**FUNDING:** Nonprofit grant funding entity

**CORRESPONDING AUTHOR:** Betsy Brock, MPH, Association for Nonsmokers-Minnesota, MN, USA

## SYM2D

### EMOTION IN THE LAW AND THE LAB: THE CASE OF GRAPHIC CIGARETTE WARNINGS

Ellen Peters<sup>1</sup>, Abigail Evans<sup>2</sup>, Natalie Hemmerich\*<sup>1</sup>, Micah Berman<sup>1</sup>, <sup>1</sup>Ohio State University, OH, USA, <sup>2</sup>Battelle, MD, USA

**OBJECTIVE:** The decision in *RJ Reynolds v FDA* (2012) to invalidate the FDA's proposed graphic health warnings was based in part on the reasoning that the proposed graphic warnings cued emotional responses, and therefore, could not be considered "factual." However, this reasoning demonstrated the courts' fundamental misunderstanding of current behavioral science research. **METHODS:** In contrast to the courts' artificial separation of emotions from fact, we synthesize and interpret relevant research in basic decision sciences and describe an evidence-based characterization of how emotions influence consumer decision-making through multiple mechanisms. We then explore how behavioral research gets "lost in translation" in the legal process. **RESULTS:** We recommend ways that behavioral scientists can work with attorneys to interpret behavioral research effectively to benefit the legal process. For science-based tobacco regulation to survive legal challenges from the tobacco industry, courts must have access to, and be able to understand and apply the relevant research. Accordingly, behavioral laboratory researchers must consider the courts as an additional audience when designing research and reporting results. **CONCLUSION:** Researchers seeking to influence policy should work closely with public health lawyers to have the greatest impact on the legal system.

**FUNDING:** Federal

**CORRESPONDING AUTHOR:** Natalie Hemmerich, JD, Ohio State University, OH, USA

## SYM3

### THE IMPACT OF WATERPIPE CONSTITUENTS, COMPOUNDS, AND DESIGN FEATURES ON TOXICITY: A CALL FOR REGULATORY ACTION

Wasim Maziak, MD, PhD, Florida International University, FL, USA; Marielle Brinkman, BS, Battelle Public Health Center for Tobacco Research, OH, USA; Cindy Hauser, PhD, Davidson College, NC, USA; Karen Bernd, PhD, Davidson College, NC, USA; Laura Stroud, PhD, Brown University, RI, USA

Tobacco use remains the leading preventable cause of death throughout much of the world. Waterpipe tobacco use - formerly a traditional habit among men in the Eastern Mediterranean (EM) - has spread across the globe. Waterpipe tobacco smoking is most prevalent among young people and women who perceive it as less harmful than cigarettes. The last two decades have witnessed a large amount of research on the prevalence, determinants, constituents, and health effects of waterpipe tobacco smoking. In response to these worrisome trends, the FDA has recently extended its regulatory authority under the Family Smoking Prevention and Tobacco Control Act (TCA) through a deeming rule to include waterpipe products. Accordingly, the FDA Center for Tobacco Products (CTP) now regulates the manufacture, import, packaging, labeling, promotion, sale, and distribution of waterpipe tobacco, charcoal, parts and accessories. This development creates the need for evidence to guide the FDA into effective regulations to curb waterpipe spread. In this symposium, researchers present their novel results about constituents, compounds, and design features of waterpipes that impact the toxicity of waterpipe tobacco products and smoke, all of which are relevant to its regulation. Dr. Maziak will present results from a study that evaluated the effects of flavors on subjective experiences, toxicant exposure and puffing behaviors. Ms. Brinkman will present results from a cross-over study that examined waterpipe smokers' exposures while using waterpipe accessories advertised to reduce harm. Dr. Hauser will describe how the constituents and design of waterpipes impact the physical properties of smoke particles. Dr. Bernd will discuss the effects of constituents of waterpipes on the cytotoxicity of waterpipe tobacco smoke on alveolar cells. Finally, Dr. Stroud will describe perceptions and preferences for waterpipe flavors among pregnant tobacco users and non-users.

**JUSTIFICATION:** The novel studies presented in this symposium on waterpipe will provide guidance to the FDA in terms of regulating waterpipes and their components.

**FUNDING:** Federal

**CORRESPONDING AUTHOR:** Eva Sharma, evasharma@westat.com

## SYM3A

### ROLE OF FLAVOR IN WATERPIPE EXPERIENCE, EXPOSURES, AND SMOKING BEHAVIOR

Ziyad Ben Taleb, Raed Bahelah, Rana Jaber, Mayra Vargas-Rivera, Olatokunbo Osibogun, Mohammed Ebrahimi-Kalan, Wasim Maziak\*, Florida International University, FL, USA

**INTRODUCTION:** Flavored waterpipe (WP) tobacco is the main type of tobacco used by young WP smokers globally, and a major factor attracting youth to smoke WP. However, evidence regarding the effect of limiting flavor on WP smokers' experience continues to be lacking. This study aims at evaluating the effect of flavor manipulation on WP smokers' subjective experiences, exposure to toxicants, and puffing behavior. **METHOD:** Forty-four WP smokers (29 experienced; 15 beginners) completed two, 45-minute ad libitum smoking sessions (preferred flavor vs non-flavored tobacco) in a randomized crossover design. Participants completed survey questionnaires assessing subjective smoking experience. WP smoking topography was recorded continuously throughout the smoking sessions. Plasma nicotine and exhaled carbon monoxide (CO) were measured before and after each smoking session. **RESULTS:** Participants had a mean age of 22.3 (SD=3.1) years and were primarily male (65.3%). Compared with non-flavored tobacco condition, we documented enhanced subjective smoking measures of satisfaction, calmness, taste, concentration, likeness, similarity to own flavor ( $p$  values <0.05) and greater number of puffs ( $p=0.03$ ) during the flavored tobacco smoking condition. No significant differences were observed for exhaled CO between the flavored (29.2±4.9ppm) and non-flavored tobacco conditions (35.1±4.2ppm). Compared with beginners, experienced WP smokers had a greater plasma nicotine boost for the flavored tobacco condition (13.1±2.1 ng/mL versus 4.3±1.7 ng/mL;  $p=0.02$ ). **CONCLUSION:** This study demonstrates the effect of limiting WP tobacco flavor on WP smokers' experiences and exposures. It shows that eliminating flavor can result in substantial changes in WP smoking experience, behavior, and exposure,

and provides a strong rationale for regulating flavoring to curb WP smoking among youth.

**FUNDING:** Federal

**CORRESPONDING AUTHOR:** Wasim Maziak, MD, PhD, Florida International University, FL, USA

## SYM3B

### COMPARISON OF WATERPIPE SMOKERS' EXPOSURES WHEN USING HARM REDUCTION ACCESSORIES

Marielle Brinkman\*, Hyoshin Kim<sup>1</sup>, Stephanie Buehler<sup>1</sup>, Anna Adetona<sup>1</sup>, Sydney Gordon<sup>1</sup>, Pamela Clark<sup>2</sup>, <sup>1</sup>Battelle Public Health Center for Tobacco Research, OH, USA, <sup>2</sup>University of Maryland, MD, USA

**OBJECTIVES:** We examined two waterpipe (WP) tobacco smoking accessories advertised to reduce harm to determine if they result in lower levels of biomarkers of acute exposure compared to the control. **METHODS:** We conducted a cross-over study of 36 experienced WP smokers using a research grade WP (RWP) in the laboratory in three configurations: standard (i.e., control, with quick-light charcoal), standard with electric heating, and standard equipped with bubble diffuser. We collected smoking topography, environmental CO, heart rate and biomarkers of acute exposure, including expired air CO, exhaled benzene, and plasma nicotine boost. **RESULTS:** The heating source had the greatest effect on exposures. Smoker's plasma nicotine, heart rate, and benzene and CO boost were all significantly lower when using an electric heating source compared to control. However, on average smokers puffed more intensely, took significantly more and larger volume puffs for a larger total puffing volume (1.8 times larger,  $p < 0.0001$ ) when using the electric heat source compared to the charcoal control; plasma nicotine boost measurements indicated this was likely due to lower mainstream nicotine delivery with the electric heating. **CONCLUSIONS:** This is the first study to report evidence of WP smokers engaging in compensation (increased and more intense puffing) to make up for the decreased mainstream nicotine delivery from the same tobacco heated with an electric device compared to quick-light charcoal. The results support the regulation of WP components and that evaluations of modified or reduced risk claims should include human studies and not be based solely on machine smoking yields.

**FUNDING:** Federal

**CORRESPONDING AUTHOR:** Marielle Brinkman, BS, Battelle Public Health Center for Tobacco Research, OH, USA

## SYM3C

### IMPACT OF SHISHA CONSTITUENTS, HEATING METHOD, PIPE HEIGHT, AND HOSE LENGTH ON PARTICLE CONCENTRATIONS AND SIZE DISTRIBUTIONS IN WATERPIPE TOBACCO SMOKE

Cindy Hauser\*, David DeGroot, Sarah Coats, Ronnae Mailig, Sam Lidsky, Davidson College, NC, USA

**SIGNIFICANCE:** Shisha's complex tobacco and flavoring matrix and indirect heating versus combustion of tobacco seen in cigarettes, may present unknown health hazards in waterpipe tobacco smoke (WTS). We are focused on how waterpipe use and design impact the physical properties WTS particles. Waterpipes can be viewed as mini atmospheric systems where vapors condense into particles and particles increase or decrease in size or number due to coagulation, agglomeration, condensation or evaporation. Not only do the glycerol, syrup and tobacco constituents, and heating method contribute to the formation of WTS particles but the waterpipe's height and hose length could impact particle aging processes. We present the results of systematic investigations into how the different constituents within shisha as well as the use of charcoal or an electronic heating source contribute to the distribution and concentration of the particulate component of WTS. **METHODS:** Commercial waterpipes were smoked (Beruit method) with a TSI Engine Exhaust Particle Sizer (EEPS) sampling particles from 5.3 to 530 nm at rate of 10Hz. Particle distributions and concentrations were evaluated during 50 minute sessions with an empty head, Teflon with glycerol, Teflon with shisha syrup or 10 g shisha, using charcoal or electronic (e-) charcoal heating. **RESULTS:** During the first 10min particles grow in size and number regardless of heating source or constituents in the head. The use of charcoal generates an initial concentration of  $10^6$  particles/cm<sup>3</sup> with a mean diameter of 30 nm that increases to  $6 \times 10^6$  particles/cm<sup>3</sup> with a mean diameter of 190 nm. The particle size distributions for syrup or



glycerol are similar to shisha but the concentration of particles generated is 6x lower. E-charcoal heating does not show the 30 nm mode and has 10x lower particle concentrations, but demonstrates similar growth to 190 nm over a session. Studies with increasing pipe height and length show decreasing concentrations and mean particle diameter. These results, therefore, inform toxicity studies, and provide information critical to understanding the formation and aging of particles in WTS.

FUNDING: Federal

CORRESPONDING AUTHOR: Cindy Hauser, PhD, Davidson College, NC, USA

## SYM3D

### SHISHA CONSTITUENTS AND HEATING METHOD AFFECT THE CYTOTOXICITY OF WATERPIPE TOBACCO SMOKE ON ALVEOLAR CELLS

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**SIGNIFICANCE:** The continued increase in worldwide waterpipe tobacco smoking, especially among younger demographic groups, has prompted expanded research into the relative safety of this lifestyle choice. Our study reports the effect of different shisha components on cell viability using a smoking apparatus optimized to model waterpipe tobacco smoke impacting lung cells. In contrast to others, we incorporate cellular exposure at the air-liquid interface at airflows more similar to those in the alveolae and under conditions allowing chemical and physical effects of particle exposure to be examined. **METHODS:** L2 cells (type II pneumocytes) were seeded at  $10^6$  cells per Transwell filter and exposed to ambient air (A), or smoke generated by charcoal heating shisha (C+S), extracted syrup on Teflon (CSyT), glycerol on Teflon (CGT), or dry Teflon (CT) following the standard Beirut smoking protocol with a medium pipe (23") and Tygon® 2375 hose (72"). After a 24hr recovery period with the air-liquid interface maintained, the treatments' effects were analyzed by normalizing the average value for three technical replicates against that of mock-exposed cells from the same experimental run. Data presented are the mean of normalized data from three experimental runs  $\pm$  SD. One way ANOVA or Kruskal Wallis rank sum test statistical analyses were performed, as indicated by variances. Two cell viability metrics were used, membrane permeability (CellTiter Fluor, Promega) and endocytic ability (Neutral red dye uptake, NRU). **RESULTS:** C+S smoke resulted in a 60% decrease in membrane permeability ( $n=3$ ,  $p=0.049$ ) and a 74% decrease in endocytosis ( $n=3$ ,  $p=0.050$ ). CGT and CT smoke did not have a significant effect on cellular viability. The role of shisha syrup and initial volatilization of whole shisha versus damage caused by a 1hr smoking session informs our model of harm due to waterpipe smoking. **CONCLUSIONS:** Our data indicate whole shisha smoke, but not all of its constituents causes greater than 30% decrease in viability and, therefore, meets the NIH definition of cytotoxicity.

FUNDING: Federal; Academic Institution

CORRESPONDING AUTHOR: Karen Bernd, PhD, Davidson College, NC, USA

## SYM3E

### PERCEPTIONS AND PREFERENCES FOR WATERPIPE TOBACCO FLAVORS IN PREGNANT MOTHERS: A NOVEL CORRESPONDENCE ANALYSIS APPROACH

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**SIGNIFICANCE:** Little is known regarding perceptions and preferences for flavors in vulnerable populations. We used a correspondence analysis (CA) approach to elucidate perceptions and preferences for waterpipe tobacco (WPT) flavorings in a racially/ethnically diverse sample of pregnant tobacco users and non-users. **METHODS:** 100 pregnant women (50% tobacco users,  $M_{age}=26$ ; 55% minorities; 66% low income) recruited from a larger study of perinatal smoking and fetal toxicity. Detailed interviews assessed preferences for and use of WPT flavors. **RESULTS:** Rates of lifetime, preconception, and pregnancy WPT use was 83, 18, and 11%, respectively. Fruit and mint were the most commonly used flavors. Pregnant mothers showed significant differences in liking, attractiveness, interest, and intentions to use WPT across flavors ( $\chi^2 \geq 41.4$ ,  $ps < .02$ ), with greatest preference for fruit, candy, mint, and alcoholic drinks, mid-level preferences for spice and non-alcoholic drink flavors (e.g., chocolate, coffee), and lowest preference for

tobacco flavors. There were no differences in perceptions of health risks across flavors. A latent factor mapping technique (biplots) from a CA of a contingency table was used to simultaneously identify (a) clustering of flavors by perception scale, (b) clustering of perception scales by flavors, and (c) clustering of participants (e.g. user vs. non-user) across flavors/perceptions. Liking for, perceived attractiveness of, interest in, and intentions to use fruit, candy, mint, and alcoholic drink flavors significantly differentiated WPT users from non-users ( $ps < .05$ ). Interest and intentions to use non-alcoholic drink flavors also significantly differentiated users from non-users ( $ps < .05$ ), while liking and perceived attractiveness for these flavors did not differentiate users from non-users. **CONCLUSIONS:** Results highlight high rates of WPT use in pregnant women, increased preference for fruit and mint flavors, and links between preferences for sweet flavors and use of WPT in a highly vulnerable population. Results also highlight the utility of CA for elucidating clustering of flavor perceptions and preferences in novel tobacco products.

FUNDING: Federal

CORRESPONDING AUTHOR: Laura Stroud, PhD, Brown University, RI, USA

## SYM4

### REACHING, ENGAGING, AND INTERVENING WITH BEHAVIORAL HEALTH SMOKERS

Faith Dickerson, PhD, MPH, Sheppard Pratt Health Systems, MD, USA; Rebecca Schacht, PhD, University of Maryland Baltimore County, MD, USA; Melanie Bennett, PhD, University of Maryland Medical School, MD, USA; Corinne Cather, PhD, Maryland General Hospital, MA, USA

Smoking cessation has been a significant success story for public health. However, disparities in smoking rates among behavioral health populations have persisted. Individuals who suffer from mental health or substance abuse problems have the highest prevalence of smoking, suffer considerable health effects attributable to smoking, and have low quit rates. Integrated care and health systems approaches offer new hope for making meaningful progress in smoking cessation in this population. This symposium highlights several programmatic, health systems interventions to address cessation among behavioral health populations in diverse healthcare settings, with a focus on implementation efforts and evaluation. The first presentation describes intensive policy and programming efforts at a large private psychiatric hospital to initiate cessation counseling in 12 hospital units and improve workflow with electronic health record tracking with the goal of prolonged post-discharge abstinence from smoking. The second describes a three-year effort of the MDQuit Tobacco Resource Center to create and launch comprehensive smoking cessation training and implementation program among behavioral health populations across Maryland. Training and dissemination efforts have reached and followed over 800 behavioral healthcare providers and over 100 agency administrators and support staff. The third highlights two projects at VA medical centers focusing on smoking cessation with SMI patients demonstrating access and engagement success and the feasibility of locating SC services in mental health settings. The fourth describes an NIH-funded comprehensive program to reduce cardiovascular risk in SMI populations that includes a smoking cessation intervention tailored to the readiness of the smoker. These projects increase our understanding of how to implement programs in diverse settings to reach, engage, and assist behavioral health smokers and offer results and conclusions that demonstrate successful implementation and initial outcomes as well as continuing challenges. Discussant: Chad D. Morris, PhD, University of Colorado

**JUSTIFICATION:** These presentations document successful initiatives to reach and engage smokers with mental health and substance abuse problems.

FUNDING: State

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## SYM4A

### IMPLEMENTATION OF A SMOKING CESSATION PROGRAM IN A LARGE PSYCHIATRIC HOSPITAL SETTING

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**INTRODUCTION:** Sheppard Pratt is a 330-bed not-for-profit psychiatric hospital with >9,000 admissions annually. Almost half of adult patients admitted to the hospital report tobacco use in the previous 30 days. Until recently no smoking cessation services were provided other than nicotine replacement therapy (NRT) as palliative care during the smoke-free hospital stay. In late 2015 a comprehen-





sive smoking cessation program was begun to take advantage of the enforced abstinence in the hospital to promote long term abstinence from tobacco. **METHODS:** Data about the implementation of the program has been collected over the past 1.5 years. **RESULTS:** A smoking cessation coordinator (SCC) was hired who developed and implemented protocols for smoking cessation counseling interventions. Since the beginning of the program 2,112 patients on 12 hospital units have received smoking cessation counseling; this represents almost 2/3 of hospitalized smokers. The SCC tracked patients' motivation to quit using a brief stage of change assessment; almost 40% expressed intent to stay quit after hospital discharge. More than 80% of hospitalized smokers have also been offered a referral for continued smoking cessation treatment at discharge, another feature of the program. The SCC initiated changes in the electronic medical record to improve the workflow of providing smoking cessation treatments and led several other quality improvement projects. Training sessions for hospital staff helped to change attitudes and to debunk myths about mental illness and smoking. A next step in the program is planned telephone contact with tobacco users after hospital discharge to promote continued abstinence and engagement in smoking cessation services. **CONCLUSIONS:** The high percentage of tobacco users among patients admitted to a psychiatric hospital and smoke-free hospital stay provide an opportunity for smoking cessation services as a "teachable moment" when patients are receiving intensive treatment. Contrary to prevailing myths, most psychiatric patients are receptive to smoking cessation counseling and many are motivated to quit.

**FUNDING:** State; MD Department of Health grants to Sheppard Pratt.

**CORRESPONDING AUTHOR:** Faith Dickerson, PhD, MPH, Sheppard Pratt Health Systems, MD, USA

## SYM4B

### SUPPORTING IMPLEMENTATION OF A STATEWIDE SMOKING CESSATION INTERVENTION AMONG MARYLAND BEHAVIORAL HEALTH AGENCIES

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**INTRODUCTION:** Efforts to address elevated rates of smoking among behavioral health populations have been limited by healthcare providers' lack of training in smoking cessation interventions and ability to integrate cessation interventions into existing clinical practices. MDQuit, an academic resource center that interfaces with stakeholders across Maryland to promote tobacco cessation, created the Breaking the Habit in Behavioral Health (BH2) training program to address these gaps. **METHODS:** BH2 was created as a manualized, cognitive-behavioral single- and multi-session treatment program that can be implemented in individual and group formats. Additional BH2 components for healthcare providers address screening, brief interventions, and referral to the state Quitline. Training and materials were offered to behavioral health providers and agency staff and administrators to facilitate agency-wide integration of smoking cessation efforts. **RESULTS:** Over 900 behavioral healthcare providers, administrators, and support staff have been trained to date. Implementation rates were assessed two and six months post-training via online surveys and a subset of trainees were interviewed to assess implementation experiences. Preliminary analyses indicate that providers can integrate BH2 materials into existing smoking cessation activities, but encounter agency, staff, and clinical barriers when attempting to initiate a new treatment group, such as scheduling difficulties, staff smoking, and patient ambivalence. **CONCLUSIONS:** Agency providers are interested and eager to learn about smoking interventions but face logistical, financial, and programmatic barriers that make implementation challenging. Potential solutions to mitigating these barriers and creating comprehensive agency-wide programmatic and policy interventions will be discussed.

**FUNDING:** State; Maryland Department of Health, Pfizer Education Grant.

**CORRESPONDING AUTHOR:** Rebecca Schacht, PhD, University of Maryland Baltimore County, MD, USA

## SYM4C

### TOBACCO DEPENDENCE AND SMOKING CESSATION: REACHING VETERANS WITH SERIOUS MENTAL ILLNESS

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**INTRODUCTION:** Smoking is the largest predictor of elevated mortality for adults with serious mental illness (SMI). Smoking and smoking-related illnesses are enormous problems for the Veteran population. Making smoking cessation (SC) programs accessible to Veterans with SMI is a critical step in improving Veterans' health. This presentation will review findings from two efforts to integrate SC services with VA mental health treatment. **METHODS:** Data for project 1 were collected as part of a VA-funded study of a behavioral SC intervention for Veterans with SMI (n=178) receiving outpatient mental health care at 3 VA Medical Centers. Data for project 2 were collected as part of a pilot study (n=10) to date out of a sample of 20 total) focused on developing an SC program for Veterans with SMI that begins during an psychiatric hospitalization and extends after discharge via telephone counseling. **RESULTS:** *Project 1:* A small percentage achieved abstinence, smoking quantity was significantly reduced, and most reported making a quit attempt during the study period. Significant reductions in smoking quantity took place within the first two weeks of participation. Predictors of engagement included more severe psychiatric symptoms and prior experience of SC group counseling. *Project 2:* There are varying levels of motivation to remain quit following discharge. Ninety percent of participants completed 1-2 30-minute SC counseling sessions while in the hospital. After discharge, 4 participants completed at least 1 telephone SC counseling session and 2 completed 2 or more. Having a telephone or being discharged to a residential program appear to assist participants in completing telephone calls. We will recruit another 10 participants; all will complete qualitative interviews to provide input into ways to make SC counseling post-hospitalization more accessible. **CONCLUSIONS:** Veterans with SMI are receptive to SC counseling; locating SC services in mental health treatment programs is feasible and can increase accessibility. Experiencing a high level of SMI symptoms should not exclude individuals from participating in SC services.

**FUNDING:** Federal

**CORRESPONDING AUTHOR:** Melanie Bennett, PhD, University of Maryland Medical School, MD, USA

## SYM4D

### SMOKING CESSATION IN THE COMPREHENSIVE CARDIOVASCULAR RISK REDUCTION TRIAL IN PERSONS WITH SERIOUS MENTAL ILLNESS REDUCTION (IDEAL)

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**INTRODUCTION:** Smoking is the primary contributor to cardiovascular (CVD) risk and premature mortality in persons with serious mental illness (SMI). This is a NIH-funded randomized controlled trial of an 18-month comprehensive cardiovascular risk reduction program for persons with SMI, which includes a smoking cessation component. **METHODS:** We report baseline data and intervention strategies. **RESULTS:** The trial randomized 269 SMI outpatients with at least one CVD risk behavior or risk factor from a community mental health organization in Maryland to control (N=132) or active intervention (N=137). All trial participants are offered group exercise classes. Participants randomized to active intervention are also offered 1) individual CVD risk reduction behavioral counseling for smoking cessation and diet from a health coach; 2) study nurse coordination with medical and mental health providers to optimally address smoking cessation, diabetes, dyslipidemia and hypertension. Participants in the trial are a mean age 48.8 (SD 11.9) years, 141(52%) female, 125(47%) African-American. At baseline, a total of 140(52%) were current smokers, 242 (90%) were overweight or obese; 132(94%) of smokers had at least one other CVD risk factor and 51% had made a quit attempt in the past year. The smoking cessation part of the intervention uses motivational interviewing, contingency management with rewards based on CO testing, and facilitation of smoking cessation pharmacotherapy. Strategies are stage-based with a different approach for participants willing to set a quit date (Preparation, 43% of smokers), those interested in quitting later (Contemplation,



39%), and those not interested in quitting (Pre-contemplation, 19%), as well as for those who have successfully quit in the program. **DISCUSSION:** Delivering smoking cessation treatment to persons with SMI is feasible as part of a CVD risk reduction intervention. This trial is unique in that it addresses address tobacco smoking in the context of other CVD risks and in those with a range of interest in quitting. We will also discuss challenges and facilitators of the intervention.

**FUNDING:** Federal; NHLBI R01 112299.

**CORRESPONDING AUTHOR:** Corinne Cather, PhD, Maryland General Hospital, MA, USA

## SYM5

### UNDERSTANDING SMOKING PATTERNS, STIGMA, AND SMOKING CESSATION TREATMENT ENGAGEMENT IN THE SEXUAL AND GENDER MINORITY POPULATION

Sean McCabe, PhD, University of Michigan, MI, USA; Sharon Lipperman-Kreda, PhD, Pacific Institute for Research and Evaluation, CA, USA; Erin Vogel, PhD, University of California, San Francisco, CA, USA; Danielle Ramo, PhD, University of California, San Francisco, CA, USA

Sexual and gender minority (SGM) individuals are disproportionately affected by tobacco use and associated health conditions, yet they face significant barriers to treatment participation and lower levels of satisfaction with treatment than others. Experiencing discrimination based on sexual orientation and/or gender identity appears to be a major reason for this disparity. Those who have multiple marginalized social identities (e.g., ethnic minority, economically disadvantaged) may be especially vulnerable to tobacco use and other health risk behaviors. This symposium will examine tobacco use in the SGM population from an interdisciplinary perspective using multiple levels of analysis. With an epidemiological focus, the first study will use national data to examine smoking rates/tobacco use disorder by sexual orientation discrimination among US adults, and also examines LDCT lung screening eligibility by sexual orientation among older adults. The second study examines perceptions of SGM discrimination and tobacco-related stigma among sexual and gender minorities who are socially disadvantaged by other social categories (e.g., being an ethnic minority, being housing insecure). The third study moves into the area of treatment adherence, examining health risk behaviors and engagement among SGM vs non-SGM young adults participating in a Facebook smoking cessation intervention trial. A final study presents formative work to develop a culturally-tailored Facebook-based smoking cessation intervention for SGM young adults. This symposium integrates epidemiological and clinical research, applying a variety of methods to a widespread public health issue. Dr. Joseph Lee, Assistant Professor of Health Education & Promotion at East Carolina University and an expert on SGM smoking who has conducted extensive research on tobacco-related health disparities, will serve as discussant. Discussion will focus on the role of discrimination in the high smoking rates in the SGM population and how treatment and public health policy can be made more effective for this population.

**JUSTIFICATION:** Research presented in this symposium can be used to address health disparities in the general population and to inform smoking cessation treatment for SGM smokers.

**FUNDING:** Federal

**CORRESPONDING AUTHOR:** Danielle Ramo, danielle.ramo@ucsf.edu

## SYM5A

### SEXUAL ORIENTATION DISCRIMINATION, TOBACCO USE DISORDER, AND ELIGIBILITY FOR LUNG CANCER SCREENING AMONG U.S. ADULTS

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**SIGNIFICANCE:** Differences in tobacco use by sexual orientation are well documented. Development of interventions requires attention to the etiology of these differences. This study examined (1) associations between sexual orientation discrimination, cigarette smoking, and DSM-5 tobacco use disorder (TUD) and (2) the eligibility for low-dose computed tomography (LDCT) lung cancer screening, as well as potential variations in eligibility by sexual orientation. **METHODS:** The

2012-2013 NESARC-III collected data via in-person interviews with a nationally representative sample of 36,309 U.S. adults. Approximately 2.8% self-identified as lesbian, gay or bisexual, 3.1% reported a past-year same-sex sexual partner, and 8.3% reported same-sex sexual attraction. Eligibility for LDCT lung cancer screening was based on U.S. Centers for Medicare and Medicaid Services guidelines for older adults aged 55 to 77. **RESULTS:** Sexual identity, sexual behavior, and sexual attraction were significantly associated with cigarette smoking and TUD, and rates were highest among bisexual adults. Sexual minorities who experienced high levels of sexual orientation discrimination had significantly greater probability of cigarette smoking and TUD than those who experienced lower levels or no sexual orientation discrimination. Overall, 23.4% of older adults met eligibility for LDCT lung cancer screening with evidence of chronic smoking; eligibility was higher among men and bisexually-identified participants. **CONCLUSIONS:** Sexual minority adults are at elevated risk for smoking-related health disparities. Eligibility for LDCT lung cancer screening among older adults varies by sexual orientation. Lung cancer screening and smoking cessation efforts should recognize that bisexual adults are at heightened risk and consider the role sexual orientation discrimination plays in smoking-related health disparities. Research is needed to understand mechanisms underlying higher rates of smoking among bisexual adults.

**FUNDING:** Federal

**CORRESPONDING AUTHOR:** Sean McCabe, PhD, University of Michigan, MI, USA

## SYM5B

### THE ROLE OF MULTIPLE SOCIAL IDENTITIES IN DISCRIMINATION AND PERCEIVED SMOKER-RELATED STIGMA AMONG SEXUAL AND GENDER MINORITY CURRENT OR FORMER SMOKERS: AN INTERSECTIONAL APPROACH

Sharon Lipperman-Kreda\*, Tamar Antin, Emile Sanders, Malisa Young, Pacific Institute for Research and Evaluation, CA, USA

To understand how sexual and gender minority (SGM) health is differentiated by multiple social identities, we investigated how intersections of being a racial minority (i.e. being African American) and economically-disadvantaged (i.e. housing insecurity) may influence experiences with discrimination and perceptions of tobacco-related stigma among SGM current and former smokers. We collected survey data from 295 SGM current and former smokers in California (19-65 years old), oversampling African American participants. Participants reported their race, past month housing insecurity, number of lifetime experiences with SGM discrimination (e.g., been subject to slurs or jokes, been treated unfairly in healthcare setting;  $M=5.3$ ,  $SD=3.2$ ), and perceptions of tobacco-related stigma including smoker-related stigma, differential treatment due to smoking, social withdrawal from non-smokers, and concealing smoking status. Of all participants, 44% identified as African American and 32% reported any past month housing insecurity. We used univariate General Linear Models to investigate main effects and interactions between being African American and facing housing insecurity on number of lifetime experiences with discrimination and on perceptions of tobacco-related stigma. Controlling for age, ethnicity, and SGM visibility, we found a significant interaction between being African American and facing housing insecurity on experiences with SGM discrimination [ $F(1,251)=5.74$ ,  $p=0.02$ ], perceived smoker-related stigma [ $F(1,230)=5.87$ ,  $p=0.02$ ], perceived differential treatment due to smoking [ $F(1,246)=10.37$ ,  $p=0.001$ ], and social withdrawal from non-smokers [ $F(1,243)=5.50$ ,  $p=0.02$ ]. These interactions suggest that economically-disadvantaged African American SGM current or former smokers experience increased levels of discrimination and perceive higher levels of tobacco-related stigma compared to other SGM current and former smokers. Results suggest that people's multiple identities intersect to intensify oppression and inequities for some people and raise questions about the unintended consequences of stigmatizing smokers for reducing smoking among SGM adults.

**FUNDING:** Federal

**CORRESPONDING AUTHOR:** Sharon Lipperman-Kreda, PhD, Pacific Institute for Research and Evaluation, CA, USA

## SYM5C

### SMOKING CESSATION AND HEALTH RISK BEHAVIORS AMONG SEXUAL AND GENDER MINORITY YOUNG ADULTS PARTICIPATING IN A FACEBOOK SMOKING CESSATION INTERVENTION TRIAL

Erin Vogel<sup>\*1</sup>, Johannes Thrun<sup>2</sup>, Danielle Ramo<sup>1</sup>, <sup>1</sup>University of California, San Francisco, CA, USA, <sup>2</sup>Johns Hopkins University, MD, USA

**SIGNIFICANCE:** This study compared smoking and other health risk outcomes from a Facebook smoking cessation intervention trial between sexual and gender minorities (SGMs) and non-SGMs. **METHODS:** Data were from a trial testing a Facebook smoking cessation intervention. Young adult smokers ( $N = 579$ ) were assigned to a 90-day Facebook intervention group or referred to smokefree.gov. All self-identified non-heterosexual or non-cisgendered participants at baseline (25.4%) were coded as SGM. At 3 months, intervention participants reported whether the intervention was easy to understand, gave sound advice, gave them something to think about, and helped them to be healthier, as well as whether they used the information, thought about the information, and would recommend the intervention. Engagement was measured by number of Facebook comments during the 3 month intervention. Risk level (high/low) for 9 behaviors (physical activity, fat in diet, fruit and vegetable consumption, stress management, alcohol use, marijuana use, illegal drug use, sleep hygiene, and safe sex practices) and smoking status was measured at baseline, 3, 6, and 12 months. In the treatment group ( $n=330$ ), logistic regression (*a t-test*) compared SGMs and non-SGMs on perceptions of (*engagement in*) the intervention at treatment end (3 months). GEEs compared SGMs and non-SGMs on smoking abstinence and risk behaviors over 12 months, controlling for treatment/control group. **RESULTS:** SGMs and non-SGMs did not differ in perceptions of or engagement in the intervention ( $p's > .05$ ) at 3 months. Over 12 months, abstinence ( $p = .73$ ; 12-month abstinence: SGMs 17%, non-SGMs 14.3%) did not differ by SGM status. However, SGMs were more likely to be at high risk for physical inactivity ( $OR = 1.50, p = .006$ ), unsafe sex ( $OR = 1.51, p = .006$ ), and sleep problems ( $OR = 1.67, p = .001$ ) than non-SGMs over 12 months. **CONCLUSION:** A Facebook smoking intervention was equally effective, engaging, and well-received by SGMs and non-SGMs; however, an intervention tailored to SGMs may produce greater long-term abstinence. Tailored interventions could aim to address multiple health risks among SGMs.

FUNDING: Federal

CORRESPONDING AUTHOR: Erin Vogel, PhD, University of California, San Francisco, CA, USA

## SYM5D

### DEVELOPMENT OF A SMOKING CESSATION INTERVENTION FOR SEXUAL AND GENDER MINORITY YOUNG ADULTS ON FACEBOOK: A SYSTEMATIC APPROACH

Danielle Ramo<sup>\*1</sup>, Alina Belohlavek<sup>1</sup>, D'Arius Hambrick<sup>1</sup>, Johannes Thrun<sup>2</sup>, Judith Prochaska<sup>3</sup>, Kevin Delucchi<sup>1</sup>, Urmimala Sarkar<sup>1</sup>, Gary Humfleet<sup>1</sup>, <sup>1</sup>University of California, San Francisco, CA, USA, <sup>2</sup>Johns Hopkins University, MD, USA, <sup>3</sup>Stanford University, CA, USA

**INTRODUCTION:** We conducted focus groups and usability testing to tailor a Facebook smoking intervention to sexual and gender minority (SGM) young adults. **METHOD:** The intervention was adapted based on 2 Facebook focus groups ( $N=27$  SGM-identified U.S. young adults). The Put It Out Project intervention included 90 Facebook posts delivered in private groups tailored to readiness to quit smoking (Ready to quit in 30 days/Not Ready; 180 posts total). 101 posts were SGM-tailored by content/image. Usability was evaluated over 30 days (3 posts/day). Participants were 37% female, 41% genderqueer, 22% lesbian/gay, 51% bisexual ( $M$  age = 19.7). Participants' open-ended feedback on each post was coded by two staff. Comments were tallied and posts with significant negative feedback were flagged for change or deletion. Flags and comment tallies were examined by SGM tailoring ( $T =$  tailored,  $NT =$  non-tailored) and content within readiness groups. **RESULTS:** For those ready to quit ( $N=11$ ), participants commented on average 6 times on each post ( $SD=1.7$ ), and coders flagged 11 posts (12%) for change or deletion. Although not significant, more tailored posts were flagged for change than non-tailored ( $T$  17% flagged;  $NT$  6%;  $p=.115$ ). There were no significant differences in tailoring by comment count ( $T$   $M=5.9$ ;  $NT$   $M=6.1$ ;  $p=.77$ ) or flags by content. Content most likely to be flagged included posts related to smoking identity (50%) and motivation (25%); these were also posts with the most comments ( $p=.004$ ). For those not ready to quit ( $N=16$ ), participants commented on average 10 times ( $SD=1.2$ ); coders flagged 17 posts (19%). There were again

no differences by SGM tailoring in either flags ( $T$  22% flagged;  $NT$  15%;  $p=.29$ ), or comment count ( $T$   $M=10.1$ ;  $NT$   $M=10.2$ ;  $p=.75$ ). There were no differences in post flagging by content ( $p=.80$ ). Content most flagged for change included posts related to motivation (33%) and social norms (29%); comments did not differ by content area ( $p=.252$ ). **CONCLUSIONS/DISCUSSION:** Qualitative feedback was important in tailoring a digital intervention to a vulnerable population. Tailored posts were generally well-received by SGM smokers regardless of readiness to quit.

FUNDING: Federal

CORRESPONDING AUTHOR: Danielle Ramo, PhD, University of California, San Francisco, CA, USA

## SYM6

### TRANSLATING GENETIC RESEARCH INTO CLINICAL PRACTICE FOR PRECISION MEDICINE TOBACCO TREATMENT: SRNT GENETICS NETWORK

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Two decades of research have advanced the state of the science of the pharmacogenetics of smoking cessation, using data from extant clinical trials and prospective clinical trials. Genome-wide association studies, genomic sequencing studies and metabolomics investigations and meta-research have validated some robust genetically informed biomarkers to inform choice of treatment for smokers. However, many challenges remain in order to translate these discoveries into evidence-based practice guidelines. These challenges include evidence gaps for rare variants, polygenic risk scores, selection biases resulting from lack of inclusion of all available clinical trials, lack of sufficient representation of ethnic/racial minorities in studies, and lack of evidence for clinical utility of using omics-based biomarkers to select pharmacotherapy for smoking cessation. The goals of this symposium will be to (a) provide an update on the state of the science of pharmacogenetic tobacco treatment research and biomarker development (e.g., Andrew Bergen, PhD James Baurley, PhD); (b) present evidence synthesis from the first Cochrane systematic review and meta-analyses of genetically-informed biomarkers for smoking cessation (Sean David, MD, SM, DPhil); (c) preview research in progress from a prospective pharmacogenetic clinical trial (Li-Shiun Chen, MD, MPH, ScD); and host (d) an expert panel led by Robert Schnoll, PhD (including the presenters and Kristopher Bough, PhD (National Institute on Drug Abuse Program Director for biomarker identification, validation and Small Business Innovation Research) and Timothy Baker, PhD (USPHS Tobacco Treatment Guideline developer and treatment expert) that will discuss and propose a field-wide enterprise to encourage open science, data sharing, and streamline clinical implementation science for companion diagnostic tests with good clinical utility, and incorporation into clinical practice guidelines.

**JUSTIFICATION:** Pharmacogenetic and pharmacogenomic research advances have led to clinical validation of genetically-informed biomarkers for smoking cessation treatment, but an integrated meta-research effort is needed to translate into evidence based treatment guidelines for selection of pharmacotherapies for treatment-seeking smokers.

FUNDING: Federal

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## SYM6A

### STATE OF THE SCIENCE OF GENETICALLY-INFORMED TOBACCO TREATMENT BIOMARKER RESEARCH AND DEVELOPMENT

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Genetically-informed tobacco treatment biomarker research has focused on leveraging knowledge of genetic influences on nicotine metabolism, tobacco dependence, risk factors involved in tobacco treatment relapse, and general substance dependence. Translation of biomarker discovery to retrospective and prospective clinical validity testing has occurred for nicotine metabolite ratio biomarkers. We have developed prediction models of the nicotine metabolite ratio (NMR) using clinical and genomic data from laboratory studies of nicotine metabolism that





account for >50% of NMR variance. Using penalized regression and Bayesian pathway approaches, we identify variants associated with the NMR in two regions of the chr19q13.2 P450 gene cluster, and in additional metabolic genes. We outline the pathway to demonstrate clinical validity retrospectively and prospectively. The SRNT Genetics-Treatment Working Group has addressed past research approaches and findings, and has provided guidance for future research and meta-analysis. A data-sharing culture and integrated analyses will accelerate the translation of biomarkers into tobacco dependence treatment, and help reduce the burden of tobacco dependence.

FUNDING: Federal

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## SYM6B

### RESULTS FROM THE FIRST COCHRANE SYSTEMATIC REVIEW AND META-ANALYSES OF GENETICALLY-INFORMED BIOMARKERS FOR SMOKING CESSATION

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There is growing evidence of multiple gene by treatment interactions from analyses of smoking cessation randomized clinical trials (RCTs), but there have been no comprehensive systematic reviews with meta-analyses. The Cochrane Tobacco Addiction Review Group register, PubMed, trial registers, abstracts and unpublished data were searched through 18 August 2016. For randomized clinical trials with data on a priori genome-wide significant single nucleotide polymorphisms (SNPs), replicated non-SNP variants and/or the nicotine metabolite ratio (NMR). Meta-analyses were conducted of active vs. placebo within genotype groups and within treatment arms between genotype groups generating pooled risk ratios using a Mantel-Haenszel random-effects model. We identified 479 records, of which 94 unique papers were eligible for inclusion, corresponding to 33 trials. Our analyses include 18 trials for which relevant data were retrieved, including 9,017 participants. Data was retrieved from 18 RCTs for 9 SNPs (rs1051730 (CHRNA3); rs16969968, rs588765 and rs2036527 (CHRNA5), rs3733829 and rs7937 (EGLN2, near CYP2A6), bupropion, nicotine replacement therapy, combination therapy, and varenicline – resulting in 40 active vs. placebo and 64 between genotype comparisons. There was statistically significant heterogeneity between genotypes (rs16969968) for NRT vs. placebo at 6-months for non-Hispanic Black (NHB) individuals ( $p=0.03$ ) and end-of-treatment ( $p=0.02$ ) and for non-Hispanic Whites for rs1051730 ( $p=0.02$ ), but not with other biomarkers, and treatment comparisons ( $n=2$  trials each). In those receiving active NRT, treatment was more effective in individuals with a slow NMR compared to those with a normal NMR for NHB and NHB combined (Normal NMR vs. slow NMR: RR 0.54, 95%CI 0.37 to 0.78) ( $n=2$  trials). Although these data suggest that the CHRNA3-A5-B4 locus and NMR may inform treatment response for NRT, data from more trials, open data sharing by investigators and industry, and inclusion of more minority participants are needed to improve reliability of point estimates and equity of clinical translation.

FUNDING: Federal

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## SYM6C

### WILL MY GENES INFORM MY PERSONALIZED RISK, TREATMENT, AND PREVENTION?

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Cigarette smoking is highly addictive and a leading threat to global health. Modern human genetic research has identified robust genetic variants that increase the risk for heavy smoking and nicotine dependence. An important step in translating these genetic discoveries is identifying the genetic factors that affect smoking cessation in order to improve current smoking cessation treatments and to predict patient prognosis. Using data from both large population studies of smoking

behaviors, lung cancer, and smoking cessation treatment trials, we identify the genetic variants that predict nicotine dependence, smoking cessation, response to cessation pharmacotherapy, and cancer risk. These data suggest utility of genes for: 1) Risk prediction: Genetic risk scores may predict smoking cessation outcomes in both prospective studies and treatment trials, 2) Treatment response: Genetic markers may moderate the effect of pharmacological treatments. The variation in efficacy between smokers with different genetic markers suggests that personalized smoking cessation pharmacotherapy based upon genetic scores could enhance the efficiency of such treatment while minimizing side effects. Current evidence strongly suggests that genetic markers (e.g., *CHRNA5* or *CYP2A6*) predict cessation failure and modulate cessation pharmacotherapy effectiveness. These findings strengthen the case for the development and rigorous testing of treatments that target patients with different genetic risk profiles. The effectiveness of such genetic markers should be indexed by meaningful clinical indices such as the number needed to treat (NNT) and the number needed to harm. 3) Prevention: Genetic markers and risk scores may inform personalized prevention efforts such as positive lifestyle changes.

FUNDING: Federal

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## SYM6D

### MULTI-STAKEHOLDER PANEL DISCUSSION OF TRANSLATION INTO EVIDENCE-BASED PRECISION MEDICINE FOR TOBACCO TREATMENT

Robert Schnoll<sup>\*1</sup>, Timothy Baker<sup>2</sup>, Li-Shiun Chen<sup>3</sup>, Kristopher Bough<sup>4</sup>, Andrew Bergen<sup>5</sup>, James Baurely<sup>6</sup>, Sean David<sup>6</sup>, <sup>1</sup>Perelman School of Medicine at the University of Pennsylvania, PA, USA, <sup>2</sup>University of Wisconsin-Madison School of Medicine and Public Health, WI, USA, <sup>3</sup>Washington University School of Medicine, MO, USA, <sup>4</sup>National Institute on Drug Abuse, MD, USA, <sup>5</sup>Biorealm, LLC, CA, USA, <sup>6</sup>Stanford University School of Medicine, CA, USA

The limited efficacy of “one-size-fits-all” pharmacotherapies for smoking cessation necessitates development of predictive biomarkers that might better match the right drug for the right patient at the right time – and thereby enhance therapeutic efficacy. Synthesis of pharmacogenetic, genomic, metabolomics and epigenetic studies suggests that predictive biomarkers for tobacco treatment may be within reach, but the reliability of meta-analyses from only a small fraction of clinical trials is limited. This panel will discuss challenges to advancing translation into clinical practice of “precision medicine” for tobacco treatment – defined by the National Academy of Medicine as “tailoring of medical treatment to the individual characteristics of each patient to classify patients into populations that differ in their susceptibility to a particular disease or in their response to a specific treatment. Preventive or therapeutic interventions can be concentrated on those who will benefit, sparing expense and side effects in those who will not.” Led by discussant Dr. Robert Schnoll (who helped lead the development of the nicotine metabolite ratio (NMR)) and with the expertise of Dr. Timothy Baker (author of the US Public Health Service Tobacco Treatment Guideline) and Dr. Kristopher Bough (who leads biomarker discovery, validation and Small Business Innovation Research programs with the National Institute on Drug Abuse (NIDA)), with the three presenters, the panel will address: (a) ways to promote open science by investigators in order to contribute clinical trial and de-identified “omics” data to public databases like the NIDA Data Share Program (<https://datashare.nida.nih.gov/>); (b) translational medicine pathways to biomarker validation and qualification by the FDA – including how several categories of biomarkers could be qualified depending on a specific context of use (e.g., diagnostic or toxicity biomarkers for patient selection or to enhance drug development); (c) how to synthesize these data to inform updates to evidence-based tobacco treatment guidelines and (d) set a vision for clinical implementation science within real-world healthcare systems.

FUNDING: Federal

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**SYM7****EXPLORING USE AND PREFERENCE OF E-CIGARETTE FLAVORS AMONG ADOLESCENTS, YOUNG ADULTS, AND ADULTS**

Melissa Harrell, PhD, MPH, University of Texas, Austin, TX, USA; Amanda Quisenberry, PhD, The Ohio State University, OH, USA; Jessica Barrington-Trimis, PhD, University of Southern California, CA, USA; Samir Soneji, PhD, Dartmouth College, NH, USA

On July 28, 2017, the FDA Commissioner announced that FDA intends to issue an Advance Notice of Proposed Rulemaking (ANPRM) to seek public comment on the role that flavors in tobacco products, including menthol, play in attracting youth, as well as the role they may play in helping some smokers switch to potentially less harmful forms of nicotine delivery. Although the ANPRM will address all tobacco products, this symposium will focus on the role of flavors among exclusive e-cigarette users and dual users of e-cigarettes and cigarettes, and for cigarette smoking quit attempts and complete quitting. Data from the following on-going studies will be presented: (1) The Ohio State University Tobacco Center of Regulatory Science (TCORS) will examine flavor use among both rural and urban adults in Ohio who are exclusive e-cigarette users and dual users of e-cigarettes and cigarette smoking, as well as interest in quitting and smoking cessation attempts by flavor type; (2) The University of Texas TCORS will present longitudinal data from youth and young adults regarding whether those who initiated e-cigarette use with sweet flavors compared to those who initiated with tobacco-flavors sustained e-cigarette use and/or initiated combustible product use; data on potential use if only certain flavors were available will also be presented; (3) The University of Southern California TCORS will present findings from two cohorts of youth and young adults in California examining whether flavor preferences differ for exclusive e-cigarette versus dual e-cigarettes and cigarette users and whether type of flavor used is associated with continued e-cigarette use, progression to cigarette smoking, and dual product use; and (4) Analysis of Wave 2 (October 2014-October 2015) data of the Population Assessment of Tobacco and Health (PATH) Study will be presented regarding reasons for e-cigarette use and e-cigarette flavor preferences among youth, young adults, and older adults exclusive e-cigarette users, and among older adults tobacco users who tried to quit within the past 12 months with the use of e-cigarettes. Discussion will focus on how science can inform regulatory actions.

**JUSTIFICATION:** Research findings can inform FDA's planned Advance Notice of Proposed Rulemaking on the role of flavors in tobacco products play in attracting youth, as well as the role flavors may play in helping some smokers quit.

**FUNDING:** Federal

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**SYM7A****THE IMPACT OF FLAVORED E-CIGARETTES ON TOBACCO USE AMONG YOUTH AND YOUNG ADULTS**

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**BACKGROUND:** Limited data on the impact of flavors in e-cigarettes on young people's tobacco use are available, though more than 7,000 e-cigarette flavors are on the market. To date, no longitudinal studies have investigated this. **METHODS:** The TX TCORS has assessed tobacco use and flavor preferences among adolescents (n=3907) and young adults (n=5482) every 6 months since 2014. Descriptive statistics were used to study differences in flavor preferences by age group and e-cigarette use at Wave 1 and preferences for using non-flavored e-cigarettes at Wave 3. Regression analyses were used to determine if young people who initiate e-cigarette use with sweet flavors (e.g., fruit, candy), compared to those who initiated with tobacco-flavor, sustained e-cigarette use and/or initiated combustible product use, across Wave 1 to Wave 4. **RESULTS:** At Wave 1, most e-cigarette users (>93%) said their first and "usual" e-cigarette was flavored to taste like something other than tobacco. No differences between exclusive and dual users (with cigarettes) were observed. Sweet flavors predominated (>75%) for both groups. Across Waves 1-4, initiating e-cigarettes with a sweet flavor, compared to tobacco or no flavor, predicted sustained e-cigarette use among youth (OR=15.44, 95% CI: 14.79, 16.10) and young adults (OR=8.15, 95% CI: 7.00, 9.48) and the onset of any combustible tobacco product use (OR=9.14, 95% CI: 8.54, 9.78 youth; OR=6.06, 95% CI: 3.20, 11.49 young adults). At Wave 3, most young people (>74%) said they would not use e-cigarettes if they were not flavored or flavored to taste only like tobacco. **CONCLUSIONS:** Flavors, especially sweet ones, may be one of the key reasons that youth and young adults continue to use e-cigarettes and start to use combustible tobacco products. Restricting the range

of e-cigarette flavors by eliminating sweet ones would enhance efforts to reduce youth and youth adult tobacco use.

**FUNDING:** Federal

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**SYM7B****ASSOCIATIONS BETWEEN ENDS FLAVOR PREFERENCE AND QUITTING BEHAVIORS IN DUAL CIGARETTE/ENDS AND ENDS ONLY USERS ENROLLED IN THE TOBACCO USER ADULT COHORT (TUAC)**

Amanda Quisenberry\*, Elizabeth Klein, Sarah Cooper, Alice Hinton, Wenna Xi, Mary Ellen Wewers, The Ohio State University, OH, USA

**PURPOSE:** Dual use of cigarettes/e-cigs has been characterized as a method to reduce cigarette consumption, and possibly quit all products over time. Among dual cigarette/e-cig users and e-cig only users, associations between flavors and quitting have yet to be fully studied. We examined flavored product use and: 1) quitting cigarettes among dual cigarette/e-cig users; and 2) quitting all tobacco products among dual cigarette/e-cig users and e-cig only users. **METHODS:** Adult rural and urban cohort members were interviewed every six months, through 18 months, and reported current product(s), flavored product use, and cessation interest. This longitudinal analysis describes results for members who reported at least some days/week use of cigarettes and e-cigs (DC/EC) (n=107) or use of e-cigs only (EC) (n=118) during at least one data collection point. **RESULTS:** Baseline mean age, region (rural/urban), gender, race, education, marital and employment status did not differ by group. DC/EC users reported higher median cessation interest (p=0.006); 31% of DC/EC users were menthol-flavored cigarette smokers. The most common e-cig flavors reported for both groups were tobacco (32.9%), menthol/mint (22.2%), fruit (16.9%), and sweets (13.8%); 14.2% reported other/multiple flavors. Except for sweets, there were no differences between groups in cessation interest by flavor type. EC sweet flavor users reported higher cessation interest compared to DC/EC sweet flavor users (p=0.016). At 6, 12, and 18 months post-enrollment, a Cox survival analysis indicated that for DC/EC users, time to quit cigarettes was not associated with cigarette flavor, e-cig flavor, region, race, or cessation interest. Time to quit all tobacco products was not associated with e-cig flavor, region, race, or cessation interest. DC/EC users of tobacco-flavored cigarettes were less likely to quit all products compared to DC/EC menthol-flavored cigarette users and EC only users (p=0.009). **CONCLUSIONS:** Flavored e-cigs may not assist adult dual users to quit cigarettes. Dual users of tobacco-flavored cigarettes/e-cigs may be less likely to quit all products over time. E-cig flavor type may not influence quitting.

**FUNDING:** Federal

**CORRESPONDING AUTHOR:** Amanda Quisenberry, PhD, The Ohio State University, OH, USA

**SYM7C****FLAVORED E-CIGARETTE USE AMONG ADOLESCENT EXCLUSIVE E-CIGARETTE AND DUAL PRODUCT USERS**

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**BACKGROUND:** Evidence of whether preferences for certain e-cigarette flavors are associated with use and persistence of combustible cigarette smoking among adolescents and young adults could inform the regulation of flavorings in e-cigarette products. **METHODS:** Prospective cohort data were pooled from two studies of youth and young adults in Southern California (aged 15-16, and 18-19 at baseline in 2015). Participants reported use of e-cigarettes and cigarettes and each e-cigarette flavor they used in the past 30 days at baseline, and at a 2-year follow-up (categorized as fruit/sweet [hereafter "non-tobacco flavors"], tobacco/menthol/flavorless [hereafter "tobacco flavors"], or other flavors). Analyses evaluated the association of baseline e-cigarette flavor preference with (a) baseline tobacco use (dual vs. exclusive e-cigarette use), and (b) past 30-day tobacco product use at follow-up (no use, e-cigarettes only, cigarettes only, dual use), after adjustment for relevant covariates. **RESULTS:** In cross-sectional analyses, participants reporting exclusive use of tobacco-flavored e-cigarettes at baseline had higher odds of





dual use (68.4% vs. 30.2%; Adjusted OR [AOR]=4.86, 95%CI: 1.71, 13.8). Use of non-tobacco (vs. tobacco-flavored) e-cigarettes at baseline was associated with higher odds of past 30-day use of e-cigarettes alone (AOR=1.48; 95%CI: 0.70, 3.15), cigarettes alone (AOR=1.32; 95%CI: 0.54, 3.20), or dual product use (AOR=1.75; 95%CI: 0.82, 3.75) than of no past 30-day use; these associations were not statistically significant. CONCLUSIONS: Use of fruit/sweet flavors is more common among e-cigarette-only (vs. dual) users, suggesting that regulatory restrictions of such flavors may disproportionately impact non-smoking youth who vape and have a lesser impact among smokers, some of whom may be using e-cigarettes to transition to a non-combustible product. Additional study is needed to evaluate whether the specific e-cigarette flavors used by youth and young adults impact transitions toward, or away from, harmful tobacco products and heavier patterns of use over time.

FUNDING: Federal

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## SYM7D

### FLAVOR PREFERENCE AMONG ADOLESCENT, YOUNG ADULT, AND ADULT E-CIGARETTE USERS: FINDINGS FROM WAVE 2 OF THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH STUDY

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In 2013-14, the majority of adolescents and adults who used e-cigarettes within the past month used flavored e-cigarettes. The flavor preference of among age groups is not known. We analyzed data from 415 adolescents (12-17 years), 1323 young adults (18-24 years), and 2320 adults (≥25 years) who reported current e-cigarette use sampled in Wave 2 of the PATH Study. We assessed use of specific flavors by use of other tobacco products, use of e-cigarettes for cessation, and reasons for use. In 2015-16, among current users, 79% of adolescents, 83% of young adults, and 64% of adults used flavored e-cigarettes. Approximately 40% of each population exclusively consumed a single flavor. The leading exclusive flavor was fruit for adolescents (22%) and young adults (21%) and was mint/menthol for adults (18%). Poly-flavor use was also common: 39% for adolescents, 41% for young adults, and 22% for adults. The leading poly-flavor combinations were fruit & candy/sweets in all populations. A higher proportion of adults who used e-cigarettes within the past year to help quit tobacco use used candy/sweet-flavored e-cigarettes compared to their counterparts who did not use e-cigarettes to quit: 40% vs. 20%. The distribution of flavor types was similar between exclusive e-cigarette users and poly-tobacco product e-cigarette users. Fruit—either exclusive or poly-flavor—was the most common flavor type across reasons for e-cigarette use including a belief e-cigarettes helped with cessation, use of e-cigarettes where and when smoking was not allowed, liked socializing when using e-cigarettes, and came in appealing flavors. A substantial proportion of users consumed non-flavored e-cigarettes (11% of adolescents & young adults, 33% of adults). Additionally, 10% of adolescents, 5% of young adults, and 3% of adults did not know if their e-cigarettes were flavored. Use of non-flavored e-cigarettes was higher among adults who believed e-cigarettes helped with cessation than those who used e-cigarettes for allowability, socializing, or appealing flavors. In conclusion, use of fruit-flavored e-cigarettes commonly occurred over the entire age spectrum and across different reasons of use.

FUNDING: Unfunded

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## SYM8

### TOBACCO RETAIL OUTLETS: INSIDE AND OUT

Jason Oliver, PhD, Duke University School of Medicine, NC, USA; Annice Kim, PhD, RTI International, CA, USA; Sarah Mills, PhD, MPH, University of North Carolina - Chapel Hill, NC, USA; Janet Hoek, PhD, University of Otago, New Zealand

Tobacco retail outlets (TROs) are widespread throughout much of the developed world. Mounting evidence indicates access and exposure to TROs is associated with smoking initiation, maintenance of smoking behavior, and relapse following cessation. Accordingly, TROs are arguably the single greatest environmental risk

factor for tobacco use and resultant negative health consequences. Yet despite tremendous growth in the field of tobacco regulatory science over the past decade, we have limited insight into the mechanisms through which TROs influence smoking behavior and the individuals at greatest risk. A deeper understanding of how geographic (e.g. store location), exterior features (e.g. storefront advertisements), and interior features (e.g. displays, pricing) intersect with human behavior and ultimately contribute to tobacco use would provide critical insights into the most appropriate ways to lessen their impact. The purpose of this symposium is to highlight recent advances on this topic through a series of talks given by both junior and established investigators. To encourage interdisciplinary cross-talk and foster collaboration, it will showcase a wide range of methodological approaches that span from laboratory-based neuroimaging studies to multi-state store audits. Dr. Jason Oliver will present findings from a study examining neural responses to personally-relevant store exteriors using a novel combination of GPS and functional neuroimaging. Dr. Annice Kim will examine the role of visual attention and the results of experimental manipulations at point-of-sale conducted using a virtual store. Dr. Sarah Mills will offer a health disparities perspective by examining the relationship between menthol-specific marketing at point-of-sale and neighborhood characteristics in a nationally representative sample. Dr. Janet Hoek will provide an international perspective using data elicited via in-depth interviews with retailers from New Zealand, a jurisdiction that has strong POS regulation. Lastly, Dr. Kurt Ribisl will provide a summary of the presented work and discuss its implications for future research, clinical interventions and tobacco control policy.

JUSTIFICATION: This symposium will provide insight into the influence of tobacco retail outlets on smoking behavior that can directly inform the development of novel interventions targeting this influence and guide policy decisions designed to mitigate this influence.

FUNDING: Academic Institution

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## SYM8A

### A NOVEL 'COMMUNITY NEUROSCIENCE' APPROACH TO UNDERSTANDING THE INFLUENCE OF TOBACCO RETAIL OUTLETS ON SMOKING BEHAVIOR

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INTRODUCTION: Tobacco retail outlets (TROs) are ubiquitous and unavoidable in the lives of smokers. Yet surprisingly little research has been conducted to understand the behavioral or neural mechanisms by which TROs may influence clinical outcomes. The present project aims to evaluate these mechanisms using a novel combination of GPS location tracking, mapping of community TROs, and fMRI assessments. METHODS: Smokers (N = 17) and non-smokers (N = 17) carried GPS loggers for a period of 14 days. GPS tracks were intersected with a database of TRO and non-TRO retail stores (e.g. clothing stores) to identify outlets that fell INSIDE and OUTSIDE activity space. The twelve most frequently encountered TROs and non-TROs inside activity space and a random selection of twelve TROs and non-TROs outside activity space were identified for each participant. Images of store exteriors were presented during BOLD fMRI scanning along with twelve static TROs and non-TROs located in another county (CONTROL). RESULTS: Main effects of Activity Space were observed in the precuneus ( $p < .001$ ), parahippocampus ( $p < .05$ ) and ventral striatum ( $p = .01$ ), indicating greater BOLD response to stores falling INSIDE activity space relative to stores OUTSIDE activity space or CONTROL stores. Smoking Status x Store Type interactions were also present in the precuneus ( $p < .001$ ) and parahippocampus ( $p < .05$ ), indicating smokers had significantly greater BOLD response to TROs relative to non-TROs in both precuneus and parahippocampus, whereas non-smokers did not exhibit Store Type effects in either region. CONCLUSIONS: Findings confirm the presence of a previously unstudied biomarker that could serve as a novel target for smoking cessation interventions. That is, neural regions related to spatial memory (parahippocampus) and self-relevance (precuneus) exhibited differential patterns of activation as a function of activity-based contact, store type and smoking status. To our knowledge, this is the first study to use GPS tracking to ideographically identify community-level cues for use in a functional imaging study, as well as the first study to examine neural responses to storefront exteriors.

FUNDING: Academic Institution

CORRESPONDING AUTHOR: Jason Oliver, PhD, Duke University School of Medicine, NC, USA

## SYM8B

### USING EYETRACKING AND VIRTUAL STORE TECHNOLOGY TO UNDERSTAND CONSUMERS' VISUAL ATTENTION TO PRO-TOBACCO CUES AND ANTI-TOBACCO ADS AT THE POINT-OF-SALE

Annice Kim<sup>\*1</sup>, James Nonnemaker<sup>2</sup>, Lauren Dutra<sup>1</sup>, Brian Bradfield<sup>2</sup>, Nathaniel Taylor<sup>2</sup>, Jamie Guillory<sup>2</sup>, <sup>1</sup>RTI International, CA, USA, <sup>2</sup>RTI International, NC, USA

**SIGNIFICANCE:** Pro-tobacco cues are pervasive at the point-of-sale (POS) and elicit smoking urges and influence tobacco purchases. Placing anti-smoking signs and banning price promotions are two strategies that have been implemented to mitigate the influence of POS tobacco marketing. Strategic placement of anti-tobacco ads may be important for maximizing consumer attention to ads given the immersive nature of retail environments. We conducted 3 studies that used either a 3D virtual convenience store and/or eyetracking technology to examine consumers' visual attention to anti-smoking signs, tobacco price promotions, and locations within the store. Results can inform our understanding of consumers' visual attention to competing pro-tobacco cues and anti-tobacco signs at the POS and identify locations for optimal placement of anti-tobacco signs. **METHODS:** Three studies were conducted with convenience samples of adult current smokers. In study #1, we recorded participants' (N=32) visual attention to store objects as they conducted a shopping task in the virtual store. In study #2, N=153 participants viewed images of 4 different anti-tobacco ads shown in different context (alone, next to cigarette-ad, on tobacco display). In study #3, N=161 participants viewed anti-tobacco ads with and without price promotions. Eye-tracking technology recorded participants' visual attention to objects in the store, anti-tobacco ads, and price promotions in terms of dwell time (DT) and fixations (F). **RESULTS:** During the shopping task, consumers paid more visual attention to pro-tobacco ads (DT:9.95 seconds; F:75.84) compared to anti-tobacco ads (DT:2.40 seconds; F:15.31). Newport cigarettes in the tobacco display had the greatest visual attention (DT:1.72 seconds; F:11.41). Visual attention to antismoking ads did not vary by ad context but varied significantly by ad type. When price promotions were present, consumers' visual attention to anti-ads decreased. **CONCLUSIONS:** Banning price promotions and placing anti-tobacco signs near checkout display may maximize consumers' visual attention to anti-tobacco messages at the POS.

**FUNDING:** Federal

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## SYM8C

### DISPARITIES IN RETAIL MARKETING FOR MENTHOL CIGARETTES IN THE UNITED STATES, 2015

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**BACKGROUND:** Most evidence of disparities in retail marketing for menthol cigarettes is limited to specific cities or states. This study is the first to compare the availability of menthol price discounts by neighborhood demography in a representative sample of tobacco retailers in the US. **METHODS:** In 2015, data collectors recorded the presence of advertised discounts for menthol versions of Newport, Camel and Marlboro, any menthol discount, any menthol advertising and Newport pack price (in cents) in 2,124 tobacco retailers. Multilevel linear and generalized linear models (stores clustered in county) were used to examine these outcomes as a function of census tract demography, controlling for store type and US region. Tract characteristics were ranked into quartiles, ordered from lowest to highest percentage of youth (aged 5-17), Black, White, Asian/Pacific Islander, and Hispanic residents; median household income was ordered from highest to lowest. **RESULTS:** Fewer stores advertised discounts for menthol varieties of Newport (28%) than Marlboro (50%) and Camel (48%). Newport discounts were more common in neighborhoods with the highest quartile of Black residents (OR 1.8) and that pattern was unique to the brand. Nearly half of stores (47%) advertised menthol. This was more common in neighborhoods in the second (OR 1.5) and fourth (OR 2.1) quartiles of Black residents as compared to the lowest quartile. Similarly, menthol advertising was more prevalent in lower-income neighborhoods. Newport cost less in neighborhoods in the second ( $B = -11.4$ ) and highest ( $B = -15.7$ ) quartiles of Black residents as compared to the lowest quartile, and in neighborhoods in the second ( $B = -8.3$ ) and third ( $B = -13.0$ ) quartiles of youth as compared to the lowest quartile. Newport was also cheaper in the lowest ( $B = -9.4$ ) as compared to the highest income quartile. **CONCLUSIONS:** A pattern of discounts in neighborhoods with more Black residents appears unique to Newport. This is the first national

study to confirm lower price for Newport in neighborhoods with more youth. Research on marketing should incorporate multiple brands. Flavor restrictions may address disparities in marketing.

**FUNDING:** Federal

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## SYM8D

### BEYOND TOBACCO POS DISPLAYS: PROGRESS AND ANOMALIES FROM NEW ZEALAND

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**INTRODUCTION:** Tobacco retail "power walls" present tobacco as an appealing product to young people. In response to this evidence, and despite vehement opposition from tobacco companies, New Zealand banned in-store tobacco displays in July 2012. Industry concerns, particularly about extended transaction times, were not borne out and implementation of the new policy proceeded smoothly. An evaluation using repeat cross-sectional surveys of 13-14 year olds compared smoking experimentation, current smoking and initiation in the previous year, and found the point-of-sale (POS) display ban was followed by significant reductions in initiation, experimental and regular smoking. The association between exposure to POS tobacco displays and smoking behaviors also reduced. Yet despite this progress, tobacco remains available from around 8000 retail outlets; reducing tobacco supply will be critical to support the large declines in smoking prevalence required to meet NZ's smokefree 2025 goal. **METHODS:** Using in-depth interviews, we explored 21 tobacco retailers' perceptions of measures such as mandatory registration or licensing that could address the anomaly between a restrictive POS environment and tobacco's widespread availability. The sample was drawn to represent different outlet types and neighbourhood socio-economic status; we analyzed transcript data using qualitative content analysis. **RESULTS:** Around half the participants felt positive or indifferent about mandatory licensing, which many thought would not affect them greatly. Participants also supported restricting the sale of tobacco within 500m of a school, but had less support for measures that would prohibit tobacco sales at some outlets. Tobacco retailers recognised the harm tobacco causes and supported measures that would protect children, but opposed those they felt would advantage some outlet types over others. **CONCLUSIONS:** Retailers sampled did not oppose radical new measures reducing tobacco supply and availability, so long as these are applied equitably.

**FUNDING:** Nonprofit grant funding entity

**CORRESPONDING AUTHOR:** Janet Hoek, PhD, University of Otago, New Zealand

## SYM9

### SOCIAL NORMS AS A PREDICTOR OF SMOKING AND E-CIGARETTE USE

Katherine East, MSc, King's College London, United Kingdom; James Thrasher, PhD, University of South Carolina, SC, USA; Tina Jahnel, MA, University of Tasmania, Australia; Ron Borland, PhD, Cancer Council Victoria, Australia

Social norms surrounding smoking and electronic (e-)cigarettes have been identified as important sources of influence for use of both products. There have been recent concerns that the introduction of novel nicotine and tobacco products such as e-cigarettes and heat-not-burn devices may be "renormalising" tobacco smoking. It is therefore timely to consider how social norms should be defined and measured and whether they could be utilized as a surveillance method to pre-empt the potential negative impact of these products on smoking prevalence. This symposium will provide an opportunity for such discussions and present several studies exploring social norms towards smoking and e-cigarettes. Stuart Ferguson, chair, will introduce the symposium. The first speaker, Katherine East will provide an overview of social norms and present a systematic review assessing the association between different types of norms and subsequent smoking uptake among youth. Second, Jim Thrasher will present data assessing how social norms and socioeconomic status are associated with cigarette and e-cigarette susceptibility and use among adolescents in Mexico, where e-cigarettes are banned. Third, Tina Jahnel will discuss the use of Ecological Momentary Assessment (EMA) methods to assess social norms, and the relationship between social norms, socioeconomic status, and smoking behavior. Fourth, Ron Borland will present longitudinal



data from the International Tobacco Control Project (ITC) Four Country Survey assessing differences in social norms between countries where e-cigarette use is legal and relatively common (US and UK) and countries where their use is highly-restricted (Canada and Australia). Stuart Ferguson will then facilitate a panel discussion on methodological approaches for assessing norms, and their utility in predicting smoking and e-cigarette use in youth and adults.

**JUSTIFICATION:** This symposium will present current social norms research among youth and adults, including measurement of norms and their reliability and predictive validity. Data will be presented from several countries and the utility of norms as predictors of smoking and e-cigarette use will be discussed.

**FUNDING:** UK Centre for Tobacco and Alcohol Studies; UK Department of Health

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## SYM9A

### THE ASSOCIATION BETWEEN NORMS AND SMOKING UPTAKE AMONG YOUTH: A SYSTEMATIC REVIEW

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**INTRODUCTION:** Most smokers take up smoking before age 21. Whilst social norms are an important predictor of youth uptake, there are many types of norms with considerable variety in how they are assessed. To our knowledge there has been no systematic review assessing which norms are associated with youth smoking uptake. **METHODS:** MEDLINE, EMBASE, CINAHL and PsycINFO were searched between January 1998 and March 2017 to identify longitudinal studies reporting measures of social norms towards smoking and their association with subsequent smoking uptake in youth age  $\leq 24$ . 5243 articles were identified of which 38 met inclusion criteria. **RESULTS:** Results were grouped into two key normative domains: descriptive norms (perception of how others behave e.g. family and friend smoking, societal smoking prevalence) and injunctive norms (perception of how others think a person ought to behave e.g. family, friend's, society's approval of smoking). Descriptive norms of close/best friends ( $n=20$ ), parent(s) ( $n=14$ ), peers ( $n=10$ ) and siblings ( $n=7$ ), and injunctive norms of parent(s) ( $n=13$ ) and best/close friends ( $n=13$ ) were the most frequently identified measures. Descriptive norms of household/family ( $n=6$ ) and adult smoking ( $n=3$ ), and injunctive norms of siblings ( $n=1$ ), peers ( $n=2$ ) and society ( $n=2$ ) were also identified. There was consistently strong evidence for an association between descriptive norms of close/best friends and parents and smoking uptake. There was mixed evidence for an association between descriptive norms of peers, siblings and household/family and uptake, and injunctive norms of parents and uptake. There was some evidence for an association between descriptive norms of adults and uptake, and injunctive norms of siblings, peers and society and uptake, however there were few articles assessing these. There was little evidence for an association between injunctive norms of best/close friends and smoking uptake. **CONCLUSIONS:** There is considerable variety in measures of norms, and while some are consistently associated with smoking uptake, others less so. Parental and best/close friend smoking show a strong and consistent association with smoking uptake.

**FUNDING:** UK Centre for Tobacco and Alcohol Studies; UK Department of Health

**CORRESPONDING AUTHOR:** Katherine East, MSc, King's College London, United Kingdom

## SYM9B

### PATTERNING OF TOBACCO USE BY SOCIAL NORMS AND SOCIOECONOMIC STATUS AMONG MEXICAN ADOLESCENTS: SIMILARITIES AND DIFFERENCES BETWEEN E-CIGARETTES AND CONVENTIONAL CIGARETTES

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Because electronic cigarettes (e-cigs) are relatively novel, social norms and socioeconomic status (SES) may influence their use differently than for cigarettes. **METHODS:** We analyzed a 2016 representative survey of 8,391 students from 58 secondary schools in the three largest Mexican cities. Product-specific norms were assessed via current use by a family member, by a close friend, and, for e-cigs, perception of the social acceptability of use. School-level norms were mea-

sured as the proportion of students whose family member/friend used each product and the proportion who perceived that society disapproves of e-cig use. SES was measured using highest parental education (primary, secondary, high school, university) and a family wealth index (i.e., four-item FAS), assessed as individual- and school-level means. Adjusted logistic GEE models regressed susceptibility (among adolescents who had tried neither e-cigs nor cigarettes,  $n=4522$ ), trial, and current use of each product on individual- and school-level norm and SES variables, adjusting for confounders (e.g., sex, age, sensation seeking, alcohol use). **RESULTS:** All individual-level measures of product-specific norms were positively associated with e-cig and cigarette susceptibility, trial, and current use. School-level friend norm was positively associated with e-cig and cigarette trial ( $OR=2.31$  and  $1.67$ , respectively) and current use ( $OR=3.12$  and  $4.89$ , respectively). School-level family smoking norm was positively associated with cigarette trial ( $OR=1.47$ ) and current use ( $OR=4.89$ ). Individual-level education (e.g., university vs. primary) was inversely associated with current use of e-cigs ( $OR=0.62$ ), as well as with cigarette susceptibility ( $OR=0.57$ ), trial ( $OR=0.89$ ), and current use ( $OR=0.83$ ). School- and individual-level family wealth were associated with trial of e-cig ( $OR=1.20$  and  $1.04$ , respectively), and individual-level wealth was associated with current e-cig use ( $OR=1.08$ ). **CONCLUSIONS:** Individual- and school-level norms and parental education appear similarly associated with e-cig and cigarette susceptibility and use, although family wealth appears associated with e-cig but not cigarette use.

**FUNDING:** Federal

**CORRESPONDING AUTHOR:** James Thrasher, PhD, University of South Carolina, SC, USA

## SYM9C

### MEASURING SOCIAL NORMS USING ECOLOGICAL MOMENTARY ASSESSMENT METHODS

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**INTRODUCTION:** Smoking occurs in, and is influenced by, situations and social contexts. Ecological Momentary Assessment (EMA) methods can be used to gather reliable and ecological valid data on individual's daily lives. As such, EMA methods can be used to gain a greater understanding of temporal variations in social norms and to explore how social norms impact smoking. The current study examined whether socioeconomic status (SES) affects smoking behavior through differential access of smoking-friendly environments, in particular places where smoking is allowed. **METHOD:** A sample of 194 daily smokers, recorded their smoking and information about situational and contextual factors for three weeks using an electronic diary. We tested whether a smoker's momentary context mediated the relationship between SES (educational attainment) and cigarettes smoked per day (CPD). Momentary context was operationalized as the proportion of random assessments where smoking was allowed versus where smoking was not allowed. Data were analyzed using random effects regression with a lower level mediation model (2-1-1 mediation) with random intercepts. **RESULTS:** Although no significant direct effect of SES on CPD were observed, there was a significant indirect effect of SES on CPD via the momentary context ( $B = -0.733$ ,  $SD=0.37$ ,  $p < .05$ ). Compared to participants with higher education, lower educated participants were more likely to encounter places where smoking was allowed ( $B = -0.188$ ,  $SD=0.056$ ,  $p < .001$ ), and this in turn, was associated with a higher number of CPD ( $B = 3.905$ ,  $SD=1.506$ ,  $p < .01$ ). **DISCUSSION:** These findings suggest that SES is associated with smoking at least partially via differential exposure to smoking-friendly environments, with smokers from lower SES backgrounds accessing more places where smoking is allowed.

**FUNDING:** U.S. National Institutes of Health, National Institute on Drug Abuse.

**CORRESPONDING AUTHOR:** Tina Jahnel, MA, University of Tasmania, Australia





## SYM9D

### SOCIAL NORMS TOWARDS SMOKING IN 2002 AND 2013/15 AMONG DAILY SMOKERS: FINDINGS FROM THE INTERNATIONAL TOBACCO CONTROL (ITC) FOUR COUNTRY SURVEY

Katherine East<sup>1</sup>, Sara Hitchman<sup>1</sup>, Ann McNeill<sup>1</sup>, Stuart Ferguson<sup>2</sup>, K. Michael Cummings<sup>3</sup>, Geoffrey Fong<sup>4</sup>, Ron Borland<sup>5</sup>, <sup>1</sup>King's College London, United Kingdom, <sup>2</sup>University of Tasmania, Australia, <sup>3</sup>Medical University of South Carolina, SC, USA, <sup>4</sup>University of Waterloo, ON, Canada, <sup>5</sup>Cancer Council Victoria, Australia

**SIGNIFICANCE:** Social norms are important predictors of smoking behaviours but patterns across countries and time have not been studied. We present cross-sectional data of three social norms from two survey waves over 10 years apart from the International Tobacco Control four country survey; adjusted and longitudinal data will also be presented at the meeting. **METHODS:** Data were from daily smokers from Australia (AU), Canada (CA), United Kingdom (UK) and United States (US) from the 2002 wave (n=2000-2500/country) and the 2013-2015 wave (n=1000-2000/country). **Outcomes:** two injunctive norms (a) % agreement with the statement "society disapproves of smoking" (b) % agreement with "people important to you believe you should not smoke"; and one descriptive norm (c) mean number "Of the five closest friends or acquaintances that you spend time with on a regular basis, how many of them are smokers?". **Weighted % agreement for (a) and (b) and means for (c) were compared across countries at each wave using 95% confidence intervals. RESULTS:** (a) In 2002, a higher proportion in CA (88%) agreed that society disapproved of smoking, than in UK (77%), US (79%) and AU (82%) (all p<.001) and a higher proportion in AU than UK (p<.01); in 2013/15, a higher proportion in CA (81%) agreed compared with UK (75%) and US (68%) (p<.01) and a higher proportion in AU (79%) and UK agreed than in US (p<.01). (b) In 2002, a higher proportion in CA (90%) and US (90%) agreed that people important to them believed they should not smoke, than UK (85%) (p<.01) with no other between-country differences (AU 88%); in 2013/15, a higher proportion in CA (86%) agreed, than UK (74%), US (76%) and AU (79%) (p<.001) with no other between-country differences. (c) In 2002, the mean number of smoking friends (M) did not differ across the countries: AU (M=2.88), CA (2.89), UK (2.99), US (2.98) (p>0.05); in 2013/15, US participants (M=2.84) had a higher mean number of smoking friends than UK (M=2.39), CA (M=2.55) (p<.001) but not AU (M=2.62). **DISCUSSION:** Social norms vary across countries. Understanding these patterns and temporal changes is required if norms can be used to predict changes in smoking behaviour.

**FUNDING:** Federal; State; Nonprofit grant funding entity

**CORRESPONDING AUTHOR:** Ron Borland, PhD, Cancer Council Victoria, Australia

## SYM10

### LEVERAGING USER DATA FROM ONLINE CESSATION INTERVENTIONS: NOVEL ANALYTIC APPROACHES TO IMPROVE EFFECTIVENESS AND REACH

Laura Vercammen, MPH, ICF, MD, USA; Alice Murray, BA, ICF, VA, USA; Jennifer Pearson, MPH, PhD, University of Nevada, Reno, NV, USA; Michael Amato, MS, PhD, Truth Initiative, DC, USA

Digital interventions for smoking cessation generate large volumes of data collected unobtrusively about users that can be used to optimize reach, engagement, and effectiveness. Leveraging these data requires new and innovative analytic methods. This symposium showcases four examples of novel analytic approaches from digital cessation interventions. The first two presentations use data from NCI's Smokefree.gov programs, and focus on maximizing overall reach and engaging a specific audience. Laura Vercammen will describe results from a "Marketing Funnel" analysis which found a strong relationship of likes and retweets on monthly intervention reach, but no significant relationship of text sign-ups or app downloads. These results suggest that engagement is an important component of effective social media strategy. Alice Murray will describe a data driven approach used to develop content imagery to reach and engage military veterans on SmokefreeVET. She will describe use of a predictive model with visual image content coding to develop materials that promoted engagement in different audience segments, including female veterans and veterans with mental health disorders. The next two presentations use data from BecomeAnEX.org, Truth Initiative's cessation platform. Both presentations apply novel analytic approaches to user-generated content (UGC) from the BecomeAnEX online social network to examine cessation-related outcomes. Dr. Jenni Pearson will describe the results of a study that examined the link between peer sentiment about nicotine replacement therapy

(NRT) and actual use of NRT. Exposure to positive peer sentiment about NRT was prospectively associated with use of NRT among treatment seeking smokers. Dr. Michael Amato will describe an innovative use of machine learning methods to determine smoking status based on UGC. Smoking status and duration of abstinence were reliably inferred among a majority (69%) of smokers who contributed content. Implications of this work for research and intervention design will be discussed. The Discussant will address how these studies fit within the broader field of digital intervention research and directions for future work.

**JUSTIFICATION:** We present data from two studies aiming to increase the effectiveness of online cessation interventions, and two studies aiming to increase their reach.

**FUNDING:** Federal

**CORRESPONDING AUTHOR:** Michael Amato, mamato@truthinitiative.org

## SYM10A

### APPLYING A MARKETING FUNNEL ANALYSIS TO MAXIMIZE THE IMPACT OF SOCIAL MEDIA IN DIGITAL TOBACCO CESSATION CAMPAIGNS

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**BACKGROUND:** Many mHealth programs have emerged that provide smoking cessation support across websites, text messaging programs, mobile applications, and social media accounts. Data from these platforms can provide insight into efforts to increase resource delivery and cessation outcomes. Combining key performance indicators across platforms continues to be a challenge, as natural silos and fast-paced changes in the social media landscape inhibit systematic collection of indicators. The purpose of this study was to explore the role of social media in increasing the reach of mHealth cessation resources. **METHODS:** Data from this study were drawn from the National Cancer Institute's Smokefree.gov initiative (SFG). The funnel analysis is a novel methodology for aggregating and analyzing data from mHealth resources. This framework classifies data using a marketing funnel model, tracking social media metrics such as follows, comments, and shares as users transition from awareness of to repeat use of SFG resources. User data from the SFG websites, conversion data from the text messaging programs, and download data from the mobile applications are then layered into the model. Correlational analysis was performed on more than 1800 posts published by SFG social media managers on SFG Facebook and Twitter accounts. **RESULTS:** There was a statistically significant relationship between "engagements" (detail expands, likes, and retweets where r=.9, .9, and .8 respectively) and monthly reach, where reach is defined as the number of unique users who have viewed a post, but no association between the number of monthly messages and reach. There was also a correlation (r=.8; p=.02) between monthly reach numbers and the average amount of time spent on the Smokefree.gov website. There was no association between social media reach and text sign-ups or app downloads. **CONCLUSIONS:** These findings suggest that rates of engagement are more valuable than message volume in driving users to digital cessation content. Social media efforts should focus on high quality content that generates engagement. These findings can guide social media strategy in efforts to deliver digital resources to users.

**FUNDING:** Federal

**CORRESPONDING AUTHOR:** Laura Vercammen, MPH, ICF, MD, USA

## SYM10B

### PREDICTING THE PERFORMANCE OF TOBACCO CESSATION IMAGERY WITH VETERANS

Alice Murray<sup>1\*</sup>, Jessica Havlak<sup>1</sup>, Dana Christofferson<sup>2</sup>, Kim Hamlett-Berry<sup>2</sup>, Erik Augustson<sup>3</sup>, <sup>1</sup>ICF, VA, USA, <sup>2</sup>Veterans Health Administration, DC, USA, <sup>3</sup>National Cancer Institute, MD, USA

**BACKGROUND:** The National Cancer Institute's (NCI) Smokefree.gov Initiative is a suite of digital smoking cessation resources. It includes resources for special populations, such as SmokefreeVET, a collaboration with the Department of Veteran Affairs. A large portion of Smokefree.gov's message dissemination comes from a robust social media presence. Finding data-driven methods for tailoring content is key to reaching high priority populations for cessation intervention with resources. **METHODS:** Ad testing is a best practice for ensuring images resonate

with intended audiences, but it can be hard to build upon testing results. The Visual Asset Map Predictive Analysis process forms a predictive model within an ad testing exercise, turning data into insights for future application. The process begins with the compilation of MRI (Mediamark Research and Intelligence) data to formulate visual hypotheses, or asset maps, for different audience segments. The asset maps inform the creation of ads, which are then delivered through social media platforms. Ad performance is measured through rates of engagement, and ad imagery is coded for visual components (examples include the presence of text overlay, the addition of humor, and racial representation). Components found to be key to the success of the ad are pulled into audience-specific algorithms. RESULTS: The SmokefreeVET Facebook page was used to develop this predictive model of image testing. The ads targeted five audience segments, including female Veterans and Veterans with mental health disorders. The resulting algorithms predicted the success of imagery with those segments. Prediction accuracy rates ranged from 61% to 73%, and image performance (indicated by rates of engagement) increased from 12.73% to 29.48% over the course of eight rounds of iterative testing. CONCLUSIONS: Successful predictive algorithms support the use of a data-driven vetting process to design imagery. This method can be applied to organic social media content as well as large-scale paid media campaigns to prevent misaligned content. This customization maximizes resources; messages and interventions are delivered to the people who need them most.

FUNDING: Federal

CORRESPONDING AUTHOR: Alice Murray, BA, ICF, VA, USA

## SYM10C

### IS EXPOSURE TO ONLINE PEER CONTENT ABOUT NICOTINE REPLACEMENT THERAPY (NRT) ASSOCIATED WITH NRT USE? RESULTS FROM A LONGITUDINAL STUDY

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SIGNIFICANCE: Nicotine replacement therapy (NRT) and social support are important components of smoking cessation treatment. For treatment delivered via the Internet, social norms/influence can be powerful drivers of behavior. This research examined the relationship between exposure to peer sentiment about NRT in an online cessation community and subsequent NRT use. METHODS: Data were drawn from BecomeAnEX.org, a publicly available Internet cessation program with a large online community. Participants were N=5,290 members of BecomeAnEX (current smokers) who enrolled in a randomized treatment trial; half received free NRT. Automated text classification was used to identify posts about NRT in the community. Sentiment toward NRT in each post was rated using Amazon Mechanical Turk (1=strongly negative, 9=strongly positive), which each post rated by ~9 unique individuals. Individual user clickstream data allowed us to quantify participants' exposure to NRT posts/sentiment. Poisson regression examined self-reported use of NRT at 3-months as a function of exposure to NRT sentiment, controlling for study arm and number of posts viewed. RESULTS: On average, participants viewed 6.5 [SD=14.7] NRT posts between study enrollment and 3 month follow-up. Mean sentiment of posts was 5.7 [SD=0.8]. For every 1-point increase in sentiment over mean sentiment, use of NRT increased 23% ( $p<0.05$ ). However, this effect varied by receipt of free NRT from the study: exposure to positive peer sentiment about NRT was associated in an increased likelihood of using NRT among participants who did not receive study NRT (RR 1.23, 95% CI 1.00, 1.50;  $p=0.0459$ ), but there was no relationship between NRT sentiment and later NRT use among those who did receive study NRT (RR 0.98, 95% CI 0.94, 1.02). CONCLUSIONS: Exposure to peer sentiment about NRT was associated with NRT use among smokers who did not receive free NRT. Promoting user-generated content with positive NRT sentiment may serve to increase NRT use among treatment seeking smokers, though further research is needed to establish a causal relationship.

FUNDING: Federal

CORRESPONDING AUTHOR: Jennifer Pearson, MPH, PhD, University of Nevada, Reno, NV, USA

## SYM10D

### AUTOMATED SURVEILLANCE OF QUIT ATTEMPTS IN AN ONLINE CESSATION COMMUNITY THROUGH PASSIVE ANALYSIS OF USER GENERATED CONTENT

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SIGNIFICANCE: User generated content (UGC) can provide useful information about individuals who participate in online cessation interventions. Real-time, automated identification of users' smoking status from UGC (i.e. pre-quit, making a quit attempt, maintaining abstinence) will enable interventions to more effectively tailor support. This study represents a first effort to passively detect smoking status among members of an online cessation program using UGC. METHODS: Secondary data analysis was performed on UGC from 826 participants in an online smoking cessation trial that included an online community. Domain experts from the online community reviewed UGC and coded the author's smoking status. Results of the manual annotation were validated by comparison with self-reported abstinence. A machine-learning classifier was then trained, based on manual annotation results, to perform automatic annotation on all remaining posts in the network, using features of users, texts, and contexts. RESULTS: Of the 826 participants in the manual annotation sample, 719 had written at least one post from which content inference of smoking status was possible. Concordance of inferred smoking status with self-reported abstinence was almost perfect ( $\kappa=0.94$ ). Posts indicating abstinence tended to be written shortly after enrollment (median=14 days). Automatic classification achieved good levels of accuracy (AUC=0.84, F1=0.76). Consideration of user characteristics and neighboring posts improved classification performance by 9.70%, relative to a classifier that considered only features of the text in the original post itself. Among users who authored UGC, 69.84% wrote at least one post from which "abstinence" was inferred. CONCLUSIONS: Passive inference of smoking status from UGC in online cessation communities is reliable for a clinically meaningful proportion of smokers who actively produce content. Future research should develop and test interventions that make use of this information to improve effectiveness by providing temporally-tailored support.

FUNDING: Federal

CORRESPONDING AUTHOR: Michael Amato, MS, PhD, Truth Initiative, DC, USA

## SYM11

### LABORATORY-BASED CLINICAL STUDIES TO INFORM TOBACCO CESSATION INTERVENTIONS AMONG INDIVIDUALS WITH PSYCHIATRIC CONDITIONS

Maggie Sweitzer, PhD, Duke University, NC, USA; Sarah Dermody, PhD, Oregon State University, OR, USA; Jennifer Tidey, PhD, Brown University, RI, USA

Cigarette smoking causes significant morbidity and mortality among individuals with psychiatric conditions. Lower success in quitting smoking among individuals with psychiatric disorders suggests the need for innovations in treatment. Laboratory-based clinical research can provide important insight into the unique features of tobacco addiction and relapse among those with co-occurring disorders. This symposium will present laboratory-based investigations of the mechanisms of tobacco addiction and relapse from neurobiological, pharmacological, and behavioral perspectives with a focus on tobacco users diagnosed with psychiatric disorders (i.e., attention deficit and hyperactivity disorder (ADHD), schizophrenia, or depression). The clinical implications of study findings will be discussed. First, Dr. Sweitzer will present fMRI data comparing reward functioning among adult smokers with and without a diagnosis of ADHD under three different conditions (smoking satiated+placebo, abstinent+placebo, abstinent+methylphenidate). Next, with a focus on both tobacco and cannabis use, Dr. Dermody will share results from a 28-day contingency management intervention tested among individuals with or without schizophrenia. Dr. Tidey will then present findings concerning the effectiveness and safety of nicotine reduction in cigarettes on smoking and mood in individuals with and without depression. The discussant, Dr. Prochaska, will end the symposium by synthesizing the results from the three presentations and discussing the implications of these data for integrating tobacco interventions in mental health care settings.



**JUSTIFICATION:** To encourage innovations in treatment for cigarette smokers with psychiatric comorbidities, this symposium will present neurobiological, pharmacological, and behavioral evidence from laboratory-based clinical studies on the unique features of tobacco addiction and relapse among cigarette smokers with psychiatric comorbidities.

**FUNDING:** Federal

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## SYM11A

### EFFECTS OF SMOKING ABSTINENCE AND METHYLPHENIDATE CHALLENGE ON REWARD FUNCTION AMONG SMOKERS WITH AND WITHOUT ADHD

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Smoking and attention deficit-hyperactivity disorder (ADHD) are highly comorbid conditions, and both are associated with alterations in neural pathways involved in reward processing. Smoking withdrawal negatively impacts reward function, but it is currently unknown if these effects are more pronounced among individuals with ADHD, representing a potential mechanism of vulnerability to smoking and relapse. Here, we examined changes in activation to monetary reward anticipation and feedback during an fMRI monetary incentive delay task among smokers with and without ADHD. We further investigated the role of catecholamine transmission on these changes via administration of 40mg methylphenidate (MPH). Thirty-five adult daily smokers (17 ADHD+, 18 ADHD-) completed fMRI scans under three conditions: a) smoking as usual + placebo; b) 24hr abstinence + placebo; and c) 24hr abstinence + MPH. Whole-brain analysis of task-related BOLD signal (cluster-corrected  $P < .05$ ) indicated robust activation during reward anticipation throughout expected circuitry, but no effect of condition or group by condition interaction. During monetary reward feedback, a significant group by abstinence interaction was observed in two large clusters encompassing bilateral caudate tail, middle frontal gyrus, thalamus and cerebellum (9432 voxels) and dorsal anterior cingulate, precuneus, and right post-central gyrus (8858 voxels), with greater abstinence-induced decreases in activation observed among ADHD compared with non-ADHD smokers. A similar group by MPH interaction was observed in the right inferior frontal gyrus (1241 voxels) and precuneus/superior parietal lobule (1826 voxels). These preliminary findings suggest that smokers with ADHD may be at greater risk for withdrawal-induced disruptions in reward processing compared with non-ADHD smokers, whereas MPH may help to increase activation in regions typically associated with cognitive control. This may reflect a compensatory process facilitating increased attention in the context of decreased reward sensitivity, rather than a normalization of withdrawal-induced reward deficits. Additional supporting data and implications will be discussed.

**FUNDING:** Federal

**CORRESPONDING AUTHOR:** Maggie Sweitzer, PhD, Duke University, NC, USA

## SYM11B

### CHANGES IN TOBACCO CONSUMPTION IN CANNABIS DEPENDENT PATIENTS WITH SCHIZOPHRENIA VERSUS NON-PSYCHIATRIC CONTROLS DURING 28 DAYS OF CANNABIS ABSTINENCE

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Tobacco and cannabis are highly co-morbid in the general population and patients with schizophrenia. Causal mechanisms may facilitate co-use, thus, it is important to determine how cannabis cessation influences tobacco use. Using a 28-day cannabis abstinence paradigm, we prospectively examined changes in tobacco consumption in patients with schizophrenia and controls with cannabis dependence and daily cigarette use. At weekly visits (Days 7, 14, 21, 28), participants completed measures of substance use, withdrawal, and clinical symptoms. Urine samples were collected twice weekly to biochemically-verify abstinence. Contingency management reinforced 28-day abstinence. Multilevel analyses separately evaluated the effects of the following predictors on change in cigarettes use relative to

baseline over time (1) biomarker-verified 28-day abstinence from cannabis and (2) weekly average of grams of cannabis per day relative to baseline. Patient status was examined as a moderator. Analyses controlled for baseline FTND. To evaluate the role of marijuana withdrawal, change in withdrawal at each visit relative to baseline was entered into the final models as a time-varying covariate. Cannabis dependent patients with schizophrenia ( $n=19$ ) and controls ( $n=20$ ) had 28-day abstinence rates of 42% and 55%, respectively. Compared to controls, schizophrenia patients reported a greater increase in cigarette per day (CPD) 7-days post-abstinence relative to baseline. More specifically, patients who had greater decreases in cannabis use at Day 7 reported greater increases in CPD relative to baseline (simple slope =  $-2.31$ ,  $p = .05$ ); this effect was nonsignificant in controls. Further, by Day 28, CPD returned to baseline levels. CPD changes were unrelated to and not accounted for concurrent changes in cannabis withdrawal. Findings support a strong association between cannabis and tobacco use in schizophrenia; however, transient tobacco substitution for cannabis in schizophrenia patients resolved by Day 28. Future studies should focus on targeting underlying mechanisms that promote co-use to better address potential changes in concurrent substance use during treatment interventions.

**FUNDING:** CIHR MOP#115145 to Dr. George, CIHR Doctoral Fellowship to Dr. Rabin, CIHR Postdoctoral Fellowship to Dr. Dermody.

**CORRESPONDING AUTHOR:** Sarah Dermody, PhD, Oregon State University, OR, USA

## SYM11C

### EFFECTS OF REDUCED-NICOTINE CIGARETTES ON SMOKING AND PSYCHIATRIC SYMPTOMS IN SMOKERS WITH AND WITHOUT DEPRESSION

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**BACKGROUND:** An FDA-mandated reduction in the nicotine content of cigarettes has the potential to reduce tobacco dependence and tobacco-related health consequences in the US. Given the high prevalence of mental health conditions among those with tobacco dependence, it is important to understand how these smokers would respond to a reduced-nicotine standard for cigarettes. **METHODS:** This presentation describes results of two studies conducted within two separate tobacco centers of regulatory science. In Study 1, we conducted a secondary analysis that examined whether baseline depressive symptom severity (CES-D score below 16 vs. 16+) affected responses to 6-week use of either normal-nicotine content (15.8 mg/g or usual brand) or reduced-nicotine content (0.4-2.4 mg/g) cigarettes among 717 smokers in a multisite trial. In Study 2, we used a within-subjects design to examine the acute subjective and behavioral responses to cigarettes varying in nicotine content (0.4-15.8 mg/g) among 56 smokers with diagnosed affective disorders. **RESULTS:** Study 1 results indicate that the effects of reduced-nicotine content cigarettes were similar in smokers with higher vs. lower depressive symptoms, and that both groups experienced reductions in smoking rate ( $p \leq .001$ ) and nicotine dependence ( $p \leq .01$ ); furthermore, among those with elevated depressive symptoms, those randomized to reduced-nicotine cigarettes had lower CES-D scores at week 6 than those randomized to normal-nicotine cigarettes ( $p < .05$ ). Study 2 results indicate that reducing the nicotine content of cigarettes decreased the addiction potential of cigarettes in those with affective disorders, as measured by subjective evaluations, responses on a cigarette purchase task and preferences on a choice task. A study of the 12-week effects of cigarettes varying in nicotine content in smokers with affective disorders is underway and will be described. **CONCLUSIONS:** These findings suggest that a reduced-nicotine standard for cigarettes may reduce smoking with minimal disruptive effects in smokers with elevated depressive symptoms or diagnosed affective disorders.

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**CORRESPONDING AUTHOR:** Jennifer Tidey, PhD, Brown University, RI, USA



## SYM12

### “SMOKERS WHO VAPE AND VAPERS WHO SMOKE”: PUBLIC HEALTH IMPLICATIONS OF DUAL USE OF TOBACCO AND ELECTRONIC CIGARETTES

Ron Borland, PhD, Cancer Council Victoria, Australia; Pamela Ling, MD, MPH, University of California San Francisco, CA, USA; Bryan Heckman, PhD, Medical University of South Carolina, SC, USA; Danielle Smith, MPH, Roswell Park Cancer Institute, NY, USA; Christine Czoli, PhD, University of Waterloo, ON, Canada

Dual use of tobacco cigarettes and e-cigarettes is highly prevalent among adult and youth tobacco users. However, little is known about dual users' patterns of product use, transitions between two products, potential health risk from dual use, and cumulative exposure to nicotine and toxicants from electronic and tobacco cigarettes. A better understanding of the use patterns and differing contexts of dual use of electronic and tobacco cigarettes is needed to inform public policy and clinical practice. While e-cigarette use among long-term smokers may lead to quitting attempts and reduction in exposure to harmful tobacco-related toxicants, the e-cigarettes may also have a negative effect of stimulating conventional cigarette smoking among young dual users. During this multidisciplinary symposium, Dr Borland from Cancer Council Victoria in Australia will present data from ITC study and discuss how various use patterns may help gain a better understanding of the potential of vaping to at least partly replace smoking among adults. Dr Ling from University of California San Francisco will present results from qualitative interviews with young adults in California who were current dual users describing the different motivations and contexts that influenced use of e-cigarettes and cigarettes, as well as product characteristics influencing product use. Dr Heckman from Medical University of South Carolina will use behavioral economic perspective across four counties to discuss delay discounting in e-cigarette users, smokers, dual users, and former smokers. Ms Smith from Roswell Park Cancer Institute will present results from an international, multi-center trial that measured levels of biomarkers of exposure to nicotine, tobacco specific nitrosamines (TSNAs), and volatile organic compounds (VOCs) among dual users. Finally, Dr Czoli from University of Waterloo will present results from a naturalistic product-switching experiment among dual users in Canada. Dr Cumming from Medical University of South Carolina will lead discussion how presented data may inform clinical practice and policy decision-making designed to impact transitions away from combustible tobacco.

**JUSTIFICATION:** Symposium will provide a better understanding of the patterns and differing contexts of dual use of electronic cigarettes and cigarettes to enhance clinician advice to dual users and inform on policy decision-making designed to impact transitions away from combustible tobacco.

**FUNDING:** Federal

**CORRESPONDING AUTHOR:** Maciej Goniewicz, maciej.goniewicz@roswellpark.org

## SYM12A

### CONCEPTUAL AND EMPIRICAL CONSIDERATIONS FOR DISTINGUISHING TYPES OF “DUAL USE”: FINDINGS FROM THE ITC PROJECT

Ron Borland\*, Krista Murray, Cancer Council Victoria, Australia

**BACKGROUND:** There has been a lot of interest in “dual use”, a term referring to any concurrent smoking and vaping, but often undefined, and where defined, it varies markedly, from dual daily use to any use of both (often at least monthly). This paper characterises dual use using both cross-sectional correlates and longitudinal stability of patterns. **METHODS:** Analyses of cross-sectional data from 2016 ITC Four Country Survey (US, England, Canada, Australia; n=11,995) with longitudinal data from earlier waves: 2,846 cases of daily smokers at one wave (4.7% daily vapers, 20.7% less than daily, and 74.7% non-vapers) with reported smoking and vaping status at the next wave. **RESULTS:** Most non-daily use of both is less than weekly, with few using most days, thus daily versus non-daily use provides a simple distinction. We identified four sub-groups: Two, *daily dual* users (20%), and *occasional dual* (non-daily) users (17%), can reasonably be considered dual users, although they have very different characteristics. The second two are *predominant smokers* (daily with occasional vaping) (57%), a large group quite similar to daily smokers; and *predominant vapers* (daily with occasional smoking) (6%), a small group quite similar to daily vapers. Dual occasional use is mainly among younger respondents who were also least likely to be sole vapers. Analyses showed that the greater the frequency of vaping relative to smoking, the greater the interest in quitting smoking. In the longitudinal analysis, most dual daily

users had reverted to predominant or sole smoking by the next wave, but 30% were no longer smoking daily (17% quit completely). Among smokers not vaping at baseline only 16% stopped daily cigarette use by the next wave, with 37% of this group now vaping, mainly daily. Transitions from predominant smoking were similar, although the proportion still vaping was greater. **CONCLUSIONS:** Treating any use of either product as one category of dual use is not useful. Patterns vary most by age. Understanding of the various patterns may help gain a better understanding of the potential of vaping to at least partly replace smoking.

**FUNDING:** Federal

**CORRESPONDING AUTHOR:** Ron Borland, PhD, Cancer Council Victoria, Australia

## SYM12B

### CONTEXT OF DUAL USE OF E-CIGARETTES AND CIGARETTES AMONG YOUNG ADULTS

Pamela Ling\*, University of California, San Francisco, CA, USA

**BACKGROUND:** Young adults have high rates of dual use of electronic cigarettes and combustible cigarettes. **METHODS:** We conducted qualitative interviews with 50 young adults in California who were current users of e-cigarettes and cigarettes, about half of whom used both products for at least 10 of the past 30 days. **RESULTS:** Young adults described the different motivations and contexts (e.g., mentality, identity, location, activities, social context, temporality) that influenced use of e-cigarettes and cigarettes, as well as product characteristics influencing use (e.g., flavors, convenience, cost, discretion, nicotine delivery, by-products, sensory experience and object properties). Differences in both contextual and product characteristics influenced when participants used e-cigarettes compared to cigarettes. Most participants did not plan to continue using either e-cigarettes or combustible cigarettes far into the future, though few had immediate plans to quit using either product. Follow up interviews are planned for 2018 to track the evolution of patterns of dual use longitudinally among study participants over time. **CONCLUSIONS:** Dual use of e-cigarettes and cigarettes is common among young adults, and specific contexts and product characteristics influence the choice of a particular product. A better understanding of the patterns of and differing contexts of dual use of electronic cigarettes and cigarettes will enhance clinician advice to young e-cigarette users and inform public policy on youth e-cigarette use.

**FUNDING:** Federal

**CORRESPONDING AUTHOR:** Pamela Ling, MD, MPH, University of California, San Francisco, CA, USA

## SYM12C

### DELAY DISCOUNTING IN E-CIGARETTE USERS, SMOKERS, DUAL USERS, AND FORMER SMOKERS: BEHAVIORAL ECONOMIC PERSPECTIVE ACROSS FOUR COUNTIES

Bryan Heckman<sup>\*1</sup>, Geoffrey Fong<sup>2</sup>, Ron Borland<sup>3</sup>, Richard O'Connor<sup>4</sup>, Warren Bickel<sup>5</sup>, Mikhail Koffarnus<sup>5</sup>, Jeffrey Stein<sup>5</sup>, Derek Pope<sup>5</sup>, K. Michael Cummings<sup>1</sup>, <sup>1</sup>Medical University of South Carolina, SC, USA, <sup>2</sup>University of Waterloo, ON, Canada, <sup>3</sup>Cancer Council Victoria, Australia, <sup>4</sup>Roswell Park Cancer Institute, NY, USA, <sup>5</sup>Virginia Tech Carilion Research Institute, VA, USA

**BACKGROUND:** Delay discounting tasks quantify the impulsive decision-making underlying addictive behaviors. As preferences for immediate rewards increase, the discounting rate becomes steeper (i.e., greater discounting), indicating higher levels of impulsivity. It is well-established that smokers have higher discounting rates than never smokers and former smokers. Only two studies have examined discounting in e-cigarette users (EC), both finding similar rates of discounting for vapers relative to smokers. However, discounting has not been compared across smokers, vapers, dual users, and former smokers. We fill these gaps by examining discounting across nationally representative samples of EC users, smokers, dual users, and former smokers from the US/EN/CA/AU. **METHODS:** Data for this study were from 13,140 adults who participated in the 2016 International Tobacco Control (ITC) 4-country study, a web-based survey. Discounting was assessed with a one-minute task unrelated to smoking. Regression analyses tested predictors of discounting, including: vaping/smoking/quit status and EC appearance/type. Relevant covariates include: quit history (# quit attempts), dependence, cessation fatigue, motivation, self-efficacy, and demographics (e.g., income, race, sex). **RESULTS:** Discounting varied by vaping status for current smokers (dai-

ly/weekly/occasional), such that greater vaping frequency was associated with greater impulsive decision-making. However, vaping status was not associated with differential discounting among former smokers. We also found that cigalike (disposable and reusable) users were more impulsive than tank (ego/mod) users, and participants from the US/AU were more impulsive than those from EN/CA. CONCLUSIONS: We found distinct associations between discounting and vaping based on the frequency and type of EC use. Surprisingly, vaping was associated with increased discounting, at least among smokers, as they might be expected to value the future more if use is motivated by health concerns. These data have implications for policy decision-making designed to impact transitions away from combustible tobacco and facilitate harm reduction.

FUNDING: Federal

CORRESPONDING AUTHOR: Bryan Heckman, PhD, Medical University of South Carolina, SC, USA

## SYM12D

### HIGHER CIGARETTE CONSUMPTION AMONG DUAL USERS OF TOBACCO AND ELECTRONIC CIGARETTES IS ASSOCIATED WITH HIGHER EXPOSURE TO TOBACCO-RELATED TOXICANTS: FINDINGS FROM AN INTERNATIONAL MULTI-CENTER TRIAL

Danielle Smith<sup>\*1</sup>, Lion Shahab<sup>2</sup>, K. Udeni Alwis<sup>3</sup>, Lanqing Wang<sup>3</sup>, Connie Sosnoff<sup>3</sup>, Yang Xia<sup>3</sup>, Benjamin Blount<sup>3</sup>, Michal Gawron<sup>4</sup>, Leon Kosmider<sup>4</sup>, Andrzej Sobczak<sup>4</sup>, Maciej Goniewicz<sup>1</sup>, <sup>1</sup>Roswell Park Cancer Institute, NY, USA, <sup>2</sup>University College London, United Kingdom, <sup>3</sup>Centers for Disease Control and Prevention, GA, USA, <sup>4</sup>Medical University of Silesia, Poland

BACKGROUND: While evidence suggests a strong dose-response relationship in disease risk based on the number of cigarettes smoked per day (CPD) among smokers, how CPD factors into exposure to harmful tobacco-related toxicants among dual users of tobacco and electronic cigarettes (e-cigarettes) has yet to be determined. METHODS: An international, multi-center trial conducted in 2014 at three institutions in the United States, Poland, and the United Kingdom yielded a sample of 91 adult dual users of tobacco and e-cigarettes who reported using e-cigarettes at least six months prior to study enrollment and use of at least two cigarettes per day (CPD). Subjects provided urine samples, which were analyzed using LC/MS-MS and UPLC/ESI-MS/MS methods for 20 biomarkers of exposure to nicotine, tobacco specific nitrosamines, and volatile organic compounds. Creatinine-corrected geometric means were calculated to minimize the skewness of the data; adjusted general linear models (using log transformed biomarker values as outcomes) assessed differences among dual users by self-reported CPD consumption (1-5 CPD; n=36, 6-10 CPD; n=20, 11+ CPD; n=35). RESULTS: Regardless of the number of cigarettes smoked, nicotine exposure was similar among all dual users. Compared with dual users who smoked 1-5 CPD, dual users who smoked 6-10 CPD and 11+ CPD exhibited significantly greater geometric mean levels of NNAL (an exposure marker for 4-methylnitrosamino)-4-(3-pyridyl)-1-butanol,  $p<0.05$ ). Smokers consuming more than 11 CPD had significantly greater levels of CYMA, an exposure marker for acrylonitrile, than those consuming less than 11 CPD ( $p<0.05$ ). CONCLUSIONS: These data provide preliminary evidence that dual use of tobacco and e-cigarettes is associated with high levels of exposure to harmful tobacco-constituents. Irrespective of e-cigarette consumption, those consuming more CPD expose themselves to greater levels of tobacco-related toxicants, including known carcinogens. Future studies examining the impact of CPD on exposure to nicotine and toxicants among dual users may aid in developing appropriate harm reduction messaging associated with dual use.

FUNDING: Federal; Academic Institution

CORRESPONDING AUTHOR: Danielle Smith, MPH, Roswell Park Cancer Institute, NY, USA

## SYM12E

### PATTERNS OF USE AND BIOMARKERS OF EXPOSURE AMONG 'DUAL' TOBACCO CIGARETTE AND ELECTRONIC CIGARETTE USERS IN CANADA

Christine Czoli<sup>\*1</sup>, Geoffrey Fong<sup>1</sup>, Maciej Goniewicz<sup>2</sup>, David Hammond<sup>1</sup>, <sup>1</sup>University of Waterloo, ON, Canada, <sup>2</sup>Roswell Park Cancer Institute, NY, USA

SIGNIFICANCE: In Canada, dual use of tobacco cigarettes (TCs) and e-cigarettes (ECs) is highly prevalent; however, little is known about dual users' patterns of

use and exposure to tobacco smoke constituents. METHODS: Adult daily dual users (n=48) were recruited in Kitchener-Waterloo and Toronto, Ontario. Participants completed a naturalistic product-switching experiment over 3 consecutive 7-day periods, with 4 study conditions: dual use, exclusive smoking, exclusive vaping, and no product use. Patterns of use were assessed at baseline. Cotinine and biomarkers of exposure, including carbon monoxide (CO), 1-hydroxypyrene (1-HOP), and 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanol (NNAL), were assessed for each study condition. RESULTS: Dual users were 36 years old, mostly male (71%), and exhibited low to moderate dependence (FTCD: 4.7 (SD=1.9)). Although dual users reported similar daily consumption of TCs and ECs (13.7 (SD=5.6) TCs per day vs. 10.9 (SD=11.4) bouts of EC use,  $p=0.09$ ), a greater proportion reported smoking TCs within the first hour of waking (98% vs. 59% for ECs;  $p<0.001$ ). Nearly all dual users reported using tank systems (92%) and ECs with nicotine (94%). Experimental findings indicated that compared to dual use, cotinine was stable when participants switched to exclusive smoking ( $p=0.524$ ), but significantly decreased when they switched to exclusive vaping ( $p=0.027$ ), despite significant increases in EC use ( $p=0.001$ ). Compared to dual use, biomarkers of exposure were significantly reduced when participants switched to exclusive vaping (CO: -41%,  $p<0.001$ ; 1-HOP: -31%,  $p=0.025$ ; NNAL: -30%,  $p=0.017$ ), and when they abstained from both products (CO: -26%,  $p<0.001$ ; 1-HOP: -14% (ns); NNAL: -35%,  $p=0.016$ ). In contrast, participants' exposure increased when they switched from dual use to exclusive smoking (CO: +21%,  $p=0.029$ ; 1-HOP: +23%,  $p=0.048$ ; NNAL: +8% (ns)). CONCLUSIONS: The study findings indicate that TCs appear superior to ECs in their ability to deliver nicotine. Dual use was associated with modest reductions in biomarkers of exposure; however, abstaining from smoking was the most important factor in reducing exposure to tobacco smoke constituents.

FUNDING: Academic Institution; Federal

CORRESPONDING AUTHOR: Christine Czoli, PhD, University of Waterloo, ON, Canada

## SYM13

### COOLING AGENTS, FLAVORS, AND NICOTINE: ADDITIVES OR DRUGS?

M. Imad Damaj, PhD, Pharmacology and Toxicology, VA, USA; Sven-Eric Jordt, PhD, Duke University, NC, USA; Mehmet Sofuoglu, MD, PhD, Yale University, CT, USA; Cheryl Oncken, MD, MPH, University of Connecticut, CT, USA

Sensory perception is an important determinant of smoking and nicotine taking behavior and, therefore, reinforcement and addiction. Research in the last two decades on the physiological effects of flavors and cooling agents such as menthol in human and animal studies has suggested that menthol's sensory properties are linked to smoking behavior and smoking cessation. More recent investigations showed that these agents act on specific peripheral and neuronal targets to modulate nicotine behavioral properties. This symposium brings together an interdisciplinary group of scientific leaders to present the latest discoveries in this area, and discuss the translation from research to practice in the form of new methods of outcome prediction, prevention strategies, and development of health policies. Dr. Damaj will present new preclinical data showing that menthol levels, sex and age factors play an important role in the enhancement of oral nicotine intake and preference in mice. These data suggest that specific nicotinic receptors may mediate the effects of menthol on nicotine. Dr. Sofuoglu will present the results of a new study aimed at determining if inhaled menthol from an electronic cigarette would change the rewarding effects of nicotine administered intravenously, and whether these effects would be greater in menthol smokers. Dr. Jordt will present new behavioral and pharmacological results of synthetic cooling agents using both in vitro and in vivo preclinical models. These results suggest that synthetic cooling agents have pharmacological effects similar to menthol and may thus reduce aversion to tobacco products and facilitate initiation. Dr. Cheryl Oncken will discuss what is known about the effects of menthol on tobacco initiation and smoking behavior in humans, highlighting further research that is needed to inform clinical practice and policy.

JUSTIFICATION: I will inform on the effects of cooling agents and flavors on the additive effects of nicotine and will inform policy makers on possible regulation of these flavors

FUNDING: Federal

CORRESPONDING AUTHOR: M. Imad Damaj, m.damaj@vcuhealth.org





## SYM13A

### MENTHOL INCREASES NICOTINE ORAL INTAKE AND PREFERENCE IN MICE: ROLE OF CONCENTRATION, SEX, AND AGE FACTORS

M. Imad Damaj\*, PhD, Pharmacology and Toxicology, VA, USA

**BACKGROUND:** Menthol is a significant additive in tobacco products including cigarettes and dissolvable tobacco and nicotine products such as strips, orbs, sticks, and lozenges. These products include different flavors to increase their appeal, smells and palatability. One of the most preferred flavors is menthol. However, there is limited knowledge on the possible interactions between menthol and nicotine with regard to the oral nicotine consumption in adult and adolescents. Therefore, we aimed to determine the impact of menthol on oral nicotine consumption and preference in mice. **METHODS:** Adolescent and adult C57BL/6J mice (n=10/ per group/per sex) were given a choice of nicotine (60 µg/ml) or mentholated nicotine (a range of concentrations of menthol (30-210 µg/ml) plus nicotine (60 µg/ml) solution using two-bottle free choice drinking assay. Our results showed that menthol increased nicotine intake and preference in both female and male adult mice without a significant effect on total fluid intake and body weight. However, compared to male mice, the effect of menthol in female animals was observed with a wider range of menthol concentration. Low concentrations of menthol enhanced nicotine preference but the effect was lost at higher concentrations. In addition, systemic injection of low doses of menthol increased nicotine intake and preference in mice. Furthermore, menthol increased nicotine intake and preference in female adolescent mice to higher level compared to adult ones. The effects of menthol are sex-, age- and concentration-dependent. **CONCLUSION:** The results of this study will contribute to our understanding on the impact of menthol flavor addition in oral dissolvable nicotine products.

FUNDING: Federal

CORRESPONDING AUTHOR: M. Imad Damaj, PhD, Pharmacology and Toxicology, VA, USA

## SYM13B

### SYNTHETIC COOLING AGENTS IN TOBACCO PRODUCTS: CHEMISTRY, PHARMACOLOGY AND EFFECTS ON NICOTINE CONSUMPTION

Sven-Eric Jordt\*, Duke University, NC, USA

Menthol is currently the only characterizing flavor permitted in tobacco cigarettes by the Family Smoking Prevention and Tobacco Control Act (FSPTCA). While the consumption of combusted cigarettes has declined, the proportion of menthol cigarettes has increased. This suggests that menthol may facilitate smoking initiation and that quitting may be more difficult for menthol cigarette smokers. In the 1970s the consumer products and flavor industries began developing synthetic cooling agents as additives in hair and skin care products and foods and beverages. These agents, most of them menthol derivatives, have cooling effects but lack the minty smell and irritant effects of menthol. At this time, knowledge about the use of synthetic cooling agents pharmacological and behavioral effects is limited. An in-depth search of the Tobacco Legacy database identified documents describing the experimental use of synthetic cooling agents by the tobacco industry in cigarettes, with test marketing in 1981. However, products were withdrawn and the cooling agent used, WS-14, never received GRAS (Generally Recognized As Safe) status. Electronic cigarette liquid vendors revealed wide availability of synthetic cooling agents, including WS-3, WS-5, WS-23 and Koolada (Menthyl-methyl-lactate). While these agents have GRAS status, this is limited for use in foods and care products. The inhalational safety of these products remains unknown. We completed a pharmacological characterization of these compounds, demonstrating that they are potent activators of the cold/menthol receptor, TRPM8, activating both mouse and human isoforms. Compounds have different actions on TRPA1, the menthol-activated respiratory irritant receptor. In mice behavioral assays, they show strong analgesic activity. Ongoing studies investigate the effects of synthetic cooling agents on nicotine intake in mice. Taken together, synthetic cooling agents have pharmacological effects similar to menthol and may thus reduce aversion to tobacco products and facilitate initiation. A receptor/target-based regulatory policy is advised, controlling both contents of natural (menthol) and synthetic cooling agents activating TRPM8.

FUNDING: Federal

CORRESPONDING AUTHOR: Sven-Eric Jordt, PhD, Duke University, NC, USA

## SYM13C

### EFFECTS OF INHALED MENTHOL ON THE REWARDING EFFECTS OF INTRAVENOUS NICOTINE IN SMOKERS

Mehmet Sofuoglu\*, Yale University, CT, USA

Primary goals of this study were to determine if inhaled menthol from an electronic cigarette would change the rewarding effects of nicotine administered intravenously, and whether these effects would be greater in menthol smokers. A total of 32 menthol-preferring smokers (MS) and 25 non-menthol-preferring smokers (NMS) participated in this double-blind, placebo controlled study. Participants were assigned to a random sequence of three different e-cigarette conditions [0% (no menthol), 0.5% (low) or 3.2% (high) menthol] across three test sessions (a single flavor condition for each session). In each session, a random order of one intravenous (IV) saline delivery, and two intravenous deliveries of nicotine (0.25 mg and 0.5 mg / 70 kg bodyweight), were administered one hour apart. While menthol did not alter the positive subjective effects of nicotine in either MS or NMS, it significantly enhanced aversive effects of nicotine in NMS and reduced smoking urges MS. MS, compared to NMS, reported blunted positive subjective responses to IV nicotine and had less severe withdrawal following abstinence from smoking. The baseline nicotine metabolite ratio (NMR) was significantly lower within MS, indicating slower nicotine metabolism in MS. Our findings did not support enhanced nicotine reinforcement inhaled menthol. However, the association of MS with blunted positive responses to nicotine and reduced withdrawal severity that may be partly due to inhibition of nicotine metabolism with menthol exposure in MS.

FUNDING: Federal

CORRESPONDING AUTHOR: Mehmet Sofuoglu, MD, PhD, Yale University, CT, USA

## SYM13D

### DISCUSSION

Cheryl Oncken\*, University of Connecticut, CT, USA

Dr. Cheryl Oncken will discuss what is known about the effects of menthol on tobacco initiation and smoking behavior in humans, highlighting further research that is needed to inform clinical practice and policy.

FUNDING: Federal

CORRESPONDING AUTHOR: Cheryl Oncken, MD, MPH, University of Connecticut, CT, USA

## SYM14

### VULNERABILITIES TO TOBACCO PRODUCT USE AND STRATEGIES TO REDUCE USE AMONG WOMEN OF REPRODUCTIVE AGE

Ryan Redner, PhD, Southern Illinois University, IL, USA; Allison Kurti, PhD, University of Vermont, VT, USA; Antonio Cepeda-Benito, PhD, University of Vermont, VT, USA; Erin Mead, PhD, University of Connecticut, CT, USA

Passage of the 2009 Tobacco Control Act granted regulatory authority over tobacco and nicotine delivery products to the FDA. This landmark legislation created a substantial need for additional research to assure that the necessary information was available to support evidence-based regulatory actions to protect public health. Meeting that need was the rationale behind the FDA's creation of the network of 14 Tobacco Centers of Regulatory Science (TCORS) along with a coordinating center (CECTR). Protecting the public health is the overarching aim of this regulatory effort. A critically important aspect of meeting that aim is increasing understanding of use patterns and adverse health impacts of tobacco and nicotine delivery products in vulnerable populations. Women of reproductive age share the same risks as other populations from smoking and use of other tobacco and nicotine products, but also have the unique risk of potentially catastrophic pregnancy complications and longer-term adverse impacts on their infants should they become pregnant. In addition, smoking poses unique risks to women irrespective of pregnancy including early menopause, osteoporosis, and cervical cancer. This symposium represents a collaboration between the University of Vermont TCORS, Ohio State TCORS, University of Maryland TCORS, American Heart Association Tobacco Regulation and Addiction Center (A-TRAC), and the Center for Evaluation and Coordination of Training and Research in Tobacco Regulatory Science

(CECTR) as part of the TCORS Vulnerable Populations Working Group. Presenters in this symposium will examine: (a) prevalence and correlates of tobacco use in a U.S. national sample of non-pregnant women of reproductive age, and (b) pregnant women, (c) prevalence and trajectory of cigarette smoking among women who reside in rural areas, and (d) response to warning labels among non-pregnant and pregnant smokers. Each presentation will offer suggestions for regulation of products, especially as it pertains to tobacco use among women of reproductive age. Discussant: Jack Henningfield, PhD

**JUSTIFICATION:** Collectively, these presentations on tobacco product use, and strategies to reduce use, among U.S. national samples of reproductive-aged women stand poised to inform intervention, educational, and policy efforts to reduce tobacco use and improve health among this vulnerable population.

**FUNDING:** Federal

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## SYM14A TOBACCO AND NICOTINE DELIVERY PRODUCT USE IN A U.S. NATIONAL SAMPLE OF WOMEN OF REPRODUCTIVE AGE

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**INTRODUCTION:** This study examined prevalence and correlates of using cigarettes, e-cigarettes, and other tobacco/nicotine delivery products in a U.S. national sample of women of reproductive age. **METHOD:** Data were obtained from women aged 18-44 years who were not currently pregnant in the first wave of the Population Assessment of Health and Tobacco (PATH, 2013-2014) Study (N = 9,637). **RESULTS:** 21.4% of women were current cigarette smokers, 6.2% were current e-cigarette users, 5.1% currently smoked cigars, and 6.8% currently used hookah. Prevalence of current use of other tobacco products was < 1.0%. Current cigarette smoking was the strongest correlate of current e-cigarette use (AOR = 86.1, 95% CI = 54.2-136.7), cigar smoking (AOR = 18.9, 95% CI = 13.6-26.4), except for hookah use, for which younger age was the strongest correlate (AOR = 11.4, 95% CI = 8.6-15.0). Among current cigarette smokers, 22.4%, 17.2%, and 15.3% were also currently using e-cigarettes, cigars, and hookah, respectively. Among former cigarette smokers, 3.6%, 3.0%, and 6.8% were currently using e-cigarettes, cigars, and hookah, respectively. Use of other tobacco and nicotine delivery products was low among those who never smoked tobacco cigarettes: 2.7% for hookah and < 1.0% for other products. **DISCUSSION:** Cigarette smoking prevalence remains relatively high among women of reproductive age and strongly correlated with use of other tobacco products. Monitoring tobacco and nicotine use in this population is important due to the additional risk of adverse health impacts should they become pregnant. Clinicians working with cigarette smokers should assess for use of other tobacco products. Among women of reproductive age, use of emerging tobacco and nicotine products appears to be largely, although not exclusively, restricted to current cigarette smokers.

**FUNDING:** Federal

**CORRESPONDING AUTHOR:** Ryan Redner, PhD, Southern Illinois University, IL, USA

## SYM14B EXAMINING PATTERNS OF TOBACCO PRODUCT USE AMONG PREGNANT WOMEN

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**INTRODUCTION:** Monitoring use of tobacco products among pregnant women is a public health priority due to the potential adverse impacts on maternal and infant health, yet little research in U.S. national samples has reported on this topic. We examined prevalence of using cigarettes and alternative tobacco products in a U.S. national sample of pregnant women, as well as longitudinal changes in tobacco use corresponding to transitioning into or out of pregnancy. **METHOD:** Prevalence of using specific products was examined among all pregnant women

who completed Wave 1 (W1) of the U.S. Population Assessment of Tobacco and Health (PATH, 2013-2014) Study (N = 387). We also examined longitudinal changes in tobacco product use over a two-year period among the following groups of women (18-44 years) who completed both Wave 1 (W1) and Wave 2 (W2) of the PATH (2013-2014, 2014-2015) Study: women not pregnant in either wave (n = 7,480), not pregnant in W1 and pregnant in W2 (n = 332), and pregnant in W1 and postpartum in W2 (n = 325). **RESULTS:** Overall prevalence was highest for tobacco cigarettes (13.8%) and e-cigarettes (4.9%). Use of all other products was generally highest among current smokers, then former smokers, and last never-smokers. Overall prevalence of any tobacco use was stable among women not pregnant in either wave (W1: 27.0%, W2: 25.9%), decreased 2.2 fold among women not pregnant in W1 and pregnant in W2 (27.6%, 12.3%), and increased 1.5-fold among women pregnant in W1 and postpartum in W2 (15.7%, 24.0%). All three subgroups demonstrated a graded relationship where the proportion of women with a stable pattern of use across both waves decreased as the number of products used increased. **DISCUSSION:** Prevalence estimates for tobacco product use during pregnancy suggest a need for more intensive or targeted tobacco control and regulatory strategies targeting this population. Overall, this study contributes new knowledge about the diversity and stability of patterns of tobacco use across time and reproductive events among reproductive-aged women.

**FUNDING:** Federal

**CORRESPONDING AUTHOR:** Allison Kurti, PhD, University of Vermont, VT, USA

## SYM14C SMOKING TRENDS AMONG RURAL WOMEN LAG BEHIND THOSE OF RURAL MEN, URBAN MEN, AND URBAN WOMEN

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**INTRODUCTION:** Smoking prevalence is declining at a lower rate in rural than urban settings in the US, and known predictors of smoking cannot account for this trend difference. Given that socioeconomic and psychosocial determinants of health disparities accumulate in rural settings, and the hypothesis that the synergistic impact of life-course disadvantages may contribute to uniquely increase the risk for smoking in women, we proposed that previously found rural disparities in smoking trends would largely be due to differences between rural and urban women. **METHOD:** We used annual cross-sectional data (n = 303,311) from the National Survey on Drug Use and Health (NSDUH) from 2007 through 2014 to compare cigarette smoking trends between and within men and women across rural and urban/suburban areas of the United States. Current smoking status was modeled with logistic regression with and without controlling for confounding risk factors. **RESULTS:** Regression derived graphs predicting unadjusted prevalence estimates and 95% confidence bands revealed that whereas the smoking trends of rural men, urban/suburban women, and urban/suburban men significantly declined from 2007 to 2014, the trend for rural women remained flat. The corresponding adjusted prevalence graphs revealed that differential trends between rural and urban/suburban men were accounted for by the covariates, but rural women continued to display a flat if not ascending trend that was significantly different from that of the other three groups. **DISCUSSION:** Rural women lag behind rural men, urban/suburban men and women in contributing to population-based reductions in current smoking prevalence, a health disparity that should be considered in the planning and prioritization of tobacco use.

**FUNDING:** Federal

**CORRESPONDING AUTHOR:** Antonio Cepeda-Benito, PhD, University of Vermont, VT, USA



## SYM14D

### STRONGER WARNING LABELS ARE NEEDED TO TARGET PREGNANT WOMEN AND WOMEN OF REPRODUCTIVE AGE WHO SMOKE

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**INTRODUCTION:** Cigarette pack warning labels are important informational sources to motivate cessation and prevent initiation, but limited research has examined label reactions among women of reproductive age (WRAge) and pregnant women, who have added health risks from smoking. This study examined reactions to text-only labels and associations with quit-related cognitions in these vulnerable populations in a U.S. national sample. **METHOD:** Using the Population Assessment of Tobacco and Health study (Wave 1), we compared label reactions among non-pregnant WRAge (18-44, N=9,622) and men of the same age (N=10,290). We also compared reactions among WRAge by pregnancy status: currently (N=386), ever (N=5,323), and never been (N=4,299) pregnant. We examined effect modification by gender and pregnancy status on associations between reactions and quit interest, likelihood of quitting, and quit intentions. Logistic and linear regression models adjusted for smoking status and demographic traits. **RESULTS:** Half of respondents (57% of men, 51% of non-pregnant WRAge, 49% of pregnant WRAge) reported seeing labels in the past 30 days. Current smokers were more likely to see them (78%) than never (36%) and former (39%) smokers. WRAge had lower odds of seeing the labels than men, but no difference was found among smokers. Among smokers, WRAge had lower odds of reading the labels but greater odds of feeling concerned by and avoiding the labels than men. Compared to men, WRAge current and former smokers had greater odds of reporting the labels made them want to quit or stay quit, and never smokers had greater odds of reporting the labels made them less likely to start smoking. Label reactions did not differ by pregnancy status, except pregnant WRAge had greater odds of reporting the labels made them less likely to start than ever pregnant WRAge. There was some significant effect modification by gender on cognitive outcomes, but little by pregnancy status. **DISCUSSION:** Stronger labels are especially needed to provoke stronger reactions among pregnant WRAge in the US. Pictorial labels that impart new information specific to reproductive and fetal health might better motivate this group.

**FUNDING:** Federal

**CORRESPONDING AUTHOR:** Erin Mead, PhD, University of Connecticut, CT, USA

## SYM15

### CUTTING-EDGE MIXED METHODS RESEARCH ON MARIJUANA AND TOBACCO CO-USE: CAUSES, CORRELATES, AND CONSEQUENCES ACROSS THE AGE SPECTRUM

Juliet Lee, PhD, Pacific Institute for Research and Evaluation, CA, USA; Evan Hermann, PhD, Battelle Memorial Institute, MD, USA; Emmanuel Oga, MD, MPH, Battelle Memorial Institute, MD, USA; Amy Cohn, PhD, Battelle Memorial Institute, VA, USA; Sharon Lipperman-Kreda, PhD, Pacific Institute for Research and Evaluation, CA, USA

Tobacco control research has relied heavily on national, population-based surveys to monitor historical and current use of products and attitudes regarding current and future use. These studies often neglect a fine-grained assessment of highly co-morbid behaviors, such as marijuana use and emerging co-use patterns with other substances. Furthermore, they cannot keep pace with rapid developments in new and transitioning substance use behaviors, disruptive technologies and innovative devices for substance use, and marketing and counter-marketing activities. Understanding the ways in which marijuana is used and interacts with tobacco product use is imperative to inform tobacco regulatory efforts and targeted prevention and intervention campaigns. This symposium presents a range of cutting-edge studies on marijuana and tobacco co-use behaviors across the age spectrum. Dr. Lee will begin with a mixed-methods qualitative lens to measure dual nicotine and marijuana use in youth and young adults. Dr. Herrmann will then present results from a human laboratory study examining the effects of varenicline and markers of tobacco dependence on relapse to marijuana use among adult co-users. The presentations then broaden to focus on two observational studies, the first of which, by Dr. Oga, shows the prevalence and correlates of marijuana use in adult e-ciga-

rette users and the second of which, by Dr. Cohn, shows the impact of marijuana use on cigarette demand in adult cigarette smokers. Dr. Lipperman-Kreda ends with a macro-level and "real-time" assessment of how the tobacco marketing environment impacts daily marijuana use and co-use with tobacco in youth and young adults. The presentations were designed to be translational in nature, covering qualitative, biobehavioral, clinical, and geo-location methodologies across youth, young adults, and older adults. Our Discussant, Dr. Peters, will highlight how findings can inform policy actions and ways to improve development of prevention/intervention programs aimed at reducing harmful patterns of co-use of marijuana and tobacco.

**JUSTIFICATION:** Understanding the ways in which marijuana is used and interacts with tobacco product use is imperative to inform tobacco regulatory efforts and targeted prevention and intervention campaigns.

**FUNDING:** State

**CORRESPONDING AUTHOR:** Amy Cohn, cohn@battelle.org

## SYM15A

### DISCOUNTING OR DISSONANCE? DISCREPANCIES IN A MIXED METHODS STUDY OF DUAL USE OF CANNABIS AND NICOTINE

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**SIGNIFICANCE:** Dual use of cannabis and nicotine by smoking cannabis leaf in blunts (small cigars/cigarillos) is associated with increased risks for dependence on both substances; and is associated with non-white male young adults. Because cannabis users may not consider blunt smoking as a form of nicotine use, there is a risk of underreporting in survey-based data collection. **METHODS:** For confidential interviews in a multi-methods study of dual use, we recruited people aged 15-24 in the East San Francisco Bay Area, screened for recent weekly use of cannabis (self-report). To date we have conducted 34 confidential interviews (projected n=40); 74% of participants identified as non-white, 53% as male. Participants responded to (1) semi-structured questions concerning their lifetime use of and attitudes towards various nicotine/tobacco and various cannabis products; and (2) a brief structured survey assessing their use of nicotine/tobacco and cannabis products in the past 30 days. We compared structured and semi-structured responses. **RESULTS:** In the survey, 18 participants reported no lifetime use of nicotine/tobacco products; of these, however, 7 reported having used blunts to consume cannabis in the past 30 days. In semi-structured responses, some participants reported negative or ambivalent attitudes towards nicotine/tobacco products. For many participants, the pragmatic and social values of smoking cannabis in blunts outweighed negative aspects. Some participants stated that most or all of the tobacco is "taken out" before the cannabis leaf is put into the cigar shell. **CONCLUSIONS:** Despite numerous reports over the past decades about blunt smoking risks, some cannabis blunt smokers may not consider this practice to constitute a form of nicotine use. Additionally, cannabis blunt smokers may be aware of but discount this form of nicotine intake. Using only one item to survey lifetime use of nicotine/tobacco products would have resulted in an 43% undercount among our respondents. Multiple data points may be needed to assess prevalence, and increased outreach may be needed to reduce risks, of nicotine use among frequent cannabis users.

**FUNDING:** State

**CORRESPONDING AUTHOR:** Juliet Lee, PhD, Pacific Institute for Research and Evaluation, CA, USA



## SYM15B

### VARENICLINE AND NABILONE IN TOBACCO+CANNABIS CO-USERS: VARENICLINE INCREASES OUTPATIENT TOBACCO ABSTINENCE, AND BEHAVIORAL MARKERS OF TOBACCO DEPENDENCE SEVERITY PREDICT INPATIENT CANNABIS RELAPSE

Evan Hermann<sup>\*1</sup>, Ziva Cooper<sup>2</sup>, Gillinder Bedi<sup>2</sup>, Divya Remesh<sup>3</sup>, Stephanie Reed<sup>2</sup>, Sandra Comer<sup>2</sup>, Richard Foltin<sup>2</sup>, Margaret Haney<sup>2</sup>, <sup>1</sup>Battelle Memorial Institute, MD, USA, <sup>2</sup>Columbia University Medical Center, NY, USA, <sup>3</sup>University of Connecticut - Storrs, CT, USA

**SIGNIFICANCE:** Concurrent use of tobacco+cannabis is common, and predicts poor clinical outcomes. This human laboratory study examined the effects of varenicline on outpatient tobacco cessation, and the effects of varenicline alone and varenicline+nabilone (a cannabinoid agonist), on inpatient measures of withdrawal and relapse to cannabis self-administration. **METHODS:** Non-treatment-seeking tobacco+cannabis users were randomized to active vs. placebo varenicline, and then completed a 15-day outpatient phase. Varenicline was titrated to 1mg BID over days 1-8, and participants were instructed to abstain from tobacco/nicotine on days 9-15. Next, participants completed a 16-day inpatient phase, consisting of two 8-day medication periods. Each 8-day period included controlled cannabis administration (days 1-2), and maintenance on either nabilone (4mg BID) or placebo-nabilone, in counterbalanced order (days 3-8). Participants remained tobacco-abstinent and on active or placebo varenicline while inpatient. Withdrawal was measured during controlled cannabis administration (days 1-2), and when no active cannabis was available (days 3-5). Relapse was measured on days 6-8, when participants could self-administer cannabis at financial cost. **RESULTS:** Rates of bio-chemically verified outpatient tobacco abstinence were higher with varenicline vs. placebo, and the varenicline group reported less mood disturbance and tobacco craving during controlled cannabis administration. Nabilone attenuated cannabis withdrawal in both varenicline groups, but did not alter relapse. Predictor analyses revealed that younger age of 1 tobacco use, self-reported tobacco use during outpatient days 9-15, and greater tobacco craving during inpatient days 3-5 all predicted cannabis relapse. **CONCLUSIONS:** Varenicline increased tobacco abstinence rates outpatient, improved mood and reduced tobacco craving inpatient, and did not alter nabilone's effects on cannabis withdrawal or relapse. Overall rates of cannabis relapse were ~30% lower than in prior studies, and tobacco-related variables were robust predictors of relapse. Tobacco cessation may reduce cannabis relapse in some tobacco+cannabis users.

**FUNDING:** Federal

**CORRESPONDING AUTHOR:** Evan Hermann, PhD, Battelle Memorial Institute, MD, USA

## SYM15C

### PREVALENCE AND CORRELATES OF RECENT MARIJUANA USE IN ADULT E-CIGARETTE USERS IN BALTIMORE

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**BACKGROUND:** Marijuana use may enhance risk for ever, but not recent, e-cigarette use in young adults, but to our knowledge no studies have tested this association in older adults. The aim of this study is to describe the prevalence and correlates of past-month marijuana use in adult e-cigarette users. **METHODS:** Data are from a screening survey of 1066 e-cigarette users age 18 years and older residing in Baltimore, Maryland between October 2016 and July 2017 who were interested in participating in a study examining e-cigarette withdrawal. The survey collected information on demographics, e-cigarette/tobacco product use, marijuana use and other related information. Participants were sourced from Facebook, Craigslist, local newspapers, mobile advertising and friends' referrals. Multivariable logistic regression analyses were conducted to identify characteristics associated with past-month marijuana use among adult e-cigarette users. Results Mean age (SD) of screening survey respondents was 31.8 years (24.3). About 65% of respondents were male, and included daily (88%), weekly (6%), monthly (2%) and less than monthly (4%) e-cigarette users. Devices used included refillable tanks (61%), modified devices (27%), disposable e-cigarettes (5%) and cartridge refill (7%). Most (73%) were former daily smokers. Prevalence of past-month marijuana use was 29% (95% CI: 26.0-31.8%). Past-month use of cigars was significantly associated with marijuana use (adjusted odds ratio (aOR)= 1.8 (1.1-3.0)). Also associated with marijuana use was past-month tobacco cigarette smoking (aOR=1.6

(1.1-2.4)) and past-month smoking of pipes (aOR=3.9 (1.4-11.1)). Past daily tobacco cigarette smoking history of greater than 10 years (compared with never daily smokers) was associated with lower odds of marijuana use (aOR=0.5 (0.3-0.8)). Current intention to stop or reduce e-cigarette use was not associated with marijuana use. **CONCLUSIONS:** Prevalence of recent marijuana co-use is relatively high in e-cigarette users. Recent marijuana use was more common in e-cigarette users who also smoked cigars, combustible tobacco cigarettes and pipes in the past month, suggesting a clustering of substance and polytobacco use.

**FUNDING:** Federal

**CORRESPONDING AUTHOR:** Emmanuel Oga, MD, MPH, Battelle Memorial Institute, MD, USA

## SYM15D

### MARIJUANA USE DAMPENS THE REINFORCING VALUE OF CIGARETTES AMONG TREATMENT-SEEKING SMOKERS

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**BACKGROUND:** Marijuana use and cigarette smoking commonly co-occur. Marijuana's effects on the reinforcing properties of nicotine are unclear, however. It may enhance the subjective rewarding effects of nicotine, or may reduce cravings or "dampen" the salient reinforcing properties of cigarette smoking, or serve as an economic substitute. Given the rapidly changing marijuana policy landscape and increased availability of marijuana, marijuana use could have "downstream" effects on cigarette smoking, particularly among those motivated to quit. Using a behavioral economic purchase task paradigm, this study examined differences in the reinforcing value of cigarettes among smokers with and without current (past 30-day) marijuana use. **METHOD:** Participants were 600 adult smokers (73% female) who were newly registered for an online cessation program, and who answered questions about demographics, cigarettes per day (CPD), past 30-day marijuana use, and completed a modified 8-item cigarette purchase task (CPT) via a web survey. Controlling for income, regression models examined the association of CPD to elasticity (sensitivity of cigarette consumption at increasing prices) and  $O_{max}$  (maximum cigarette expenditure), and the moderating effect of past 30-day marijuana use on these associations. **RESULTS:** Participants consumed, on average, a pack a day; 20.7% reported past 30-day marijuana use. There was a significant CPD x marijuana use interaction on  $O_{max}$ , showing a positive and significant association between CPD and  $O_{max}$  among non-past 30-day users ( $b = .67$ ,  $p < .001$ ), and a significant positive, but weaker association between CPD and  $O_{max}$  among past 30-day marijuana users ( $b = .30$ ,  $p < .05$ ). **CONCLUSION:** Smokers who consumed more cigarettes per day also endorsed greater maximum cigarette expenditures (willingness to allot more money to smoking), but this effect was significantly weaker among smokers who reported past 30-day marijuana use. These findings suggest a dampening effect of current marijuana use on the rewarding value of cigarette smoking in treatment seeking smokers who are heavily female.

**FUNDING:** This study was funded by Truth Initiative.

**CORRESPONDING AUTHOR:** Amy Cohn, PhD, Battelle Memorial Institute, VA, USA

## SYM15E

### EXPOSURE TO TOBACCO OUTLETS IN ACTIVITY SPACES AND TOBACCO, NICOTINE, AND MARIJUANA DAILY USE AND CO-USE

Sharon Lipperman-Kreda<sup>\*</sup>, Joel Grube, Andrew Gaidus, Laura Finan, Pacific Institute for Research and Evaluation, CA, USA

We investigated young people's daily exposure to tobacco outlets in their activity spaces and their daily tobacco/nicotine and marijuana use and co-use, using Geographical Ecological Momentary Assessment (GEMA). To date, data have been collected from 39 participants (15-20 years old) in 8 California cities for 14 days. In an initial survey, participants reported age, sex, race/ethnicity, and subjective family socioeconomic status. Using GPS-enabled smartphones with a survey application, they responded to brief daily surveys and location coordinates (latitude and longitude) were obtained at one minute intervals throughout the study. Tobacco outlet addresses and GPS locations were geocoded and activity spaces were constructed by joining se-



quential points. Exposure measures included the number of tobacco outlets within 50m or 100m of these polylines and the amount of time participants were within 50m or 100m of tobacco outlets each day. We excluded days in which participants were tracked for less than 360 min, leaving us with 439 days for analysis. Prevalence of co-use of tobacco/nicotine and marijuana was 21.1%. Controlling for demographics, no associations were found between exposure measures and tobacco/nicotine and marijuana use and co-use in multilevel logistic regression analyses. However, we found interactions between number of outlets within 50m of participants' polylines and age group (i.e., under 18 years old versus 18 or older) on marijuana use (OR=0.83,  $p=0.004$ ) and tobacco/nicotine and marijuana co-use (OR=0.87,  $p=0.07$ ), and between number of tobacco outlets within 100m of participants' polylines and age group on their daily tobacco/nicotine use (OR=0.91,  $p=0.09$ ), marijuana use (OR=0.86,  $p=0.007$ ), and tobacco/nicotine and marijuana co-use (OR=0.90,  $p=0.05$ ). These interactions indicated that exposure to tobacco outlets was associated with increased risks for tobacco/nicotine and marijuana use and co-use among those under 18 years of age but not older. Our results suggest that younger youth are more susceptible to exposure to tobacco outlets in their daily lives, and that the number of outlets, but not the time they spend around these outlets, matters.

FUNDING: State

CORRESPONDING AUTHOR: Sharon Lipperman-Kreda, PhD, Pacific Institute for Research and Evaluation, CA, USA

## SPECIAL SYM

### THE LATEST FROM THE PATH STUDY – SELECTED TOBACCO USE 3 WAVE TRANSITIONS AND E-CIGARETTE AND BIOMARKER DATA

Andrew Hyland<sup>1</sup>, Nicolette Borek<sup>2</sup>, Kevin Conway<sup>3</sup>, <sup>1</sup>Roswell Park Cancer Institute, NY, USA, <sup>2</sup>Food and Drug Administration, MD, USA, <sup>3</sup>National Institute on Drug Abuse, MD, USA

The National Institutes of Health, through the National Institute on Drug Abuse, is partnering with the Food and Drug Administration's Center for Tobacco Products to conduct the Population Assessment of Tobacco and Health (PATH) Study, under a contract with Westat. The PATH Study is an address-based nationally representative, longitudinal cohort study of approximately 46,000 adults and youth in the United States aged 12 years and older. The study uses Audio-Computer Assisted Self-Interviews for adults and youth to collect information on tobacco-use patterns across tobacco products on the U.S. market; risk perceptions and attitudes towards tobacco products including emerging tobacco products; and tobacco initiation, cessation, and relapse behaviors. Additionally, the PATH Study collects biospecimens among consenting adults aged 18 years of age and older to assess biomarkers of exposure and harm related to tobacco use. This symposium will 1) provide an overview of the PATH Study, methods and progress; 2) describe selected high level tobacco product use transition probabilities across the first 3 waves of data, which will include indicators of cessation, initiation, and relapse for different tobacco products; 3) describe detailed e-cigarette use patterns and factors associated with these patterns; and 4) present cross-sectional data comparing biomarkers of exposure between e-cigarette users, cigarette users, dual users, and non-users of tobacco products. The presentation will conclude with the next steps for the PATH Study, information on how researchers can access PATH Study data and biospecimen samples followed by questions from the audience.

JUSTIFICATION: Data from the PATH Study should be useful to both inform policy and regulatory thinking as well as to the general scientific community.

FUNDING: Federal

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## SYM16

### CAN WE CLEAR THE SMOKE IN PATIENTS WITH MENTAL ILLNESS?

Robert Schnoll, PhD, University of Pennsylvania, PA, USA; A. Eden Evins, MD, Massachusetts General Hospital Center for Addiction Medicine, Boston MA USA; Li-Shiun Chen, MD, MPH, ScD, Washington University in St. Louis, MO, USA; Allison Carroll, MS, Northwestern University Feinberg School of Medicine, IL, USA

The goal of this symposium is to demonstrate urgency and implementation challenges for smoking cessation among patients with serious mental illness (SMI). Patients with SMI die 25 years earlier and have a threefold increase in smoking prevalence compared to the general population. Despite patient interest in evidence-based treatment and success with smoking cessation treatment, inadequate provision of

evidence-based smoking cessation treatment in this population contributes to its high smoking prevalence and related health consequences. We will discuss how different strategies can be implemented and scaled across multiple psychiatric care settings in this high risk population of smokers. Each presentation represents unique and complementary research paradigms in understanding how we can promote smoking cessation in patients with mental illness, allowing comparisons of different implementations strategies and their applications. The symposium includes 4 speakers: 1) Dr. Robert Schnoll will present data from an ongoing trial testing 2 training programs to promote tobacco dependence treatment in community mental health. 2) Dr. Allison Carroll will present data from an ongoing specialty clinic-based treatment of smokers with major depressive disorder. 3) Dr. Eden Evins will present data on treatment of cigarette addiction amongst people with SMI who receive community services through the Massachusetts Department of Mental Health. This data includes smoking history and smoking cessation treatment history in smokers with SMI in greater Boston who will receive a system wide intervention. 4) Dr. Li-Shiun Chen will present findings from two low-burden, inexpensive decision support and feedback strategies that significantly increase the provision of smoking cessation treatment and likelihood of quitting among patients with SMI. In addition, this symposium includes 2 expert discussants. Dr. Brian Hitsman and Dr. Nancy Rigotti will discuss how successful implementation strategies in general medical settings and other populations may be adapted to better incorporate practice guidelines in psychiatric settings and patients with mental illness.

JUSTIFICATION: This symposium aims to shift current practice by how different strategies can be implemented and scaled across multiple psychiatric care settings in this high risk population of smokers with mental illness.

FUNDING: Federal

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## SYM16A

### WORKING WITH COMMUNITY MENTAL HEALTH CLINICS TO TEST CLINICIAN TRAINING PROGRAMS FOR TREATING NICOTINE DEPENDENCE AMONG SMOKERS WITH SERIOUS MENTAL ILLNESS

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Community mental health clinics (CMHCs) are well suited to treat smoking because 1) their clients view CMHC clinicians as a primary source for healthcare; 2) CMHC clinicians have frequent and prolonged client contact; and 3) CMHC clinicians are experienced in providing addiction treatment. However, cultural and organizational barriers undermine CMHC clinicians from effectively treating client tobacco use. This trial compares guideline-based training to an organizational training program (Addressing Tobacco Treatment through Organizational Change) for improving clinician treatment of tobacco use and reducing smoking rates in CMHCs. From the first 16 months of a 5-year trial, 5 of 7 CMHCs approached for the trial enrolled, yielding 93 personnel and 223 clients as the current ITT sample; 5% of subjects withdrew from the study. Clients (38% mood and/or psychotic disorder; 61% male, 70% African American) smoked an average of 14 cigarettes/day and were treated at their clinic for an average of 4.6 years. Most clients (63%) reported that they would like clinic help to quit smoking; 56% reported that they wanted to quit smoking in the next 6 months, and 68% acknowledged the health risks of smoking. However, 69% of clients reported that smoking cessation was not part of their clinic treatment, and 13% and 6% of clients reported receiving nicotine patches or varenicline, respectively. Clinic personnel (73% female, 53% African American, 18% smokers, 45% social workers) have worked in their current position an average of 5.8 years and reported having an average of 34 clients. Only 39% of personnel agreed that tobacco use treatment is an important part of their job and 41% thought that patients were concerned about their smoking. Only 36% of personnel assessed smoking status, 34% advised patients to quit, 30% encouraged NRT, and 5% encouraged varenicline. Personnel reported the following barriers to providing tobacco treatment: lack of training (53%), lack of treatment resources (39-43%), and lack of perceived impact (38%). Thus far, our data show high trial feasibility and justification for testing models for training CMHC personnel to more effectively treat client smoking.

FUNDING: Federal

CORRESPONDING AUTHOR: Robert Schnoll, PhD, University of Pennsylvania, PA, USA



## SYM16B

### PROVISION OF SMOKING CESSATION TREATMENT FOR SMOKERS WITH SERIOUS MENTAL ILLNESS

A. Eden Evins<sup>\*1</sup>, Sally Reyerer<sup>2</sup>, Melissa Maravic<sup>1</sup>, Corinne Cather<sup>1</sup>, Gladys Pachas<sup>1</sup>, <sup>1</sup>Massachusetts General Hospital Center for Addiction Medicine, Boston, MA, USA, <sup>2</sup>Bay Cove Human Services, MA, USA

**INTRODUCTION:** The mortality disparity for people with serious mental illness (SMI) such as schizophrenia, and bipolar or major depressive disorder compared to those without such illnesses is 25 years, is growing, and is largely due to smoking-related illnesses. Smoking cessation treatments that have been shown to be safe and effective, specifically for these smokers, exist but may be underutilized in this population. **METHOD:** All smokers with SMI receiving Department of Mental Health psychiatric rehabilitation services through the two largest providers in Greater Boston, n=1300, were asked to complete a survey about their smoking cessation treatment. **RESULTS:** The 971 smokers with SMI who have completed the survey to date are predominantly male (70.3%), white (46.4%) or Haitian, Black or African American (35.7%), smoke 11-20 cigarettes per day (32.7%), have mean expired CO of 22.5 ppm  $\pm$  20.6 and smoke within 5 minutes of waking (39.9%). Of the 899 reported having seen their primary care provider (PCP) within the past year, 897 participants (99.8%) report their PCP knows they smoke tobacco, 71.4% report that their PCP recommended they quit smoking, and 45.6% reported their PCP suggested or prescribed a cessation aid. Specific cessation aids recommended included nicotine patch 26.8%, nicotine gum/lozenge 18.8%, varenicline 6.0%, and bupropion 1.4%. Only 16.2% report being offered more than one approach to quit smoking, either two medications, including dual NRT, or a medication plus a behavioral intervention. Behavioral interventions recommended included smoking cessation group treatment 18.4% and Quitline 14.5%. **CONCLUSIONS:** Nearly 30% (28.6%) of smokers with SMI who had visited their PCP in the past year report their PCP did not recommend they quit smoking, a minority report being offered pharmacotherapeutic cessation aids, and very few report being offered guideline concordant combination treatment with pharmacologic and behavioral interventions.

**FUNDING:** Nonprofit grant funding entity

**CORRESPONDING AUTHOR:** A. Eden Evins, MD, Massachusetts General Hospital Center for Addiction Medicine, Boston MA USA

## SYM16C

### FROM GUIDELINES TO PRACTICE: IMPLEMENTING SMOKING CESSATION TREATMENTS FOR PATIENTS WITH SERIOUS MENTAL ILLNESS IN COMMUNITY MENTAL HEALTH SETTINGS

Li-Shiun Chen<sup>\*1</sup>, Timothy Baker<sup>2</sup>, Ross Brownson<sup>3</sup>, Laura Bierut<sup>4</sup>, <sup>1</sup>Washington University in St. Louis, MO, USA, <sup>2</sup>Tobacco Research and Intervention, University of Wisconsin, School of Medicine, WI, USA, <sup>3</sup>Prevention Research Center in St. Louis, Brown School, Washington University, MO, USA, <sup>4</sup>Washington University School of Medicine, MO, USA

**SIGNIFICANCE:** Patients with serious mental illness (SMI) have high smoking prevalences and experience early mortality compared to the general population. Inadequate implementation of evidence-based smoking cessation treatment in community mental health centers (CMHCs) has contributed to growing disparities in smoking prevalence and related health consequences. This study evaluates the effects of quality improvement implementation strategies on provider delivery of smoking cessation treatment and patient smoking cessation outcomes in the CMHC context. **METHODS:** We implemented healthcare system strategies of decision support and academic detailing with data-driven feedback in order to increase provider adoption of evidence-based smoking cessation treatment. We analyzed pre- and post-implementation (6/2014-6/2016) on patient receipt of treatment and patient smoking rate using pharmacy and medical record data. **RESULTS:** The implementation strategies were associated with increased treatment delivery and decreased patient smoking. Patient receipt of cessation medication increased from 4.6% to 18.0% (N=1,492, z=12.3, p<0.0001) based on pharmacy data. In addition, patient smoking prevalence decreased from 57.4% to 54.3% (N=3,692, z=2.63, p=0.0088). **CONCLUSIONS:** Quality improvement approaches were associated with increased smoking cessation care and decreased smoking prevalence amongst patients treated in CMHC settings. Thus, decision support and academic detailing hold promise to reduce smoking and its harms in this high-risk, underserved population. Future research should explore the effects of such strategies in a larger sample of clinics and patients, and use a design providing greater internal validity. The study leverages the great opportunity offered by

smokers making healthcare visits to community mental health centers and should decrease the prevalence of smoking and its profound health consequences in this vulnerable disadvantaged population.

**FUNDING:** Academic Institution

**CORRESPONDING AUTHOR:** Li-Shiun Chen, MD, MPH, ScD, Washington University in St. Louis, MO, USA

## SYM16D

### RECRUITING SMOKERS WITH DEPRESSION FOR A CESSATION TRIAL AND THEIR CARDIOVASCULAR HEALTH AT ENROLLMENT

Allison Carroll<sup>\*1</sup>, Mark Duffman<sup>1</sup>, Anna Veluz-Wilkins<sup>1</sup>, Su Fen Lubitz<sup>3</sup>, Nancy Jao<sup>1</sup>, Joseph Bastian<sup>3</sup>, Jacqueline Gollan<sup>1</sup>, Raymond Niaura<sup>2</sup>, Michael Thase<sup>3</sup>, Frank Leone<sup>3</sup>, Robert Schnoll<sup>3</sup>, Brian Hitsman<sup>1</sup>, <sup>1</sup>Northwestern University Feinberg School of Medicine, IL, USA, <sup>2</sup>NYU College of Global Public Health, NY, USA, <sup>3</sup>University of Pennsylvania Perelman School of Medicine, PA, USA

**BACKGROUND:** Smokers with major depressive disorder (MDD), who experience higher rates of cardiovascular disease (CVD), are often excluded from smoking cessation trials and can be challenging to enroll. We describe our experience in recruiting smokers with current or past MDD for an ongoing smoking cessation clinical trial and characterize the cardiovascular health of enrolled participants. **METHODS:** The study is a multisite, randomized, double-blind, placebo controlled smoking cessation trial of 12 weeks of behavioral activation plus varenicline. Candidates completed a telephone eligibility screen and then completed a clinic visit to confirm final eligibility. At baseline, enrolled participants completed measures of cardiovascular health per American Heart Association guidelines: body weight, physical activity, diet, total cholesterol, blood pressure, and blood glucose. **RESULTS:** Between June 2015 and August 2017, 4375 candidates responded to proactive recruitment letters (19%), print/internet media ads (59%), TV ads (17%), and referral/word of mouth (5%). Of the 1470 candidates who completed the initial phone eligibility screen, 519 were interested in participating and eligible for an in-person eligibility visit. Of the 315 candidates who completed the in-person evaluation, 167 (53%) were confirmed eligible and 140 (44%) were ultimately enrolled and randomized to treatment. The enrolled sample comprised 46% women, 51% African Americans, with an average age of 50.4 (SD=12.5) years. Half of participants were classified with current MDD (54%). With respect to cardiovascular health, a greater proportion of smokers with current MDD vs. past MDD were overweight (Chi-square (2)=6.8, p=.03) and had high blood pressure (Chi-square (2)=6.9, p=.03). **CONCLUSIONS:** Substantial effort is needed to recruit clinical samples for smoking cessation clinical trials. Key CVD risk factors, namely overweight and high blood pressure, were especially prevalent among smokers with current MDD, a population already at high risk for CVD due to smoking and depression, reinforcing the critical need to improve the delivery of treatment to this particularly vulnerable subgroup.

**FUNDING:** Federal

**CORRESPONDING AUTHOR:** Allison Carroll, MS, Northwestern University Feinberg School of Medicine, IL, USA

## SYM17

### MENTHOL CIGARETTES: WHAT DO BANS ACHIEVE?

Robert Schwartz, PhD, University of Toronto, ON, Canada; Eric Soule, PhD, Virginia Commonwealth University, VA, USA; Michael Chaiton, PhD, University of Toronto, ON, Canada; Joanna Cohen, PhD, Johns Hopkins, MD, USA

The United States Food and Drug Administration concluded that a ban on menthol cigarettes would likely elicit a reduction in cigarette consumption, increased cessation, and reduced initiation of smoking. Ontario's ban on the sale of menthol cigarettes, first announced in May 2015, took effect on January 1st, 2017. Understanding the effects of a menthol ban in Ontario, Canada – a province with some 2 million smokers – can be useful to jurisdictions preparing similar bans. This symposium is the first glimpse into a rigorous evaluation of the adoption and implementation of a menthol ban. Results of three pioneering studies will provide participants with a rounded view of the effects of the ban. Participants will learn about: 1) Purchase study results about how the tobacco industry prepared the market for the ban and how it has endeavored to retain menthol smokers in the post-ban period; 2) concept mapping study results on menthol cigarette smokers' reactions and responses to the ban; 3) pre-post survey results of changes in menthol smoker behaviors. Demonstrating that menthol cigarettes are an increasing challenge





in the global market, the final piece presents results from a multi-country study of menthol cigarette use in 14 low and middle income countries. The discussion will help draw out implications of the presented research for the potential of menthol bans to achieve the FDA anticipated impacts of reduced consumption, increased cessation and reduced initiation. Lessons learned for rolling out menthol bans in other jurisdictions will be highlighted.

**JUSTIFICATION:** Findings will inform policy development in other jurisdictions for developing, adopting and implementing menthol cigarette bans.

**FUNDING:** Federal

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## SYM17A INDUSTRY TACTICS IN RESPONSE TO THE MENTHOL BAN IN ONTARIO, CANADA

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**INTRODUCTION:** This study assessed steps taken by the industry prior to and following the menthol ban by examining changes in products and their packaging available for sale. **METHODS:** Just prior to the ban, we purchased samples of every available menthol tobacco product in 8 retail outlets in Toronto, Ontario. Two research staff asked vendors for one of each type of menthol, capsule and green coloured or labeled packaged cigarette brands available. In total, we collected 30 unique packs. One month post-implementation (February 2017), we purchased all menthol replacement or green packs available from 5 of our original stores. In total, we collected 23 replacement packs. We conducted content analysis on both sets of packs. **RESULTS:** Tobacco companies made substantial efforts to prepare smokers for the menthol ban in Ontario by introducing menthol flavored capsules (14 of 30 pre-ban packs), promoting the idea of choice, and associating new colours with menthol (12 of 30 were blue, white and silver). In some cases, they explicitly promoted 'smooth tasting' non-menthol alternatives, encouraging menthol smokers to switch to non-menthol cigarettes post-ban. Post-ban, the tobacco industry made considerable efforts to retain menthol smokers by: 1) providing retailers with materials demonstrating which post-ban packs replaced which pre-ban menthol packs; 2) introducing and expanding offers of aqua filter, adjustable, and charcoal filter cigarettes; 3) designing replacement packs with elements similar to menthol packs in color (green, blue, silver and white), capsule pack symbols (power buttons) and descriptors (smooth, fresh). **CONCLUSIONS:** These efforts may decrease the success of the menthol ban in encouraging cessation and decreasing initiation. Jurisdictions preparing for menthol bans may consider measures to prevent or mitigate these and other industry tactics that have been documented in regard to other tobacco control measures.

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**CORRESPONDING AUTHOR:** Robert Schwartz, PhD, University of Toronto, ON, Canada

## SYM17B MENTHOL CIGARETTE SMOKERS' REACTIONS AND RESPONSES TO A MENTHOL FLAVORED CIGARETTE BAN IN ONTARIO, CANADA

Eric Soule<sup>\*1</sup>, Michael Chaiton<sup>2</sup>, Bo Zhang<sup>2</sup>, Marzena Hiler<sup>1</sup>, Robert Schwartz<sup>2</sup>, Joanna Cohen<sup>3</sup>, Thomas Eissenberg<sup>1</sup>, <sup>1</sup>Virginia Commonwealth University, VA, USA, <sup>2</sup>University of Toronto, ON, Canada, <sup>3</sup>Johns Hopkins, MD, USA

**SIGNIFICANCE:** This study's purpose was to examine menthol cigarette smokers' reactions and responses to Ontario's menthol cigarette ban using concept mapping. **METHODS:** Ontario residents who reported past year menthol smoking before the ban (n=67) participated in a study in June, 2017. Participants generated statements in response to a prompt: "A specific way that the menthol cigarette ban has affected me or a specific action I have taken in response to the menthol cigarette ban is..." Researchers reviewed the statements until saturation and removed duplicates. Participants sorted the final list of 79 statements into piles of similar content and rated each statement on a scale (1 – Definitely NOT true for me to 7 – Definitely true for me). Multidimensional scaling of sorting data was used to generate a cluster map. **RESULTS:** A map of 7 clusters was generated. The clusters

organized statements into themes: Thoughts about the Ban, Perceiving the Ban as Ineffective, Emotional Reactions to the Ban, Smoking Non-Menthol Cigarettes, Smoking Cessation or Reduction, Alternative Menthol Cigarette Purchasing Behaviors, and Alternative Tobacco Use Behaviors. Participants rated the Thoughts about the Ban cluster highest (most true) and Alternative Tobacco Use Behaviors cluster lowest (least true). Participants who smoked menthol cigarettes before the ban every day or most days rated the Alternative Menthol Cigarette Purchasing Behaviors, Emotional Reactions to the Ban, and Smoking Non-Menthol Cigarettes clusters higher than participants who reported smoking menthol cigarettes occasionally or rarely. **CONCLUSIONS:** Banning menthol cigarettes resulted in expected and unexpected responses including smoking cessation and behaviors to find alternatives to menthol cigarettes.

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## SYM17C SHORT-TERM IMPACT OF ONTARIO'S BAN ON MENTHOL CIGARETTES

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**INTRODUCTION:** The province of Ontario, Canada implemented a ban on menthol in all forms of tobacco products that came into effect January 1<sup>st</sup>, 2017. This paper examines changes in behaviour among a cohort of menthol smokers as part of the first evaluation of a real world menthol ban. **METHODS:** 972 past year menthol smokers (16+, living in Ontario) were surveyed by telephone (n=325) or online (n=647) between September and December 2016. Participants were re-contacted in February 2017. Logistic regressions, adjusted for demographic and smoking characteristics, were used to assess characteristics of participants who reported post ban a) past month menthol cigarette use, b) use of alternative tobacco or flavoured products after the ban, or c) quit attempts. **RESULTS:** At follow up after the ban, 34% (95% CI: 30%, 37%) reported smoking a menthol cigarette, and 40% (95% CI: 37%, 44%) had either made a quit attempt or had quit smoking with 15% (95% CI: 12%, 18%) abstinent at follow-up. Primary menthol smokers before the ban were more likely to report using flavoured e-cigarettes or cigars after the ban than those who smoke menthol occasionally. Following the ban, participants were more likely to expect to quit because of the ban, and less likely to expect to use other tobacco or nicotine products as substitutes, than they were before. **CONCLUSIONS:** Short-term effects of the menthol ban suggest that the ban encouraged significant quitting behaviour as well as attempts by smokers to seek out other sources of menthol or alternative substitutes.

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**CORRESPONDING AUTHOR:** Michael Chaiton, PhD, University of Toronto, ON, Canada

## SYM17D WHAT IN THE WORLD IS HAPPENING WITH MENTHOL CIGARETTES?

Joanna Cohen\*, Kevin Welding, Jennifer Brown, Carmen Washington, Katherine Smith, Johns Hopkins, MD, USA

Menthol masks the harshness and irritation of smoking. Vulnerable populations disproportionately smoke menthol cigarettes. While a range of methodologies have been used to study menthol cigarettes in the U.S., very little research has been done reporting on the extent of menthol cigarettes on the market in other countries and how they are packaged and described. We undertook a multi-country study to fill this gap; here we describe the menthol cigarettes available on the market in 14 low- and middle-income countries (LMICs). Between 2013 and 2017



we set out to systematically purchase all unique cigarette packs available in Bangladesh, Brazil, China, Egypt, India, Indonesia, Mexico, Pakistan, the Philippines, Russia, Thailand, Turkey, Ukraine and Vietnam. These countries are from five of the six WHO regions. Cigarette packs were purchased in 2013 (wave 1) in all countries, and between 2015-17 (wave 2) in seven countries. Over 4,000 packs were purchased and double coded for menthol descriptors. In 2013, 8% of packs from the 14 countries were mint or menthol; this increased to 11% in the seven countries with wave 2 data. The prevalence of unique menthol packs was highest in the Philippines (increasing from 34% to 43%). Between wave 1 and 2, the proportion of mint/menthol packs with flavor capsules increased from 8% to 23%. Of the major multinational companies, PMI had the largest proportion of unique packs that were mint/menthol (approximately one in six packs in wave 1 and one in five packs in wave 2), about twice the prevalence of the next big company, JTI. We will report on the difference in prices between mint/menthol and other cigarettes, by country. The proportion of mint/menthol brand variants increased over time in our sample of countries. Our estimates are likely underestimates as they do not take into account new "unconventional" descriptors that are menthol-like (e.g., "ice blast"). Given that menthol cigarettes are associated with poorer smoking outcomes, the increase of these brand variants on the market should be particularly concerning.

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## SYM18

### EMERGING EVIDENCE ON THE TOXICITY OF NON-CIGARETTE TOBACCO PRODUCTS

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In August 2016, the FDA Center for Tobacco Products finalized a rule that deemed cigars, cigarillos, waterpipe and electronic nicotine delivery systems (ENDS) as part of their tobacco regulatory authority. One aspect of their tobacco regulatory authority is setting product standards for the manufacture of tobacco products that will reduce negative effects on individual and population health. A key scientific input to developing evidence-based regulation is a sound knowledge base to understand the toxicity of newly deemed, non-cigarette tobacco products. This line of toxicity research focuses on how tobacco products and their design characteristics (and changes in those characteristics) impact exposure to harmful and potentially harmful constituents that are associated with tobacco caused morbidity and mortality. This symposium will focus on the cutting-edge research results to inform our understanding of the toxicity of three of the newly deemed classes of tobacco products: waterpipe tobacco, ENDS and cigars. Dr. Rachel Grana will chair and moderate the session. Ms. Marielle Brinkman will present research on how humectant and flavorant content affect harmful and potentially harmful constituent emissions in mainstream waterpipe tobacco smoke. Dr. Ilona Jaspers will present research on the effects of ENDS on respiratory immune responses. Dr. Robert Tarran will present research on the effects of chronic ENDS use on the airway proteome and implications for lung health. Dr. Cindy Chang will present data analyses on biomarkers of cigar exposure among U.S. adults from the Population Assessment of Tobacco and Health (PATH) study. Finally, Dr. Kimberly Benson from FDA CTP will serve as discussant and offer summary remarks reflecting on how the presented findings might inform tobacco product regulation.

JUSTIFICATION: This symposium brings together research on the toxicity of tobacco products and potential health effects across non-cigarette tobacco products, which are frequently used by youth and young adults, and therefore represents an important input into evaluating tobacco use impacts on public health.

FUNDING: Federal

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## SYM18A

### THE EFFECT OF HUMECTANT AND FLAVORANT CONTENT ON HARMFUL AND POTENTIALLY HARMFUL CONSTITUENT EMISSIONS IN MAINSTREAM WATERPIPE TOBACCO SMOKE

Marielle Brinkman<sup>\*1</sup>, Anna Adetona<sup>1</sup>, Stephanie Buehler<sup>1</sup>, Erich Strozier<sup>1</sup>, Hyoshin Kim<sup>2</sup>, Juyun Lim<sup>3</sup>, Pamela Clark<sup>4</sup>, <sup>1</sup>Battelle Memorial Institute, OH, USA, <sup>2</sup>Battelle Memorial Institute, WA, USA, <sup>3</sup>Oregon State University, OR, USA, <sup>4</sup>University of Maryland, College Park, MD, USA

OBJECTIVE: Isolate the effects of humectant, and a sweet flavorant content of waterpipe (WP) tobacco on the levels of harmful and potentially harmful constituents (HPHCs) in mainstream WP tobacco smoke. METHODS: We measured humectants (glycerol [G] and propylene glycol [PG]), nicotine (N), natural and synthetic sugars, and flavor chemicals in a popular unflavored and flavored WP tobacco brand. We prepared three WP tobaccos by adding precise amounts of humectants and a sweet flavorant to the low-humectant, unflavored brand (Control) to produce a 2x2 matrix of WP tobaccos. Using a validated research-grade waterpipe (RWP), two-stage puffing regimen, machine smoking and a multi-analyte total particulate matter extraction method, we measured semi-volatile HPHCs in the manipulated and Control tobaccos. RESULTS: Humectant content (G+PG) was more than 33X greater (w/w) in the flavored brand vs. the Control, largely due to greater concentration of the sweet-tasting G. Nicotine content of the Control was 1.5X greater, which can be explained by the humectant mass of the flavored tobacco. Natural sugar content and calculated perceived sweetness was twice as high in the flavored tobacco. Synthetic sugars were not detected in either brand. Both brands contained comparable levels of several organic chemicals perceived as sweet. However, the concentration of vanillin was more than 200X greater in the flavored brand. Based on these data, the following tobaccos were prepared from the Control (1% G, 0.002% PG, 2.8 mg/g N, 0.05 ug/g vanillin): HH-HF (33% G, 1.5% PG, 1.9 mg/g N, 26 ug/g vanillin), HH-LF (33% G, 1.5% PG, 1.9 mg/g N, 0.05 ug/g vanillin), and LH-HF (1% G, 0.002% PG, 2.8 mg/g N, 26 ug/g vanillin). Mainstream HPHC emissions from machine smoking will be compared across the manipulated and Control tobaccos. Next Steps: To understand the direct and indirect harm associated with specific chemicals in WP tobacco, a cohort of WP smokers will smoke the manipulated and Control tobaccos using the RWP in separate laboratory sessions. The resulting puffing topography, flavor perception, and estimated HPHC exposure data will inform the development of product standards for WP tobacco.

FUNDING: Federal

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## SYM18B

### EFFECTS OF E-CIGARETTES ON RESPIRATORY IMMUNE RESPONSES

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Vaping flavored electronic cigarettes (e-cigs) is gaining popularity in the US, particularly among teens and young adults. Comprehensive assessment of adverse effects on respiratory immune function by e-cigarettes and potential flavoring compounds is missing. Epithelial cells lining the respiratory tract and innate immune cells patrolling the respiratory mucosa are the first line of host defense against inhaled pathogens. We have previously demonstrated that e-cig-induced adverse health effects in epithelial cells lining the nasal passages include suppression of important innate immune responses. Similarly, we have data demonstrating that flavored e-cig aerosols induce immune modifying effects in the nasal mucosa, including reducing ciliary beat frequency on airway epithelial cells and modify cellular bioenergetics, which could significantly affect host defense responses at the level of the epithelium. Furthermore, we have demonstrated that flavored e-cigarettes inhibit host defense function of specific immune cells. Specifically, cells lining the nasal cavity and lower airways such as neutrophils, natural killer (NK) cells, and macrophages, were stimulated with flavored e-liquids. Several different flavors, especially those containing large amounts of cinnamaldehyde, impaired functional responses in all of these immune cells, which are indicative of impaired host defense capabilities. To translate these findings into humans, we used the controlled exposure of human volunteers to the live attenuated influenza virus (LAIV) vaccine, to safely examine innate immune responses to influenza infection. Compared to non-smokers, e-cigarette users showed modification of immune-related genes in nasal epithelial cells as well as reduced levels of chemokines in the epithelial lining fluid, thus potentially resulting in the decreased ability to recruit immune cells into the nasal mucosa and mount an appropriate immune response.





Together, these data indicate that vaping flavored e-cigarettes has significant effects on markers of respiratory host defense responses in humans.

FUNDING: Federal

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## SYM18C

### CHRONIC VAPING AND THE AIRWAY PROTEOME: IMPLICATIONS FOR LUNG HEALTH

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E-cigs typically vaporize an e-liquid that contains propylene glycol/vegetable glycerin (PG/VG), nicotine and flavors. However, little is known about the effects of E-cig use (i.e. vaping) on the human lung. To better understand the effects of vaping, we conducted bronchoscopies on healthy non-smokers, cigarette smokers and chronic E-cig users and used these samples to perform proteomic analysis. We obtained bronchial biopsies from healthy non-smokers, cigarette smokers (smoker) and E-cig users (vapers) and used these to perform proteomics. To confirm our observations, we exposed well-differentiated primary human airway epithelial cultures to PG/VG and nicotine. We also performed western blotting and confocal microscopy to confirm our proteomic analyses. All subjects had normal 1 second forced expiratory volumes (FEV<sub>1</sub>s) and normal bronchoalveolar inflammatory cell counts. However, we detected ~300 proteins that were significantly changed relative to non-smokers. Of these, 79 proteins were commonly changed in both vapers and smokers. In contrast, smokers had 213 uniquely altered proteins while vapers had an additional 112 uniquely changed proteins. We confirmed protein changes for both up and downregulated proteins by western blot. Of note, the mucin MUC5AC was commonly changed in the bronchial epithelia of both vapers and smokers. We then used MUCAC as a biomarker of exposure for bronchial epithelia. We then exposed well-differentiated airway cultures to either PG/VG, or PG/VG and nicotine for 30 min and measured intracellular MUC5AC levels by confocal microscopy 24 h later. Interestingly, PG/VG alone was able to drive the increase in MUC5AC, as seen in chronic vapers and exposure to 18 mg/ml nicotine had no additional effects on MUC5AC levels. Our data indicate that vaping exerts major biological effects on the lung and causes extensive changes at the protein level. Some of these changes were driven by PG/VG exposure alone. Whilst the long-term implications these findings remain to be determined, we propose that despite being on the GRAS list, the safety of PG/VG in the lung urgently be reviewed.

FUNDING: Federal

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## SYM18D

### BIOMARKERS OF EXPOSURE AMONG U.S. ADULT CIGAR SMOKERS: RESULTS FROM 2013-2014 POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY

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**SIGNIFICANCE:** The cigar market is diverse, and data are limited on exposure biomarker patterns according to cigar type. We used exposure biomarker concentrations of nicotine and tobacco toxicants to compare different types of cigar smokers, cigarette smokers, and non-users of tobacco. **METHODS:** Using Wave 1 data from the Population Assessment of Tobacco and Health (PATH) Study, we conducted a cross-sectional analysis comparing geometric mean concentrations of urinary total nicotine equivalents (TNE), and urinary metabolites of tobacco-related toxicants, including tobacco-specific nitrosamines (TSNA), polycyclic aromatic

hydrocarbons (PAH), volatile organic compounds (VOC), and metals, in adult cigar-only smokers (all cigars and separately for traditional, cigarillo, and filtered cigars), cigarette-only smokers, dual cigar/cigarette smokers, and non-users. We also calculated geometric mean ratios (GMR) for these concentrations comparing each tobacco user group with non-users adjusting for sex, age, race/ethnicity, education and creatinine. **RESULTS:** Daily cigar-only smokers (n=61) had urinary TNE-2 (cotinine plus trans 3'-hydroxycotinine) concentrations that were lower than daily cigarette-only smokers (n=2218; p<0.0001) and daily dual cigar/cigarette smokers (n=601; p<0.0001). However, daily cigar-only, cigarette-only and dual smokers had similarly increased GMRs of over 200 for NNAL (metabolite of TSNA NNK) and over 100 for CYMA (metabolite of VOC acrylonitrile) compared with non-users. Among the different types of cigars used, daily filtered cigar-only smokers (n=8) had higher TNE-2 concentrations compared to daily traditional cigar-only smokers (n=12; p=0.02) and daily cigarillo-only smokers (n=26; p<0.0001), but similar to daily cigarette-only smokers (p=0.20). Notably, urinary NNAL concentrations in daily filtered cigar-only smokers were higher than those in daily cigarette-only smokers (p<0.0001). **CONCLUSIONS:** Exposure biomarker concentrations varied across the different types of cigar smokers. Daily filtered cigar-only smokers had tobacco exposure biomarker concentrations that were similar to or higher than daily cigarette-only smokers.

FUNDING: Federal

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## SYM19

### SMOKEFREE MULTI-UNIT HOUSING: THE NEXT FRONTIER FOR PROTECTING VULNERABLE POPULATIONS

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As smoking is banned in public, a greater proportion of exposure to secondhand smoke (SHSe) occurs in homes, particularly among vulnerable populations including children, elderly, disabled, and residents of low-income environments, e.g., public housing. Living in multi-unit housing (MUH) exposes millions to incursions from others' smoke in their homes. This symposium presents data from several MUH settings regarding efforts to protect people from SHSe and to effectively implement such policies. Findings represent over 50 cities or states in 17 different countries. This cutting-edge research informs policy and practice efforts to protect people from SHSe in housing in diverse global settings.

**JUSTIFICATION:** This symposium will directly inform efforts to implement smoke-free housing policies, including the new rule issued by the U.S. Department of Housing and Urban Development, to reduce the burden of tobacco use among low income communities.

FUNDING: Federal

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## SYM19A

### DATA TO ACTION: THE BURDEN OF SMOKING IN SUBSIDIZED HOUSING AND IMPLICATIONS FOR TOBACCO CONTROL POLICY

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**SIGNIFICANCE:** The U.S. Department of Housing and Urban Development (HUD) finalized a rule effective February 3, 2017, requiring each public housing agency to implement a smoke-free policy. The rule prohibits the use of lit tobacco products in all living units, indoor common areas, administrative offices, and all outdoor areas within 25 feet of buildings. This presentation will discuss data on smoking behaviors, economic impact, and population attitudes that were critical to inform the rule. **METHODS:** Smoking prevalence among U.S. adults who received federal housing assistance during 2007-2012 were assessed using National Health Interview Survey and HUD linked data (n=4,771). Annual cost savings were assessed using residency estimates from HUD and cost data from multiple sources; cost savings were assessed for secondhand smoke-related direct health care, renovation of smoking-permitted units, and smoking-attributable fires. Data on population level attitudes toward the rule came from the 2016 Summer Styles, a nationally represent-



tative web-based survey conducted among U.S. adults (n=4,203). RESULTS: Overall, 33.6% of HUD-assisted adults are current cigarette smokers. Current smoking varied by sex, age, race/ethnicity, children living in the household, and chronic disease status; prevalence was highest among adults aged 25-44 (42.5%) and those who reside with children (37.5%). Half of smokers attempted to quit in the past year; 82.1% were daily smokers; and, 35.8% of daily smokers smoked 20+ cigarettes a day. Overall, 48.4% of HUD-assisted adults were never smokers and 18.6% were former smokers. The rule will save society approximately \$150 million per year in averted costs. Overall, 73.7% of U.S. adults favor the rule, including two-fifths of smokers. CONCLUSIONS: One-third of adults in HUD-assisted housing are current cigarette smokers, the HUD smoke-free rule is poised to yield considerable cost savings, and most U.S. adults support the rule. Continued data collection, including evaluation of the rule, are critical to inform the implementation and sustainability of efforts to reduce the burden of tobacco use among U.S. multiunit housing residents.

FUNDING: Federal

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## SYM19B

### SMOKE-FREE POLICIES AND SUPPORT FOR SMOKING BANS IN MULTIUNIT HOUSING: ITC PROJECT FINDINGS FROM CANADA, UNITED STATES, AND UNITED KINGDOM

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SIGNIFICANCE: Smoking in multiunit housing poses a legal and practical challenge in crafting strong and enforceable policies to reduce this potentially significant threat to public health. Although this problem exists in every country with multiunit housing, there have been almost no international comparative studies of smoking in multiunit housing and perceptions of smoking and of banning smoking in multiunit housing. METHODS: We examined smoke-free policies in multiunit housing among representative national samples of adult smokers and former smokers of ITC surveys in Canada, United States, and United Kingdom during 2013-15 living in multiunit housing (Canada: N=611; US: N=904; UK: N=989), where low-income smokers are more likely to live (e.g., Canada: 56% of low-income smokers vs. 34% of moderate/high income smokers). Respondents living in multiunit housing were asked questions about the rules about smoking in their buildings, and their preference (either positive or negative) about banning smoking in their building, along with a large set of questions about smoking behavior, key psychosocial correlates of smoking and of quitting such as intentions to quit. RESULTS: Smokers in multiunit housing were more likely to report that their buildings had no smoking restrictions vs. complete smoking bans (Canada: 36%/28%; US: 40%/30%; UK: 46%/26%). Former smokers were more likely than current smokers to strongly prefer smoking bans (Canada: 26% vs. 14%; US: 33% vs. 15%; UK: 35% vs. 13%; all p<0.05). Smokers intending to quit were more likely to prefer smoking bans (17.6% vs. 7.8% overall, p<0.01; no between-country differences). CONCLUSIONS: Across countries, less than one-third of smokers living in multiunit housing report that their buildings had complete smoking bans. Former smokers were more likely to strongly prefer smoking bans than current smokers. Multiunit housing bans may encourage smokers to quit and reduce relapse among former smokers—of particular importance for low-income smokers.

FUNDING: Federal

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## SYM19C

### SUCCESSFULLY IMPLEMENTING A SMOKEFREE MULTI-UNIT HOUSING POLICY AT THE LOCAL LEVEL: INSIGHTS FROM RESIDENTS AND MANAGERS

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SIGNIFICANCE: Half the U.S. population is protected from secondhand smoke (SHS) exposure in workplaces and public places; however, an increasing propor-

tion of exposure occurs in homes. Over 25% of the U.S. population lives in multi-unit housing (MUH) and 40% of Marylanders. This study assesses managers' and residents' views regarding smokefree MUH and asks participants about policies to reduce SHS exposure and emphasizes successful implementation. METHODS: We interviewed building managers and residents, and conducted focus groups with smokers and non-smokers (N= 50 participants). The study explored residents' and managers' views regarding their exposure to SHS in their units, the effects of SHS, their attitudes about a policy to prohibit smoking in the building, and suggestions to implement this policy. RESULTS: There was broad support for a comprehensive smokefree MUH policy in Montgomery County among smokers and non-smokers with only a small number of participants objecting. The greatest concerns involved government intervention in the home. Nearly all participants were aware of the risks of SHS and did not want to expose non-smokers to these risks. Smokers generally support this policy as well with the strong suggestion that outside smoking areas be clearly marked so smokers would not be harassed for smoking there. Study findings focused particularly on how to most effectively implement this policy, with themes related to the consequences of a policy, challenges to implementation, "grandfathering" in existing smokers, and allowing adequate transition time for residents to adjust to the new policy. CONCLUSIONS: The study provides crucial data to inform the policymaking process with numerous specific suggestions for implementation to maximize success and attempts to engage MUH residents and managers in adopting and implementing the policy since they are most directly affected. Policymakers can adopt a comprehensive smokefree MUH policy in Montgomery County with confidence that there is broad support among local smokers and nonsmokers and they should focus their efforts to implement a policy that includes residents suggestions to mark outdoor smoking areas clearly.

FUNDING: Federal

CORRESPONDING AUTHOR: Bob Vollinger, MSPH, National Cancer Institute, MD, USA

## SYM19D

### SMOKE-FREE HOUSING RULES AFFECT COMMUNITY COHESION AMONG SMOKERS AND NON-SMOKERS DIFFERENTLY: LESSONS FOR POLICY IMPLEMENTATION

Vaughan Rees<sup>\*</sup>, Jessica Davine, Robyn Keske, Natasha Sokol, Alan Geller, Harvard T.H. Chan School of Public Health, MA, USA

SIGNIFICANCE: Smoke-free rules in public housing, including a rule proposed by HUD, may reduce tobacco use and improve protection for millions of low income residents. To tailor smoke-free housing implementation strategies, we assessed factors associated with residents' support for a smoking ban and self-reported exposure to SHS, pre- and post-adoption of a smoke-free policy in a multi-unit, affordable housing setting. METHODS: A mixed-methods study assessed residents' (n=70 smokers; n=168 non-smokers; ages 18-65) support for a smoke-free policy, in 12 housing developments in 4 US states, immediately prior and 6 months after policy adoption. RESULTS: Before adoption, compared with smokers, non-smokers reported higher support (83% v. 25%;p<0.05) and greater reduction in perceived SHSe (53.9% v. 25.4%;p<0.05) than smokers. Non-smokers were more likely to support the ban before adoption (aOR=9.9;p<0.001) and after adoption (aOR=7.5;p<0.001), and older residents were more likely to increase their support (aOR=1.04;p=0.005). High community cohesion before adoption was associated with less perceived SHSe after adoption (aOR=0.6;p=0.025). However, community cohesion decreased among smokers following adoption (p<0.05). CONCLUSIONS: Smokers and nonsmokers differed in their attitudes towards a smoke-free housing ban and reports of SHS exposure. Smoke-free housing policy implementation strategies must be tailored to the needs of different residents, including smokers. Implementation in subsidized housing could be improved with strategies that enhance community cohesion, especially among smokers.

FUNDING: Federal

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**SYM19E****UNDERSTANDING SMOKE-FREE HOUSING IN THE UNREGULATED SHORT-TERM RENTAL MARKET (AIRBNB): FINDINGS FROM 43 CITIES IN 17 COUNTRIES**

Ryan Kennedy\*, Kevin Welding, Johns Hopkins Bloomberg School of Public Health, MD, USA

**SIGNIFICANCE:** Airbnb is the leading online hospitality service, allowing people to rent or lease short-/medium-term housing (rooms, apartments, houses, and even castles). In Airbnb listings, hosts describe property features including "house rules" such as whether smoking is allowed. Airbnb has over 3 million listings in 65,000 cities and 191 countries and over 160 million guests have stayed in Airbnb housing. **METHOD:** This study is the first to examine prevalence of smoking in Airbnb housing through an extensive review of smoking rules on Airbnb listings involving properties from 43 cities in 17 countries (N=413,341). **RESULTS:** The highest prevalence of smoke-free properties was found in Denmark (97.4%, n=16,178), Scotland (97.1%, n=6,272) and Canada (95.5%, n=30,499). The lowest prevalence of smoke-free properties was found in Belgium (80.9%, n=5,650), Spain (n=71.9%, n=36,086) and France (59.9%, n=2,116). **CONCLUSIONS:** Airbnb's immense and growing popularity worldwide provides an important opportunity for tobacco control advocacy and education to promote smoke-free residential policies.

**FUNDING:** Unfunded

**CORRESPONDING AUTHOR:** Ryan Kennedy, PhD, Johns Hopkins Bloomberg School of Public Health, MD, USA

**SYM20****ENDS ON SOCIAL MEDIA: FROM SHAPING ENDS USE TO QUIT-SMOKING INTERVENTION**

Xuan Wei, University of Arizona, AZ, USA; Ashley Sanders-Jackson, PhD, Michigan State University, MI, USA; Annice Kim, PhD, RTI International, CA, USA; Erin Vogel, PhD, University of California, San Francisco, CA, USA

Social media (SM) represents an array of online environments characterized by ever-changing approaches for communicating ideas, images, products, new knowledge, and many other types of content. SM platforms include Facebook, Twitter, Snapchat, Reddit, and many others. SM is unique due to its interactive, sharing philosophy and its important behavioral impacts. For instance, SM has become a major way to share new information on electronic nicotine delivery systems (ENDS) products, including flavors, product types, instructions, and the impact of media campaigns. In the rapidly changing ENDS market, SM provides a venue to better understand how ENDS are discussed, sold, and modified. SM may have a fundamental role in the rapid evolution of ENDS products. The relationship between SM and ENDS use is best understood using multiple methods, including natural language processing to identify complex patterns of information, content analyses, tracking of responses to other media or product introductions, survey data, and even randomized clinical trials. In the proposed symposium, we will present novel research using a variety of methods to characterize the role of SM in ENDS use and to discuss how SM can provide an important window for understanding changes in ENDS use. First, Dr. Zeng will present data on the only ENDS SM portal that allows users to search for content on multiple SM platforms simultaneously. This portal has been used to identify important new data on ENDS in SM, such as SM reactions to FDA media campaigns. Second, Dr. Sanders-Jackson will describe which online health information channels (OHIC) vapers and dual users use to obtain health information, as compared to other tobacco product users generally and combustible cigarette users (smokers) specifically. Third, Dr. Kim will present data on the most widely shared ENDS tweets over a 2-year period, including sharing behavior. Fourth, Dr. Vogel will present the results of a randomized trial testing a Facebook-based smoking cessation intervention for young adults age 18 to 25 that found an association between ENDS use and greater probability of smoking cessation. Dr. Leischow will serve as Discussant.

**JUSTIFICATION:** Social media have become a fundamental form of communication in general, and regarding ENDS products in particular, so understanding how social media are and can be used for characterizing ENDS use could have significant education, intervention, and policy implications.

**FUNDING:** Federal

**CORRESPONDING AUTHOR:** Scott Leischow, scott.leischow@asu.edu

**SYM20A****ANALYZING THE IMPACT OF "THE REAL COST" CAMPAIGN**

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**SIGNIFICANCE:** In 2014, the FDA launched a nationwide youth tobacco prevention campaign called "The Real Cost." A significant component of The Real Cost has been conducted through social media platforms such as Twitter. As part of the effort to gain a better understanding of the online community reached by The Real Cost, we have conducted a social media study analyzing the influencers and leaders of this online community. **METHODS:** Our team has developed the SMILE system (Social Media-based Informatics pLatform for ENDS regulatory research), which automatically and continuously collects ENDS data from popular social media platforms, mainstream news websites, and literature databases. SMILE also provides a set of analytic and visualization tools. Leveraging this system, we collected 11,385 tweets related to The Real Cost. Based on network-centric measures such as PageRank and out-degree centrality, we identified the influencers and their categories. We then analyzed the sentiment of their tweets about the campaign and developed a GLM model aiming to explain why those users are influencers. **RESULTS:** Among the top 20 influencers, 30% belongs to mass media, and 30% celebrities. The key influencers also include government social media accounts. Network visualization shows that the entire community is centered around those influencers. We note that 65% of the influencers support the campaign, while individual, non-celebrity influencers are more likely to post negative tweets doubting the advertising approach or the perceived exaggerated content. We found that a user's power of influence is positively and significantly associated with community participation and tweet popularity. **CONCLUSION:** This study analyzes the influencers in the "The Real Cost" online community by exploring who the influencers are, how they influence others, and why they are influencers. The findings provide useful insights as for how to conduct such public health campaigns to maximize their impact.

**FUNDING:** Federal

**CORRESPONDING AUTHOR:** Xuan Wei, University of Arizona, AZ, USA

**SYM20B****WHERE DO E-CIGARETTE USERS AND DUAL USERS FIND HEALTH INFORMATION COMPARED TO SMOKERS AND TOBACCO USERS? A US SAMPLE OF ADULTS**

Mariaelena Gonzales<sup>1</sup>, Ashley Sanders-Jackson<sup>2</sup>, <sup>1</sup>University of California Merced, CA, USA, <sup>2</sup>Michigan State University, MI, USA

**SIGNIFICANCE:** While the media use of combustible cigarette users (smokers) is well studied, the evidence base regarding which channels can be used to communicate scientifically correct information to e-cigarette users (vapers) and dual users is needed. We describe which online health information channels (OHIC) vapers and dual users use to obtain health information as compared to other tobacco product users generally and combustible cigarette users (smokers) specifically. **METHODS:** We analyzed the relationship between vaping and OHIC using a sample of US adult tobacco users (n=6,133) in the 2014-15 National Health Interview Survey. Controlling for individual difference variables, we used logistic regressions to compare users of tobacco products that were not e-cigarettes (other tobacco users) to vapers, and then compared vapers and dual users to smokers. Outcomes were general internet use, looking up health information online, filling a prescription online, scheduling a healthcare appointment online (appointment online), communicating with a health provider via email (provider emailing), and using a chat group to learn about health topics (chat). **RESULTS:** Compared to other tobacco users, vapers were more likely to use the internet (OR=1.82, p<0.001), look up health information online (OR=1.52, P<0.001), fill a prescription online (1.43, p=0.48) and chat (1.76, p=0.26). Compared with smokers, vapers were more likely to use the internet (OR=2.59, p<0.001) and look up health information online (OR=1.51, p=0.018). Dual users were more likely to use the internet (OR=1.99, p=0.001) and engage in provider emailing (OR=1.72, p=0.045). **CONCLUSION:** Vapers and dual users are both more likely to use OHIC than tobacco users or smokers. These channels may be important in conveying health information, however, the channels varied by whether or not the respondent was solely a vaper, or if they engaged in dual use.

**FUNDING:** Unfunded

**CORRESPONDING AUTHOR:** Ashley Sanders-Jackson, PhD, Michigan State University, MI, USA





## SYM20C

### ANALYSIS OF MOST WIDELY SHARED E-CIGARETTE POSTS ON TWITTER

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**SIGNIFICANCE:** E-cigarette information is widely available on social media platforms like Twitter. Most studies to date have examined the topic and sentiment of e-cigarette Tweets. Less is known about what types of e-cigarette tweets are salient to Twitter users. What content people choose to retweet and share with their networks could be a measure of salience. In this study, we examined what type of e-cigarette tweets were most commonly shared, who posted these tweets, and how widely these tweets were disseminated. Results could provide insights into how we can use social media data to identify e-cigarette topics that may be salient to the public. **METHODS:** We identified nearly 10 million e-cigarette tweets from 2.3 million unique Twitter handles between November 2014 to June 2016. We analyzed number of retweets, tweet content, twitter handle, and number of followers. For the top 50 most shared e-cigarette Tweets, we estimated the total potential reach and coded tweet type (e.g. news, ad, joke) and type of user (e.g. individual, marketer, celebrity). **RESULTS:** Of the 10 million e-cigarette tweets, approximately 37.8% were retweets. Among the 50 most retweeted e-cigarette tweets, 78.7% were jokes about e-cigarettes/vaping, 9.7% about ads, and 6.6% about news. The top two tweets were each retweeted about 26,000 times and potentially reached up to 43M Twitter users. Joke tweets originated from celebrities (37.7%), individuals (36.4%), and joke accounts (25.9%). Some of the most viral tweets came from individuals with relatively few followers. There were nearly 60K "we get it, you vape" joke tweets that were retweeted 200K times. These jokes parody vape cloud/ cloud chasing behavior and includes images such as tornadoes with the line, "we get it, you vape." These posts first appeared in July 2015 and remained relatively stable over time. **CONCLUSIONS:** The most widely shared e-cigarette information on Twitter was not about health, but jokes parodying e-cigarette use. Examining social media can provide insights into what information users find interesting and may signal potential shifts in social norms, but results should be triangulated with other data.

FUNDING: Federal

CORRESPONDING AUTHOR: Annice Kim, PhD, RTI International, CA, USA

## SYM20D

### PATTERNS OF E-CIGARETTE USE AND SMOKING CESSATION: AN EXAMINATION OF YOUNG ADULT SMOKERS PARTICIPATING IN A FACEBOOK CESSATION INTERVENTION TRIAL

Erin Vogel\*, Danielle Ramo, University of California, San Francisco, CA, USA

**SIGNIFICANCE:** Electronic nicotine delivery systems (ENDS) such as e-cigarettes and e-hookahs are often used for smoking cessation. It is not yet clear whether the potential benefits of use outweigh the risks. This study examined the associations between using ENDS that do or do not contain nicotine as part of a quit attempt among young adults participating in a Facebook-based smoking cessation intervention. **METHODS:** Data were taken from a randomized trial testing a Facebook-based smoking cessation intervention for young adults age 18 to 25. Participants ( $N = 500$ , 55% female, 73% non-Hispanic White,  $M$  age = 21) were randomly assigned to a 90-day intervention or a control group. In the intervention condition, they were assigned to a secret Facebook group tailored to their readiness to quit smoking. Participants reported ENDS use and smoking status at 3, 6, and 12 months. Participants were categorized at each timepoint as no ENDS use, any ENDS use with nicotine, or ENDS use only without nicotine. Three dummy-coded logistic regression analyses tested the effect of ENDS use during the follow-up period on 7-day reported abstinence at each timepoint, controlling for experimental condition (treatment or control) and using no-ENDS as the reference group. **RESULTS:** At 3 months, 87% of participants did not use ENDS, 11.4% used nicotine ENDS (N-ENDS), and 1.6% used non-nicotine ENDS (NN-ENDS). ENDS use was not associated with abstinence ( $p = .41$ ). At 6 months, 83.3% were non-users (12.9% N-ENDS, 3.8% NN-ENDS). NN-ENDS users had higher quit rates (54%) than non-users (13.5%;  $OR = .14$  [.04, .43],  $p = .001$ ). At 12 months, 83.9% were non-users (12.7% N-ENDS, 3.4% NN-ENDS). N-ENDS users had higher quit rates (38%) than non-ENDS users (18%;  $OR = .37$  [.19, .72],  $p = .004$ ). **CONCLUSION:** ENDS use is associated with reported abstinence 6 and 12 months after enrolling in a Facebook-based smoking cessation intervention for young adults, yet the role of nicotine in ENDS is inconsistent. More research is needed to determine the role of nicotine in quit attempts involving ENDS use and the success of such attempts.

FUNDING: Federal

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## SYM21

### TRANSGENERATIONAL EFFECTS OF PARENTAL NICOTINE AND TOBACCO EXPOSURE ON EMOTION, COGNITION, AND REWARD

Edward Levin, PhD, Duke University Medical Center, NC, USA; Thomas Gould, PhD, Penn State University, PA, USA; Deirdre McCarthy, Florida State University College of Medicine, FL, USA; Heath Schmidt, PhD, University of Pennsylvania School of Medicine, PA, USA; Laura Stroud, PhD, Brown University; The Miriam Hospital, RI, USA

Smoking is the leading cause of preventable death in the US, responsible for over 440,000 deaths per year. Hence, the effects of nicotine, the main addictive substance in tobacco, as well as other compounds in tobacco plant on behavior and physiology are under intense scrutiny. Numerous studies have shown that nicotine has significant effects on cognition, emotion, and reward processing. Importantly, recent advances in the field of epigenetics have demonstrated that these effects are inherited by subsequent generations through alterations in the epigenome. This is a novel yet quickly growing field of study that attracts researchers from variety of disciplines. Accordingly, our panel will discuss the most recent developments on the transgenerational effects of parental nicotine and tobacco exposure on reward, emotion, and cognition and offer insights into the neurobiological and epigenetic mechanisms. Specifically, our panel speakers will present data on the influence of tobacco smoke extract exposure from preconception throughout gestation on locomotor activity and anxiety in rats (Dr. Edward Levin). In addition, employing mouse models, we will present novel findings on the effects of paternal nicotine exposure on fear learning and nicotine self-administration in subsequent generations (Drs. Thomas Gould and Heath Schmidt). Moreover, our panel will present and discuss recent data demonstrating the paternal nicotine-induced changes in epigenetic modification of male germ cell DNA (Deirdre McCarthy). Finally, in order to establish translation between pre-clinical models and clinical studies in humans, we will discuss the effects of maternal smoking in infant neuro-behavioral and epigenetic alterations (Dr. Laura Stroud). Overall, our symposium will discuss novel findings on transgenerational inheritance of nicotine's effects on variety of traits, which represents a dramatic paradigm shift in understanding nicotine's influence on future generations. Therefore, the talks included in our panel cover a wide range of topics that may appeal to a broad audience interested in behavior, neurobiology, and genetic and epigenetic inheritance.

**JUSTIFICATION:** Understanding the mechanisms underlying the effects of parental nicotine exposure on fear, stress, anxiety, reward, and cognition in subsequent generations will have direct implications in terms of identifying new risk groups for stress and anxiety disorders as well as addiction in humans.

FUNDING: Federal

CORRESPONDING AUTHOR: Munir Kutlu, [gunes.kutlu@psu.edu](mailto:gunes.kutlu@psu.edu)

## SYM21A

### TRANSGENERATIONAL NEUROBEHAVIORAL TOXICITY OF NICOTINE AND TOBACCO EXPOSURE IN RATS

Edward Levin\*, Marty Cauley, Brandon Hall, Yael Abreu-Villaça, Shaqif Junaid, Hannah White, Andrew Hawkey, Duke University Medical Center, NC, USA

Tobacco exposure during neurodevelopment has long been associated with persisting neurobehavioral dysfunction in children. Tobacco contains thousands of compounds. The relative contributions to developmental neurotoxicity of nicotine and the variety of other bioactive compounds in tobacco are still being discovered and the dose and time-effect functions are still being worked out. Experimental animal studies can be very helpful for not only demonstrating the cause-and-effect relationships between tobacco and nicotine exposure and neurobehavioral dysfunction, but also for determining the neural mechanisms of behavioral impairment and the critical timing and doses of exposure that present neurotoxic risk. In studies with Sprague-Dawley rats, we have shown that exposure to low dose tobacco smoke extract (TSE) at a dose modeling second hand smoke (0.2 mg/kg/day of nicotine) from preconception throughout gestation caused in the offspring locomotor hyperactivity during adolescence and cognitive impairment under low-motivating conditions in adulthood. These effects were more pervasive than



the same dose of nicotine given alone. Next, we determined developmental windows of exposure with three periods of exposure: pre-mating, early gestation and late gestation. During adolescence, significant locomotor hyperactivity and more anxious-type behavior in the elevated plus maze was seen after late gestational TSE exposure. TSE exposure before mating also produced some significant behavioral impairments in the offspring, including decreased habituation of locomotor activity during adolescence and locomotor hyperactivity in adult males. Nicotine is a developmental neurotoxin but its effects are exacerbated by co-exposure to other compounds in tobacco. Our recent study has shown that the prototypic polycyclic aromatic hydrocarbon found in tobacco smoke, benzo-a-pyrene, also causes persistent neurobehavioral impairment after developmental exposure. Tobacco exposure ending prior to mating also causes significant persisting behavioral dysfunction in the offspring.

FUNDING: Federal

CORRESPONDING AUTHOR: Edward Levin, PhD, Duke University Medical Center, NC, USA

## SYM21B

### PATERNAL NICOTINE EXPOSURE TRANSGENERATIONALLY ALTERS GENE EXPRESSION IN THE CHOLINERGIC SIGNALING PATHWAY

Thomas Gould<sup>\*1</sup>, Munir Kutlu<sup>1</sup>, Rob Cole<sup>2</sup>, Jessica Tumolo<sup>3</sup>, Vinay Parikh<sup>3</sup>, <sup>1</sup>Penn State University, PA, USA, <sup>2</sup>Vanderbilt University, TN, USA, <sup>3</sup>Temple University, PA, USA

Numerous studies have indicated a bidirectional relationship between smoking and mental health problems such as anxiety and stress disorders. In addition, with the recent developments in genetics, now we know that the effects of substance of abuse are not confined within the same generation but they may be transgenerationally transmitted through epigenetics mechanisms. In light of these developments, we recently investigated the effects of paternal nicotine exposure on fear learning and memory in subsequent generations where male adult C57BL/6J mice received either chronic nicotine (Nic-Sired group; 28 days, 12.6 mg/kg/d) or chronic saline (Sal-Sired group) exposure. Our results showed that paternal nicotine exposure resulted in augmented fear learning and recovery in the F1 and F2 generations. In addition, paternal nicotine also altered hippocampal cholinergic function. Specifically, we found that the Nic-Sired F1 and F2 generation mice had an altered response to the enhancing effects of acute nicotine on hippocampus-dependent fear learning. Moreover, using electrochemical recordings, we found that paternal nicotine reduced nicotine-evoked acetylcholine release in both ventral and dorsal hippocampus and potassium-evoked acetylcholine release only in the ventral hippocampus in F1 generation mice. In line with these findings, the results of our whole transcriptome RNA-Seq experiment demonstrated that alterations in fear learning and hippocampal cholinergic function were accompanied by changes in ventral hippocampal gene expression in several pathways including the "Choline Synapse" pathway. Furthermore, we found that in the Nic-Sired group, expression of two genes (*Chma3* and *Chrb4*) within the gene cluster that encode  $\alpha 3/\alpha 5/\beta 4$  nicotinic acetylcholine receptors (nAChRs) was reduced in the ventral hippocampus. However, we did not find expression changes in the "Choline Synapse" pathway for dorsal hippocampus. Together, our results suggest that paternal nicotine exposure leads to alterations in the hippocampal cholinergic function and expression changes in the associated gene pathways.

FUNDING: Federal

CORRESPONDING AUTHOR: Thomas Gould, PhD, Penn State University, PA, USA

## SYM21C

### NICOTINE-INDUCED DNA METHYLATION IN SPERMATOZOA: CONSEQUENCES FOR OFFSPRING'S BEHAVIOR AND GENE EXPRESSION

Deirdre McCarthy\*, Florida State University College of Medicine, FL, USA

Cigarette smoking and other forms of nicotine use remain a leading cause of disease, disability and death in the United States. Nicotine's effects on epigenetic modification of somatic cell DNA are becoming known. However, little is known about nicotine's effects on the germ line or the potential consequences of any such effects on the offspring's brain or behavior. With this in mind, we exposed

adult male mice to nicotine (200µg/ml) in drinking water for 12 weeks. While the nicotine exposure was ongoing, the mice were bred with drug naïve females. To evaluate the hypothesis that nicotine can induce epigenetic modification of male germ cell DNA, we collected spermatozoa from the nicotine-exposed males and examined methylation of spermatozoal DNA using DNA immunoprecipitation combined with qPCR. We found significant changes in genome-wide DNA methylation as well as DNA methylation at dopamine receptor promoter regions in the nicotine-exposed fathers' spermatozoa. The offspring of the nicotine-exposed males displayed hyperactivity and inattention, phenotypes commonly associated with ADHD. Interestingly, the nicotine-exposed mice (fathers) did not display either of these behavioral phenotypes. We examined dopamine receptor mRNA expression in the offspring's brain using quantitative real-time PCR. Dopamine D2 and D4 receptor mRNA showed sex- and brain region-specific changes in the offspring, although the offspring were not exposed to nicotine during their life cycle. These data suggest that nicotine-induced epigenetic modification of the father's germ line is associated with behavioral phenotypes and molecular changes in the offspring's brain. Our findings call for revision of the current education, research and public health efforts, which focus primarily on nicotine exposure of women, so that nicotine's effects on men, especially their germ line, can receive equal attention. Moreover, we have recently shown that maternal nicotine exposure also produces hyperactivity in the F1 offspring, and that this phenotype is transmitted to the F2 and F3 offspring, further highlighting the need to investigate the impact of nicotine exposure on subsequent generations.

FUNDING: Academic Institution

CORRESPONDING AUTHOR: Deirdre McCarthy, Florida State University College of Medicine, FL, USA

## SYM21D

### PATERNAL NICOTINE SELF-ADMINISTRATION IS ASSOCIATED WITH INCREASED VULNERABILITY TO NICOTINE-TAKING BEHAVIOR IN OFFSPRING

John Maurer<sup>1</sup>, Chris Turner<sup>1</sup>, Matthieu Wimmer<sup>2</sup>, Heath Schmidt<sup>\*3</sup>, <sup>1</sup>University of Pennsylvania, PA, USA, <sup>2</sup>Temple University, PA, USA, <sup>3</sup>University of Pennsylvania School of Medicine, PA, USA

Human epidemiological studies indicate that children of parents who smoke tobacco have a higher incidence of developing nicotine dependence, cognitive deficits and anxiety. These findings suggest that nicotine may reprogram the germline to produce aberrant behavioral phenotypes in subsequent generations. The goal of this study is to establish a novel animal model of the trans-generational effects of voluntary preconceptional nicotine taking. Male Sprague Dawley rats were allowed to self-administer nicotine (0.03 mg/kg/infusion) on a fixed-ratio 1 (FR1) schedule of reinforcement for 60 consecutive days. Each nicotine-experienced rat was paired with a yoked saline control rat that received the same number and temporal pattern of infusions. Following nicotine self-administration, nicotine-experienced and yoked saline control rats were allowed to mate with drug-naïve dams. At P60, acquisition of nicotine self-administration was assessed in the offspring (F1 generation). Both female and male nicotine-sired offspring self-administered significantly more nicotine than saline-sired offspring. These effects were specific to nicotine, as sucrose taking and cocaine self-administration were not altered in the offspring of nicotine sires. Cognitive function and anxiety-like behaviors were also measured in separate cohorts of F1 littermates. Our preliminary results indicate that male and female nicotine-sired offspring had deficits in hippocampal-dependent spatial memory relative to controls. Taken together, these data are consistent with human epidemiological studies and indicate that paternal nicotine taking produces heritable addiction-like phenotypes. To identify potential mechanisms underlying the inter-generational effect of nicotine, future studies will profile transcriptomes in brain regions known to regulate the effects of nicotine on behavior as well as epigenetic modifications within gametes. Identifying the mechanisms underlying transmission of enhanced vulnerability to nicotine dependence and mood disorders could aid in the development of novel pharmacotherapies for individuals at risk for developing chronic smoking behavior and mental disorders.

FUNDING: Federal

CORRESPONDING AUTHOR: Heath Schmidt, PhD, University of Pennsylvania School of Medicine, PA, USA

## SYM21E

### IMPACT OF MATERNAL SMOKING ON INFANT NEUROBEHAVIOR: MEDIATION BY EPIGENETIC REGULATION OF PLACENTA STRESS AND NEURODEVELOPMENT GENES

Laura Stroud<sup>\*1,2</sup>, George Papandonatos<sup>1</sup>, Tessa Kehoe<sup>2</sup>, Meaghan McCallum<sup>1,2</sup>, Carmen Marsit<sup>3</sup>, <sup>1</sup>Brown University, RI, USA, <sup>2</sup>The Miriam Hospital, RI, USA, <sup>3</sup>Emory University, GA, USA

**SIGNIFICANCE:** Between 1 and 3 infants is born exposed to tobacco in the US; rates may increase with increasing uptake of novel tobacco products (e.g. hookah, e-cigarettes) by pregnant mothers. Besides known causal links with low birth-weight and prematurity, suggestive associations between maternal smoking and neurobehavioral dysregulation (e.g., disruptive behaviors, attention deficits) have emerged across development. However, mechanistic pathways remain poorly understood. We investigated methylation of glucocorticoid and serotonergic genes as mediators of links between maternal smoking (MS) and infant neurodevelopment. **METHODS:** We recruited 205 racially/ethnically diverse, disadvantaged pregnant mothers ( $M_{age}=26$ , 57% minorities, 68% unplanned pregnancies) oversampled for tobacco use (53% smokers). Maternal smoking (MS), cotinine, and CO were measured prospectively over pregnancy. Infant neurobehavior was assessed by the NICU Network Neurobehavioral Scale and Laboratory temperament assessment battery (Lab-TAB) at 1 and 6 months, respectively. Saliva cortisol samples were collected before, during and after neurobehavioral tasks for assessment of stress response. Placenta samples were collected within 5 hours of birth and assayed for methylation of stress and serotonergic genes using pyrosequencing. **RESULTS:** Preliminary findings revealed an impact of MS on altered infant attention, non-optimal reflexes, autonomic stress, and distress ( $t's >1.76$ ,  $p's <.08$ ). We also found differences in infant cortisol reactivity at six months ( $t=2.2$ ,  $p<.05$ ), but not one month. Finally, we found associations between MS and epigenetic regulation of placenta stress (NR3C1) and serotonergic (HTR2A) genes ( $t's >1.83$ ,  $p's <.10$ ) and between NR3C1 genes and infant neurobehavior ( $p's >.22$ ,  $p's <.01$ ). **CONCLUSIONS:** Results highlight the impact of MS on early neurobehavioral deficits potentially portending known long-term adverse outcomes from MS (e.g. disruptive disorders, ADHD). Interrogating the placenta methylome may serve as a novel approach to elucidate mechanisms underlying the impact of MS on offspring neurodevelopment.

**FUNDING:** Federal

**CORRESPONDING AUTHOR:** Laura Stroud, PhD, Brown University; The Miriam Hospital, RI, USA

## SYM22

### CYTISINE FOR SMOKING CESSATION: FILLING IN THE GAPS

David Shurtleff, PhD, National Institutes of Health, MD, USA; Maciej Goniewicz, PhD, PharmD, Roswell Park Cancer Institute, NY, USA; Marjolein Verbiest, PhD, University of Auckland, New Zealand

Cytisine, a plant-based alkaloid, has been used in Central/Eastern Europe for more than 50 years as a smoking cessation medication. Like varenicline, cytisine is structurally similar to nicotine and acts as a partial agonist at nicotinic acetylcholine receptors. Trial evidence shows that cytisine is an effective, safe, and acceptable smoking cessation medication compared to a placebo, whilst modelling shows cytisine to be affordable and cost-effective. In 2014 the CASCAID trial was published in the New England Journal of Medicine, and showed that cytisine was at least as effective as nicotine replacement therapy at helping people to quit smoking. Since this publication a further five trials of cytisine for smoking cessation are now being undertaken around the world, in addition to a number of preclinical studies. Regulatory approval for cytisine has not been sought for countries outside central/eastern Europe until recently. In 2017, cytisine was approved by Health Canada as a natural smoking cessation product, and available over-the-counter. Furthermore, in 2017 an IND application for cytisine was accepted by the US FDA. This symposium will update attendees on the pre-clinical and clinical research underway around the world to address the many knowledge gaps for this medication. The symposium is sponsored by the informal SRNT Cytisine Working Group. On behalf of the group, Dr. Rigotti will introduce the symposium, provide a high level overview of cytisine for those new to the field, and summarize clinical trials of cytisine that are currently underway but not completed. Dr. Shurtleff of NIH will summarize the latest preclinical cytisine research funded by the U.S. National Center for Complementary and Integrative Health to support US regulatory approval. Dr. Goniewicz will report on pilot data exploring cytisine delivery via an e-cigarette, and Dr Verbiest will present new data from the CASCAID trial looking at the ef-

fectiveness of cytisine for smoking cessation in people with mental illnesses. Dr. Walker will then facilitate a discussion with the audience regarding research gaps for cytisine, and how to address them.

**JUSTIFICATION:** For more than 50 years cytisine has remained unknown outside of Eastern/Central Europe. This symposium will highlight important preclinical and clinical research into cytisine in the hope of encouraging more members of the SRNT research community to contribute to the evidence base for this medication.

**FUNDING:** Federal

**CORRESPONDING AUTHOR:** Natalie Walker, n.walker@auckland.ac.nz

## SYM22A

### THE REGULATORY SCIENCE OF CYTISINE: AN UPDATE ON THE PRE-CLINICAL GLP-REGULATED SAFETY ASSESSMENT

David Shurtleff<sup>\*1</sup>, Craig Hopp<sup>1</sup>, Elaine Knight<sup>1</sup>, Hanna Ng<sup>2</sup>, Gary Wolfe<sup>3</sup>, <sup>1</sup>National Institutes of Health, MD, USA, <sup>2</sup>SRI International, CA, USA, <sup>3</sup>Gary Wolfe Toxicology LLC, VA, USA

Cytisine is a natural product structurally similar to nicotine with partial nicotinic acetylcholine receptor agonist activity. It is found in the leaves of the golden rain (*Laburnum anagyroides*) tree and has been marketed in tablet form as an inexpensive smoking cessation aide in Eastern Europe under the trade name Tabex since 1964. Because of its potential benefit and relatively low cost compared to other smoking cessation medications (e.g., varenicline), there is interest in making cytisine available to smokers in many countries around the world. Before cytisine can become available to smokers in the United States (USA), it must be approved by the USA Food and Drug Administration (FDA). The FDA considers cytisine to be a new drug molecular entity, which requires the full range of Good Laboratory Practice (GLP) safety and preclinical toxicity studies for an Investigational New Drug (IND) application, and additional preclinical reproductive toxicology studies to support Phase 3 clinical studies. With support and oversight from the National Institutes of Health (NIH), National Center for Complementary and Integrative Health (NCCIH), a full range of GLP-regulated preclinical IND- studies and reproductive toxicology studies were conducted. An updated summary of the preclinical safety data to support the IND application, and future Phase 3 clinical studies will be presented. In addition, an overview of future studies, and the strategies in seeking regulatory approval for cytisine will be discussed.

**FUNDING:** Federal

**CORRESPONDING AUTHOR:** David Shurtleff, PhD, National Institutes of Health, MD, USA

## SYM22B

### E-CIGARETTES AS POTENTIAL PULMONARY DELIVERY DEVICES FOR CYTISINE: A PILOT STUDY TO MEASURE AEROSOL YIELDS AND CYTOTOXICITY

Maciej Goniewicz<sup>\*1</sup>, Noel Leigh<sup>1</sup>, Evan Yang<sup>1</sup>, Chris Bullen<sup>2</sup>, Malcolm Tingle<sup>2</sup>, Natalie Walker<sup>2</sup>, <sup>1</sup>Roswell Park Cancer Institute, NY, USA, <sup>2</sup>University of Auckland, New Zealand

**BACKGROUND:** E-cigarettes (ECs) typically aerosolize nicotine with a mixture of propylene glycol, vegetable glycerol and flavorings, and serve as a substitute for cigarettes or to assist with quitting smoking or cutting down. We aimed to test if cytisine, a partial agonist of nicotinic acetylcholine receptors (nAChRs), can be effectively delivered to aerosol from EC and whether cytisine-containing aerosol is safe to respiratory cells. **METHODS:** Refill solutions containing variable concentrations of cytisine: Low (12 mg/ml), High (24 mg/ml), Zero (0 mg/ml; control) and one of nicotine (24mg/ml) comparator) were prepared. An Evod Twist tank EC system was used to generate the aerosol with a smoking-machine. We measured how much cytisine is delivered to the aerosol by extracting it from aerosol to organic solvent with analysis using gas chromatography. Inhalation cytotoxicity of cytisine was tested with human bronchial epithelial cells (H292) in an Air Liquid Interface (ALI) system. We measured cell viability using trypan blue assay, metabolic activity using a neutral red uptake assay, and six cytokines (IL-1 $\beta$ , IL-6, IL-10, CXCL1, CXCL2 and CXCL10) with commercially available ELISA kits. **RESULTS:** A single puff from EC with 12 mg/ml cytisine solution delivered approximately 53  $\mu$ g cytisine to aerosol, while a single puff from 24 mg/ml solution delivered 94  $\mu$ g cytisine to aerosol. Bronchial epithelial cells showed a similar extent of decreased viability and metabolic activity after exposure to all four EC aerosols. Exposure of cells to





EC aerosol resulted in increased released of cytokines; however there were no differences in levels of released cytokines between the cytosine-containing aerosols, the nicotine aerosol and drug-free aerosol (control). **CONCLUSIONS:** The EC device used in this study was effective at delivering cytosine from refill solution to aerosol. We estimate about 25-30 puffs of 12 mg/ml cytosine solution are needed to deliver a dose equivalent to that from a single tablet (1.5 mg). Cytosine delivered in aerosolized form from EC increases cytotoxicity of EC aerosol on bronchial epithelial cells but no more than zero-drug or nicotine EC aerosols.

FUNDING: Academic Institution

CORRESPONDING AUTHOR: Maciej Goniewicz, PhD, PharmD, Roswell Park Cancer Institute, NY, USA

## SYM22C

### CYTOSINE VERSUS NICOTINE REPLACEMENT THERAPY FOR SMOKING CESSATION IN PEOPLE WITH MENTAL ILLNESS: SECONDARY ANALYSIS OF A NON-INFERIORITY TRIAL

Natalie Walker<sup>1</sup>, Marjolein Verbiest<sup>\*1</sup>, Varsha Parag<sup>1</sup>, Marewa Glover<sup>2</sup>, Hayden McRobbie<sup>3</sup>, Joanne Barnes<sup>1</sup>, Vili Nosa<sup>1</sup>, Chris Bullen<sup>1</sup>, <sup>1</sup>University of Auckland, New Zealand, <sup>2</sup>Massey University, New Zealand, <sup>3</sup>The Dragon Institute for Innovation, New Zealand

**BACKGROUND:** Smoking rates are substantially higher among people with mental illnesses compared to the overall population. In the general population, cytosine has been shown to significantly increase continuous smoking abstinence rates compared to a placebo and nicotine replacement therapy (NRT). To date, no studies have examined the effectiveness of cytosine for smoking cessation in people with mental illnesses. **METHODS:** Secondary analyses of data from a pragmatic, open-label, non-inferiority trial undertaken in New Zealand among 1,310 daily adult smokers motivated to quit who called the national Quitline. People with schizophrenia were excluded. Participants were randomised (1:1 ratio) to receive cytosine for 25 days or NRT for 8 weeks. Low-intensity, telephone-delivered behavioral support was provided to both groups through the Quitline. The primary outcome was self-reported continuous abstinence one month post-quit date. Based on self-reported medication use and the Anatomical Therapeutic Classification System we identified 182 (13.9%) participants with a mental illness. In this subgroup we analysed self-reported smoking prevalence and adverse events at one and six months post-quit date. **RESULTS:** No statistically significant difference was observed in one month continuous abstinence rates between participants with a mental illness who received cytosine or NRT (31/87; 35.6% versus 23/95; 24.2% respectively,  $p=0.092$ ). A similar finding was found for six month continuous abstinence rates (11.5% versus 7.4%,  $p=0.339$ ) and adverse events over the six month period (65 events among 35 participants versus 48 events among 34 participants,  $p=0.104$ ). **CONCLUSION:** Cytosine appears as effective and safe as NRT at supporting smoking cessation amongst smokers with a mental illness who were motivated to quit, although the sample size was small.

FUNDING: State

CORRESPONDING AUTHOR: Marjolein Verbiest, PhD, University of Auckland, New Zealand

## SYM23

### ACROSS THE SPECTRUM: DIVERSITY OF TOBACCO PRODUCT USE

Brian Thomas, PhD, RTI International, NC, USA; Youn Lee, PhD, RTI International, NC, USA; Jenny Wiley, PhD, RTI International, NC, USA; Lauren Pacek, PhD, Duke University School of Medicine, NC, USA; Dorothy Hatsukami, PhD, University of Minnesota, MN, USA

A predominant characteristic of tobacco product use at the population-level is its wide diversity. Recent years have seen the rapid proliferation of types of tobacco products extending beyond combustible cigarettes to include e-cigarettes, waterpipe tobacco, little cigars, and heat-not-burn tobacco. Further, increasingly sophisticated electronic nicotine delivery systems have increased the ability to customize vaping and its topography for users who vary across sex, age, and other individual and environmental parameters. This symposium uses a multidisciplinary approach to focus on important aspects of tobacco product and user diversity, with an emphasis on delineation of the implications of results for understanding and regulating tobacco product use. Dr. Thomas (speaker 1) will discuss anal-

ysis of chemical constituents contained in the aerosol produced by an array of commercially available tobacco products of several types, including combustible cigarettes, little cigars, and e-cigarettes. Dr. Wiley (speaker 2) will continue the conversation through presentation of data showing sex differences in the effects of flavored and non-flavored aerosolized nicotine-containing e-liquids in drug discrimination, a mouse model of nicotine's subjective effects. Dr. Lee (speaker 3) will describe the cross-user variety observed in the topography of e-cigarette use measured over a two-week period via a portable puff monitor and its implications for nicotine exposure levels. Dr. Pacek (speaker 4) will present survey results showing that dual users of combustible and electronic cigarettes would consider shifting preference to combustible cigarettes if the diversity of e-cigarettes (e.g., nicotine content, flavors, device customization) were to be restricted through regulatory action. Dr. Hatsukami (discussant) will conclude with a discussion of implications of the findings for tobacco regulatory science.

**JUSTIFICATION:** Together, the presentations in this symposium characterize the diversity of tobacco constituents across product types and describe how product diversity and user variation may interact to affect potential exposure to nicotine and other harmful and potentially harmful constituents.

FUNDING: Federal

CORRESPONDING AUTHOR: Jenny Wiley, [jwiley@rti.org](mailto:jwiley@rti.org)

## SYM23A

### ANALYSIS OF TOBACCO ALKALOIDS IN CIGARETTES, LITTLE CIGARS, E-CIGARETTES AND WATERPIPE TOBACCO

Brian Thomas<sup>\*1</sup>, Jenny Wiley<sup>1</sup>, Melanie Silinski<sup>1</sup>, Julie Marusich<sup>1</sup>, Steven Meredith<sup>2</sup>, Robert Gahl<sup>2</sup>, Kia Jackson<sup>2</sup>, <sup>1</sup>RTI International, NC, USA, <sup>2</sup>Food and Drug Administration, MD, USA

The Tobacco Control Act gives the Food and Drug Administration (FDA) authority to issue product standards for cigarettes and other tobacco products, including electronic cigarettes (e-cigarettes), cigars, and waterpipe tobacco. For example, the FDA recently announced that it intends to regulate and reduce nicotine levels in cigarettes. However, other alkaloids and chemical constituents contained and liberated during the use of tobacco products may have abuse liability and may differ significantly across product types and across brands within a product type. Levels of minor alkaloids could theoretically be manipulated to compensate for decreased nicotine levels. Therefore, the objective of the current study is to analytically characterize the profile of nicotine and non-nicotine constituents produced by different types of tobacco products. Analytical methods were used to determine total particulate matter and concentrations of nicotine, anabasine, anatabine, myosmine, cotinine, normicotine, harmaline, norharmaline and acetaldehyde in smoke condensate from cigarettes and little cigars, reconstituted in ethanol. Smoke yields were determined under Health Canada Intense smoke machine conditions. Results reveal modest distinctions between brands within product type, and generally higher analyte exposure levels for little cigars compared to cigarettes, with Djarum Black Clove little cigars producing significantly greater analyte levels than any other product across most measures, including nicotine yield. These results will be used to inform the selection and preparation of aqueous solutions of smoke condensate/aerosol generated from selected tobacco products, which will be evaluated in future studies for their reinforcing effects in a rodent nicotine self-administration procedure. The characterization of the differences in alkaloid production and potential harm (including abuse liability and dependence) caused by different tobacco products and tobacco constituents and their relevance to nicotine reinforcement and self-administration will provide information that may inform future regulatory approaches.

FUNDING: Federal

CORRESPONDING AUTHOR: Brian Thomas, PhD, RTI International, NC, USA

## SYM23B

### IDENTIFYING E-CIGARETTE PERSON AND SESSION TYPES USING REAL-WORLD PUFF TOPOGRAPHY

Youn Lee<sup>\*1</sup>, James Nonnemaker<sup>1</sup>, Antonio Morgan-Lopez<sup>1</sup>, Jessica Pepper<sup>1</sup>, Edward Hensel<sup>2</sup>, Risa Robinson<sup>2</sup>, <sup>1</sup>RTI International, NC, USA, <sup>2</sup>Rochester Institute of Technology, NY, USA

Delivery of nicotine and other substances from electronic nicotine delivery systems (ENDS), or e-cigarettes, depends in-part on how users puff on the devices.

Little is known about variation in puffing behavior among users of e-cigarettes to inform testing protocols or understand if types of puffing behaviors result in increased exposure to constituents. We analyzed puff topography data collected using a portable use monitor (wPUM™) continuously over 2-weeks among N=34 current 2<sup>nd</sup> gen e-cigarette users in the context of their everyday lives. For each puff, the wPUM™ recorded duration, volume, flow rate, and inter-puff interval. We conducted sensitivity analyses to define use session and identified patterns (latent classes) at the session level using multilevel latent profile analysis, resulting in 2 person types and 4 session classes. Session class 1 was characterized by 30 puffs per session (PPS) with low puff volume (low flow rate, puff duration). Session class 2 was characterized by 24 PPS with a high puff volume (similar puff duration to class 1, higher flow rate). Session class 3 was characterized by highest PPS (~290) but flow rate and puff duration like class 1. Session class 4 was characterized by the fewest PPS and longer average puff duration. Person type 1 had mostly class 1 sessions (97.3% low puff volume) while person type 2 had many class 1 sessions (67.8% low puff volume) with a mix of the others (21.8% class 2; 3.2% class 3; 7.1 % class 4). Results suggest that there are different session patterns among e-cigarette users which can result in variation of potential exposure to the constituents of e-cigarette emissions. Higher puff counts, puff duration, and puff volume could result in increased exposure to e-cigarette constituents for some users. This variation in session patterns among e-cigarette users can be used in models to study exposure to e-cigarette constituents and associated toxicity. Such findings have implications for potential public health impact and regulation of e-cigarettes. Further study is needed to determine what user, product, or environment characteristics might influence puffing behavior and associated session patterns.

FUNDING: Academic Institution; RTI International (non-profit research institute) internal research and development funds

CORRESPONDING AUTHOR: Youn Lee, PhD, RTI International, NC, USA

## SYM23C

### NICOTINE-LIKE DISCRIMINATIVE STIMULUS EFFECTS OF E-LIQUIDS IN A VAPING MODEL IN MALE AND FEMALE MICE

Jenny Wiley\*, Timothy Lefever, Julie Marusich, Alexander Kovach, Brian Thomas, RTI International, NC, USA

Despite the demonstrated value of animal models for providing data on nicotine addiction, translation can sometimes be problematic. In humans, tobacco products are most commonly smoked or vaped whereas injection is the most frequently used route of administration in animal models. Further, preclinical investigations often inject nicotine alone, which ignores possible modulatory effects of numerous non-nicotine chemicals contained in tobacco as well as the chemosensory effects of smoke/aerosol inhalation (including flavors). Recently, we and others have developed methods to expose rodents to aerosolized drugs via an e-cigarette mechanism. In the present study, we used this method to examine the discriminative stimulus effects of commercially available nicotine-containing e-liquids in male and female C57/BL6 mice trained to discriminate 0.75 mg/kg nicotine administered via subcutaneous injection. Nicotine discrimination is an established and pharmacologically selective animal model of the subjective effects of nicotine in humans. Results showed that male mice exhibited full (> 80% drug-aperture responding) dose-dependent substitution for the training dose. Female mice also showed dose-dependent increases in responding on the nicotine-associated aperture; however, full substitution was not attained in all mice at doses lower than 1 mg/kg. Further, responding on the nicotine-associated aperture was more variable in females at the lower doses, suggesting that the training dose may have been sub-optimal. These results are consistent with findings in humans that the nicotine's discriminative stimulus effects are attenuated in women as compared with men. In contrast with effects of injected nicotine, the aerosolized tobacco extract in commercially purchased non-flavored and menthol-flavored e-liquids did not fully substitute for nicotine, although dose-dependent increases in responding on the nicotine-associated aperture were observed for each e-liquid in both sexes. These results emphasize differences in the effects of tobacco products across individual characteristics such as sex and across product characteristics, including route of administration and flavor.

FUNDING: RTI International (non-profit research institute) internal research and development funds

CORRESPONDING AUTHOR: Jenny Wiley, PhD, RTI International, NC, USA

## SYM23D

### WHAT WOULD YOU DO IF...? ANALYSIS OF YOUNG ADULT DUAL USERS' ANTICIPATED RESPONSES TO HYPOTHETICAL E-CIGARETTE MARKET RESTRICTIONS

Lauren Pacek\*, Jason Oliver, F. Joseph McClernon, Duke University School of Medicine, NC, USA

FDA's regulatory authority over the manufacture, marketing, and distribution of e-cigarettes (EC) may lead to new regulations and product standards. Some regulations may be beneficial to users (e.g., battery standards) and nonusers (e.g., child-resistant packaging). Others (e.g., limiting flavors) may result in decreased market diversity of EC products and reduced product customization, which may decrease the appeal and likelihood of EC use. Accordingly, regulations may have the unintended consequence of increasing combustible cigarette (CC) use among dual EC/CC users. Understanding the impact of regulations is important for mitigating unintended negative consequences. We conducted a survey in June 2017 in dual EC/CC users aged 18-29 (n=242) on Amazon Mechanical Turk. Participants reported whether they would quit, reduce, maintain, or increase their EC and CC use in response to hypothetical EC market restrictions on EC nicotine content, flavor, and ability to modify/customize EC devices. Restrictions on nicotine content, flavor, and ability to customize devices, as well as simultaneous restrictions on all three characteristics, resulted in 9%, 17%, 22%, and 31% of dual users, respectively, indicating that they would increase their CC use. These restrictions also resulted in anticipated reductions in EC use. We also examined whether anticipated responses to restrictions differed as a function of current EC preferences. Among individuals who use flavored, as compared to tobacco/menthol e-liquid, restrictions on flavor led to a greater proportion reporting anticipated increases in CC use (19% vs. 13%; p=0.012) and decreased/quit EC use (71% vs. 32%; p<0.001). Among 3<sup>rd</sup> generation device users, versus 1<sup>st</sup>/2<sup>nd</sup> generation, restrictions on device modification led to a greater proportion indicating increased CC use (33% vs. 18%; p=0.008). Findings indicate that some young adult dual users may increase CC use following restrictions on EC, and that these effects would be most pronounced among those who customize their EC experience. Product standards for EC need to be considered in light of the impact they may have on the use of tobacco products in addition to EC.

FUNDING: Federal

CORRESPONDING AUTHOR: Lauren Pacek, PhD, Duke University School of Medicine, NC, USA

## SYM23E

### DISCUSSANT

Dorothy Hatsukami\*, University of Minnesota, MN, USA

Discussant will review results of the presented research and will discuss its potential implications for tobacco regulation.

FUNDING: Unfunded

CORRESPONDING AUTHOR: Dorothy Hatsukami, PhD, University of Minnesota, MN, USA

## SYM24

### DECONSTRUCTING THE NATURAL CIGARETTE NARRATIVE: ANALYZING CURRENT EVIDENCE TO INFORM FUTURE POLICY

Erin O'Gara, PhD, ClearWay Minnesota, MN, USA; Dana Carroll, PhD, Masonic Cancer Center, University of Minnesota, MN, USA; Irina Stepanov, PhD, University of Minnesota, MN, USA

Cigarettes marketed as natural lead consumers to believe that they are smoking a less harmful product. Terms like "additive-free" or "only tobacco and water," that are used to promote Natural American Spirit cigarettes (NAS), create the perception of a "healthier" cigarette without evidence of their reduced risk. In August 2015, the US Food and Drug Administration (FDA) sent letters to Santa Fe Natural Tobacco Company (makers of NAS) and 2 other companies warning that their use of the words natural and additive-free was a violation of the federal Food, Drug and Cosmetic Act. Although the FDA has begun regulatory steps against the tobacco industry's deceptive marketing of natural and additive-free cigarettes, the task of refuting misleading and deceptive claims will ultimately fall to the public health and





tobacco control community. This symposium will present a data-driven deconstruction of the false narrative of natural cigarettes. Raymond Boyle and Joni Jensen will co-chair the session and introduce the context of the problem and the need for further action. Erin O'Gara from ClearWay Minnesota will provide an overview of NAS marketing including the adoption of Native American imagery. Irina Stepanov from the University of Minnesota will discuss toxicant yields in NAS cigarettes and exposures in smokers. Dana Carroll from the University of Minnesota will present data that contrasts perceived health risks and biomarkers of potential harm in NAS smokers to smokers using other brands. Jennifer Pearson from the University of Nevada, Reno will present data from an experimental web-based Amazon Turk task where NAS pack aspects were removed to determine if they affected perceived harm and perceived addictiveness. Richard O'Connor will serve as the symposium discussant of the presentations, and will facilitate a broader discussion with the presenters and audience on policy actions that can be taken, including how researchers and the public health community can refute the misleading and deceptive claims of the tobacco industry.

**JUSTIFICATION:** This symposium will refute the misleading and deceptive claims of the tobacco industry marketing some cigarettes as natural and additive free.

**FUNDING:** Nonprofit grant funding entity

**CORRESPONDING AUTHOR:** Raymond Boyle, rboyle@clearwaymn.org

## SYM24A

### "OUR SECRET IS... THERE ARE NO SECRET INGREDIENTS": THE MARKETING OF NATURAL AMERICAN SPIRIT

Erin O'Gara\*, Joanne D'Silva, CoCo Villaluz, Raymond Boyle, ClearWay Minnesota, MN, USA

**SIGNIFICANCE:** Santa Fe Natural Tobacco Company's (SFNTC) product, Natural American Spirit (NAS) gained popularity in the 1990s for being a niche product line marketed as additive-free. Adding to NAS's appeal were carefully crafted ads and product placement, as well as prominent Native American imagery on all products. The use of Native imagery is noteworthy, given that traditional tobacco is sacred and has a long history within many Native communities. The objective of this study was to explore how SFNTC marketing tactics have changed over time, and in particular, how these techniques have exploited Native imagery and traditional tobacco. **METHODS:** A content analysis was conducted on SFNTC marketing materials, advertisements and documents (n=300) related to brand identity. Documents were obtained from the UCSF Truth Tobacco Industry Documents Library and marketing materials were collected from the Rutgers Trinkets and Trash website. Multiple coders reviewed documents as part of an iterative process, and common themes were identified. **RESULTS:** Early SFNTC marketing materials differentiated NAS from other commercial cigarette brands based on the exclusion of additives and the use of organic tobacco. NAS also relied heavily on the use of Native imagery and the sacred practices of traditional tobacco, which were included in brand promotional materials and direct mailings to reinforce claims of commercial tobacco as natural. In more recent years, NAS has cultivated an image as an environmentally conscious and ethically-minded brand, in line with their target demographics that include educated, sophisticated, socially/environmentally conscious, liberal-minded tobacco users. **CONCLUSIONS:** SFNTC used language that implies relative safety over other products. In addition to creating an image as a natural alternative, SFNTC has positioned NAS as a conscientious brand, all the while exploiting Native imagery and the role of traditional tobacco as a way to promote their products. Ongoing monitoring of marketing tactics is needed to ensure that recent FDA policy actions regarding NAS misleading descriptors are not circumvented.

**FUNDING:** Nonprofit grant funding entity

**CORRESPONDING AUTHOR:** Erin O'Gara, PhD, ClearWay Minnesota, MN, USA

## SYM24B

### PERCEIVED HEALTH RISKS AND BIOMARKERS OF POTENTIAL HARM AMONG NATURAL AMERICAN SPIRIT SMOKERS

Dana Carroll<sup>1</sup>, Joni Jensen<sup>1</sup>, Eric Donny<sup>2</sup>, Steve Hecht<sup>1</sup>, Sharon Murphy<sup>1</sup>, Xianghua Luo<sup>1</sup>, Irina Stepanov<sup>1</sup>, Dorothy Hattakami<sup>1</sup>, <sup>1</sup>Masonic Cancer Center, University of Minnesota, MN, USA, <sup>2</sup>University of Pittsburgh, PA, USA

We compared perceived health risks and biomarkers of potential harm in smokers of Natural American Spirit (NAS) brand to smokers of other popular brands. In a clinical trial of adult smokers, participants were asked what they believe their risk is

for health problems on a scale from 1 (low risk) to 10 (high risk) based on smoking their usual brand. NAS brand smokers (n=68) were compared to smokers of Marlboro (n=314), Newport (n=347), Camel (n=138), and Pall Mall (n=104). Responses were modeled as a binary variable where 1-5 was 'perceived low risk' and 6-10 was 'perceived high risk'. Analyses were adjusted for age, gender, race, smoking duration, and cigarettes per day (CPD). Biosamples were analyzed for markers of oxidative damage and inflammation: 8-isoPGF2 $\alpha$ , white blood cell count (WBC), and high sensitivity C-reactive Protein (hsCRP). Biomarker analyses were also adjusted for potential confounders with total nicotine equivalents instead of CPD. Odds of perceived high risk for lung cancer, emphysema, bronchitis, and addiction in smokers of NAS did not differ from smokers of the other four brands. Odds of perceived high risk for other cancers was more than 2 times higher in Marlboro smokers (odds ratio (OR) [95% confidence interval (CI)]: 2.28 [1.31, 3.97], Camel smokers (OR [CI]: 2.37 [1.29, 4.38], and Pall Mall smokers (OR [CI]: 2.01 [1.04, 3.87] smokers versus NAS smokers. Odds of perceived high risk for heart disease (OR [CI]: 1.83 [1.05, 3.19] and stroke (OR [C CI]: 1.78 [1.03, 3.10] were approximately 80% higher in Marlboro smokers versus NAS smokers. Levels of 8-iso-PGF2 $\alpha$  (geometric mean(GM): 1.02 nmol/mg creatinine), WBC (GM: 6.97 thou/ $\mu$ L), and hsCRP (GM: 1.63 mg/L) were no different in NAS smokers compared to smokers of the other brands. Perceived high risk for non-lung cancers was lower among NAS smokers compared to the majority of the other brands. Additionally, perceived high risk for cardiovascular conditions were lower among NAS smokers versus Marlboro smokers. Since levels of biomarkers of potential harm were no different, corrective marketing is needed to accurately inform consumers about the potential health risks of NAS cigarettes.

**FUNDING:** Academic Institution; Federal

**CORRESPONDING AUTHOR:** Dana Carroll, PhD, Masonic Cancer Center, University of Minnesota, MN, USA

## SYM24C

### TOXICANTS AND CARCINOGENS IN NATURAL AMERICAN SPIRIT CIGARETTES

Irina Stepanov\*, Vipin Jain, Aleksandra Alcheva, University of Minnesota, MN, USA

Natural American Spirit (NAS) cigarettes are marketed as made from "natural" or "organic" tobacco and "100% additive-free". While such marketing implies reduced risk of toxic exposures, most of the harmful and potentially harmful constituents in cigarette smoke derive either from the tobacco plant itself or from the process of combustion. We analyzed a range of tobacco-derived constituents, such as nicotine, other tobacco alkaloids, and tobacco-specific N-nitrosamines (TSNA), as well as a panel of combustion-derived constituents, in 13 varieties of the NAS brand. Nicotine levels in all samples averaged 1.6 $\pm$ 0.5 (SD) mg/cigarette. Only one variety contained nicotine at 0.6 mg/cigarette; the remaining samples ranged from 1.2 to 2.5 mg/cigarette, which is relatively high compared to the majority of other cigarette brands on the U.S. market. The levels of TSNA were highly variable across the NAS varieties: the sum of five TSNA (NNN, NNK, NNAL, NAT, and NAB) ranged from 38 to 273 ng/cigarette. This variability persisted when total TSNA levels were expressed per mg nicotine (47-208 ng/mg nicotine), suggesting that, at similar nicotine intake, exposure to these carcinogens in smokers of different NAS types may vary significantly. Levels of formaldehyde (26 $\pm$ 17  $\mu$ g/cigarette), acetaldehyde (695 $\pm$ 147  $\mu$ g/cigarette), acetone (267 $\pm$ 57  $\mu$ g/cigarette), acrolein (39 $\pm$ 13  $\mu$ g/cigarette), propionaldehyde (49 $\pm$ 11  $\mu$ g/cigarette), crotonaldehyde (18 $\pm$ 6  $\mu$ g/cigarette), butanone (70 $\pm$ 17  $\mu$ g/cigarette), and butyraldehyde (35 $\pm$ 9  $\mu$ g/cigarette) were generally similar to those found in other commercial US cigarette brands. The levels of the tested constituents did not differ among NAS varieties labeled as made with "natural", "organic", or simply "U.S. grown" tobacco. Our results suggest that NAS cigarettes may be more addictive than many other cigarette brands due to higher nicotine content. Our results also demonstrate that descriptors such as "organic" and "additive-free" are highly misleading. There is an urgent need to communicate this information to NAS smokers who are generally younger, concerned about the harms of tobacco, and believe that NAS cigarettes are less harmful than other brands.

**FUNDING:** Federal

**CORRESPONDING AUTHOR:** Irina Stepanov, PhD, University of Minnesota, MN, USA

## SYM25

### A SYMPOSIUM ON CIGARS: MEASUREMENT CHALLENGES, HARMONIZATION AND STATISTICAL TECHNIQUES FOR AGGREGATING DIVERSE DATA SETS, AND INDICATORS OF CIGAR TOXICITY

Howard Fishbein, DrPH, MPH, Westat, Inc., MD, USA; MeLisa Creamer, PhD, University of Texas, TX, USA; Irfan Rahman, PhD, University of Rochester Medical Center, NY, USA

A Symposium on Cigars: Measurement Challenges, Harmonization and Statistical Techniques for Aggregating Diverse Data Sets, and Indicators of Cigar Toxicity This symposium will showcase the work of more than a dozen TCORS and CTP TRS researchers collaborating to understand the epidemiology, policy implications, and clinical considerations inherent in cigar use. The research teamwork will feature: 1) The Cigar Collaborative (3 TCORS, 2 CTP grantees including PATH data, harmonizing cigar data collected from 5 data sources to address research hypotheses.) 2) The Cigar Measurement Group (a Subcommittee of the TCORS Measurement Working Group focused on a 1) systematic review of published measurement papers and 2) investigating and documenting how the 14 TCORS are addressing cigar use measurement.) 3) The Cigar Toxicity Working Group (a Working Group focused on cigar toxicity in animal and human models of exposure.) \*Dr. Howard Fishbein, lead of the Analysis and Synthesis Core for the Center for Evaluation and Coordination of Training and Research (CECTR) for the TCORS will serve as the Symposium Chair. Dr. Fishbein leads the Cigar Collaborative, is an active member of the Cigar Measurement Group, and a facilitator of the Cigar Toxicity Working Group. Symposium attendees will learn: 1) The latest measurement tools used to assess exposure and use of cigars among youth. 2) How to harmonize data when different survey tools, populations, study design, and sample sizes exist. How to apply a Model-based Inference Approach, a form of Integrative Data Analysis, to interpret analyses/address research questions from a harmonized data set. 3) What lays ahead for cigar toxicity research on humans from what we have learned from animal models. 4) What can be gained by working collaboratively across sites. Including: (1) accelerating knowledge sharing and innovation; (2) increasing the availability of conceptual model development; (3) enhancing coordinating cross-disciplinary collaboration among CTP-funded scientists, facilitating data sharing, analysis, and synthesis; and (4) enhancing innovativeness to produce results that help inform policy and collaborative processes.

**JUSTIFICATION:** This symposium will enhance capacity of the TRS research community in better understanding cigar use, by encouraging coordinated cross-disciplinary collaboration among CTP-funded scientists, facilitating data sharing, analysis, and synthesis demonstrated through harmonization techniques, and working across research disciplines.

**FUNDING:** Federal

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## SYM25A

### HARMONIZING CIGAR SURVEY DATA ACROSS TCORS, CTP, AND PATH STUDIES: THE CIGAR COLLABORATIVE RESEARCH GROUP

Howard Fishbein<sup>\*1</sup>, Robin Mermelstein<sup>2</sup>, Melissa Harrel<sup>3</sup>, Alexander Loukas<sup>4</sup>, Kymberly Sterling<sup>5</sup>, <sup>1</sup>Westat, Inc., MD, USA, <sup>2</sup>University of Illinois at Chicago, IL, USA, <sup>3</sup>University of Texas Health Science Center, TX, USA, <sup>4</sup>The University of Texas at Austin, TX, USA, <sup>5</sup>Battelle Memorial Institute, GA, USA

The Cigar Collaborative Research Group (CCR) has harmonized survey research data from 5 data sets with questions on cigar perceptions/use/behaviors. Data are from 2 Texas TCORS, Georgia State's TCORS, a CTP grant at the University of Illinois, Chicago, and PATH data. The CCR was in response to a CECTR announcement encouraging collaboration among TCORS and CTP grantees. Given scores of survey questions/response options from across the 5 data sources, creating a harmonized data set was challenging. Researchers followed these steps: 1) reviewed closely cigar data from each data source; 2) found where it was possible to harmonize questions and maintain the original intent of the question; and 3) only select questions where 3 or more of the 5 data sets could provide responses following these rules. This process resulted in harmonizing 24 survey questions from across the 5 data sets. These 24 harmonized questions resulted in seven hypotheses being analyzed. Few characteristics of the data set are: 25,201 respondents < 35 yrs; 50% M/F; of ever users 61% chose flavored cigars; highest initiation - females 25-34 yrs; males <18yrs; need to smoke cigars highest <18yrs. Examples

of research questions: 1) how does trying a cigar product vary by demographics; by first time users; by flavors 2) For those who say they "needed" a cigar what does that population look like compared with those who did not "need" a cigar, but were cigar users? 3) Are those who initiated cigar use with flavors more likely to continue to use cigar products? We have varying ages of respondents, study design differences, sample size differences. We used a Model-Based Inference Approach to apply an Integrative Data Analysis (IDA) Technique to the harmonized data set. This approach incorporates study of origin as a predictor in statistical analyses of the harmonized data to control for differences between studies that might be due to demographics or sampling. Commonalities/differences in the effects of interest across studies are evaluated by incorporating interactions between study of origin and key predictors. This analysis will serve as a *Proof of Concept* of how such collaborative research is possible.

**FUNDING:** Federal

**CORRESPONDING AUTHOR:** Howard Fishbein, DrPH, MPH, Westat, Inc., MD, USA

## SYM25B

### IDENTIFYING AND ADDRESSING CIGAR MEASUREMENT CHALLENGES

MeLisa Creamer<sup>\*1</sup>, Josephine Hinds<sup>2</sup>, Grace Kong<sup>3</sup>, Howard Fishbein<sup>4</sup>, Jennifer Ross<sup>5</sup>, <sup>1</sup>University of Texas, TX, USA, <sup>2</sup>The University of Texas at Austin, TX, USA, <sup>3</sup>Yale University, CT, USA, <sup>4</sup>Westat, Inc, MD, USA, <sup>5</sup>Wake Forest School of Medicine, NC, USA

The Tobacco Centers of Regulatory Science (TCORS) Cigar Measurement Working Group is composed of members from four TCORS and the Center for Evaluation and Coordinator of Training and Research in Tobacco Regulatory Science (CECTR). The primary purpose of this group is to address measurement issues of cigar products, including large cigars, little filtered cigars, and cigarillos. This group is focused on 1) cigar use measures on current national assessments of cigar products and 2) a review of the published cigar measurement studies to highlight current measurement challenges. To assess existing cigar measures, we presented a compilation of measures from 10 national surveys, including the Population Assessment of Tobacco and Health (PATH), National Youth and Adult Tobacco Surveys (NYTS, NATS), and Monitoring the Future (MTF). Across these national surveys, we found many measurement inconsistencies, making data comparisons difficult. For example, some surveys separate questions by cigar type (e.g., traditional cigars vs. cigarillos) whereas others categorize all cigars as one product; and some surveys define current use as past 30 days whereas others measure current use as using "every day or some days." The PATH study provides the most detailed questions on these constructs as well as patterns of cigar use (e.g., quantity and frequency) for different cigar types, which are generally lacking in other studies. In terms of measurement studies (n=9), we identified several measurement challenges and gaps that need to be further addressed and explored. Some of these challenges include the variations of cigar terminology used, whether to provide brand names in study questionnaires, and how to incorporate frequent cigar product manipulation practices such as "blunting" (as users replace some or all of the loose tobacco with marijuana), which make cigar quantity and frequency difficult to assess. Since first organizing in November 2016 meeting, the Cigar Measurement Working Group continues to identify measurement opportunities and are working on the development of products, such as systematic reviews, that may help to address these measurement challenges of cigar use.

**FUNDING:** Federal

**CORRESPONDING AUTHOR:** MeLisa Creamer, PhD, University of Texas, TX, USA

## SYM25C

### COMPARATIVE ACUTE PULMONARY TOXICITY AND BIOMARKERS OF CIGARILLOS, WATERPIPES, AND CIGARETTE SMOKE (IN MICE)

Irfan Rahman<sup>\*1</sup>, Isaac Sundar<sup>2</sup>, Naushad Kahn<sup>2</sup>, <sup>1</sup>University of Rochester Medical Center, NY, USA, <sup>2</sup>University of Rochester, NY, USA

The popularity of cigarillos (mini or little cigars), waterpipe/hookah smoking is increasing in western countries. Epidemiological studies suggest that harmful effects of cigars/cigarillos and waterpipe tobacco smoke are similar in their effects



perhaps more than that of conventional cigarettes. Cigarillos including flavored mini cigars and waterpipe tobacco users inhale toxic compounds including high levels of particulates and carbon monoxide that are deleterious to the respiratory system. We determined the comparative acute pulmonary toxicity of cigarillos, waterpipe smoke (WS) and cigarette smoke (CS) exposures in mice. Adult C57BL/6J mice were exposed to cigars (flavored cigarillos), WS and CS (research grade 3R4F cigarettes) for 3 days (~300 mg/m<sup>3</sup> TPM, two 1 hr session with 1 hr interval) based on topography parameters, and mice were sacrificed after 24 hrs post-last exposures. Exposure to cigarillos and WS was performed using a direct whole body inhalation exposure system via a CSM-SSM machine with pump (CH-Technologies Inc.). Serum cotinine levels in exposed mice were measured to ensure the exposure equivalent. Comparative effect of acute cigarillos, WS and CS exposures on pulmonary toxic responses (e.g., oxidative stress and inflammatory response as biomarkers) was assessed. We found total lung inflammatory cell influx was differentially regulated after cigarillos, WS versus CS exposures. Further analysis of specific inflammatory cell influx in bronchoalveolar lavage fluid show neutrophils and T-lymphocytes were differentially increased by CS versus cigarillos and WS exposures. Total GSH was significantly decreased by CS vs WS. Similarly, the level of lipid peroxidation marker malondialdehyde was increased by cigarillos, CS vs WS. Pro-inflammatory cytokines (MCP-1, KC, and MIP-2) levels were increased in BALF by cigarillos and WS vs. CS. Our data suggest that acute pulmonary toxicity is differentially regulated by cigars and WS versus CS. Further studies are in progress to determine the long-term chronic comparative effects of cigarillos, WS and CS in lung injurious responses and biomarkers.

FUNDING: Federal

CORRESPONDING AUTHOR: Irfan Rahman, PhD, University of Rochester Medical Center, NY, USA

## SYM26

### USING MHEALTH INTERVENTIONS TO REACH VULNERABLE POPULATIONS WITH TOBACCO CESSATION RESOURCES

Julia McQuoid, PhD, MS, University of California San Francisco, CA, USA; Jonathan Shuter, MD, Albert Einstein College of Medicine, NY, USA; Dana Christofferson, PhD, U.S. Department of Veterans Affairs, DC, USA; Lorien Abrams, ScD, George Washington University Milken Institute School of Public Health, DC, USA

The populations with the highest rates of smoking and other tobacco use are often the groups least likely to access cessation services. Mobile health (mHealth) interventions minimize many traditional barriers to use, such as transportation and costs, and offer anonymity, which may be especially important to stigmatized populations. Even among vulnerable populations in the United States, both cellphone ownership and smartphone ownership are ubiquitous, making these modalities well-suited to reach traditionally hard to reach populations. mHealth cessation programs can be tailored to the unique needs and tobacco use patterns of specific populations. In this symposium, we provide examples of how cellphones can be used to (1) collect data on vulnerable populations that can be used to tailor interventions, and (2) deliver cessation interventions to specific subgroups of smokers. The first presentation describes a study that used a mixed methods ecological momentary assessment to gather data on LGBTQ+ young adults smoking patterns to inform the design of mHealth interventions. The next presentation describes Positively Smoke Free - Mobile (PSF-M), the first smartphone-based tobacco treatment program targeting persons living with HIV (PLWH) who smoke. The third presentation describes the development and preliminary findings from a smokeless tobacco (i.e., dip, chew) text-messaging cessation program for military veterans, who have high rates of smokeless tobacco use. The final presentation will present findings from a randomized trial of Quit4baby, a text-messaging cessation program for pregnant smokers, who are often reluctant to seek out treatment services because of the stigma associated with smoking while pregnant. The symposium will end with a discussion around the potential of mHealth cessation resources for vulnerable populations and future research needs.

JUSTIFICATION: This symposium will provide valuable information for practitioners interested in research about or use of digital cessation interventions for at-risk populations.

FUNDING: Academic Institution

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## SYM26A

### INTEGRATING ECOLOGICAL MOMENTARY ASSESSMENT WITH SPACE-TIME GEOGRAPHY TO IMPROVE MHEALTH TOBACCO INTERVENTIONS FOR LGBTQ+ YOUNG ADULTS

Julia McQuoid<sup>\*1</sup>, Johannes Thru<sup>2</sup>, Pamela Ling<sup>3</sup>, <sup>1</sup>University of California San Francisco, CA, USA, <sup>2</sup>Bloomberg School of Public Health - Johns Hopkins, MD, USA, <sup>3</sup>University of California San Francisco School of Medicine, CA, USA

BACKGROUND: Tobacco use and associated health risks are increasingly concentrated within marginalized groups, including LGBTQ+ young adults. In-depth understanding of contexts of tobacco use may improve tailored mHealth smoking cessation interventions. This novel mixed method study combined ecological momentary assessment (EMA), GPS, and an adapted travel diary-interview method for understanding place-based practices of smoking among high risk individuals. METHODS: Participants ( $N=17$  bisexuals, ages 18-26) collected data on non-smoking and smoking situations for 30 days with a smartphone app. EMA surveys captured internal and external situational factors (e.g., craving intensity, location type, seeing others smoking). Participants' mobility patterns were collected continuously using phone location sensors. Subsequently, participants completed in-depth interviews reviewing maps of their own EMA and mobility data. Data and transcripts were analyzed separately and integrated at the case level in a matrix. RESULTS: The integration of EMA maps into the interview prompted discussion of contexts and smoking practices that may not have otherwise been discussed. Interviews clarified participant interpretation of EMA measures and provided insight into experiences and meanings of smoking locations and practices (e.g., smoking in a moving versus parked car). The EMA method identified the most frequent smoking locations/times for each participant (e.g., afternoons on university campus) and the interviews added enriched descriptions of associated situational factors and participant perceptions of social contexts, (e.g., peer rejection of bisexual identity) and the role of smoking therein (e.g., physically escape uncomfortable environments). DISCUSSION: This mixed method reveals the richness of individuals' experiences of smoking contexts while providing objective measures of situational smoking factors. These findings can inform tailored mHealth interventions (e.g., cessation apps, online support group content) for high risk young adults such as bisexuals. Future studies could integrate GIS analysis of area-level characteristics with an activity space approach.

FUNDING: Academic Institution

CORRESPONDING AUTHOR: Julia McQuoid, PhD, MS, University of California San Francisco, CA, USA

## SYM26B

### POSITIVELY SMOKE FREE - MOBILE (PSF-M): AN MHEALTH APPROACH TO TOBACCO TREATMENT FOR HIV-INFECTED SMOKERS

Jonathan Shuter<sup>\*1</sup>, Lawrence An<sup>2</sup>, Lorien Abrams<sup>3</sup>, <sup>1</sup>Albert Einstein College of Medicine, NY, USA, <sup>2</sup>University of Michigan, MI, USA, <sup>3</sup>Milken Institute School of Public Health, George Washington University, DC, USA

BACKGROUND: Persons living with HIV (PLWH) in the US smoke at triple the rate of the general population, and smoking is now the leading killer of PLWH. Efforts to promote cessation have met with limited success. PSF-M is the first smartphone-based tobacco treatment targeting PLWH smokers. Setting: Montefiore CPL Clinic, an outpatient HIV care center in the Bronx, NY. The Bronx is the poorest urban county in the US. 28% of Bronx households live in poverty, and 2% of Bronx residents have HIV infection. METHODS: From 2015-2017, we performed a randomized controlled trial of PSF-M vs standard care to assess feasibility and preliminary efficacy in 100 PLWH smokers. PSF-M is a mobile website that offers an SMS-based quit-smoking program and smartphone features including secure login, quit-day selection/ calendar, 9 educational/motivational videos (5-10 minutes each), and a HELP button with craving response options. RESULTS: 88% of screened candidates enrolled. 11% were excluded because of inadequate cellphone capabilities, and 1% because of low literacy. 48/100 were randomized to PSF-M, mean age=45, 54% male, 81% Black, 31% Latino, 83% unemployed. They smoked a mean of 12 cigs/day and 60% reported moderate/high nicotine addiction. PSF-M UTILIZATION: Participants viewed a mean of 6/9 videos, logged into the site on 13 of a possible 42 days, and received 131 text messages. 77% used the HELP feature for cravings (58% phone-a-friend, 29% play-a-game, 4% play-a-song). 67% requested craving tips by text. 10% opted to stop all incoming PSF-M texts. SATISFACTION: 58% rated PSF-M very/extremely helpful, and 56% rated themselves very/extremely satisfied. 98% would recommend PSF-M to PLWH family or friends as a quitting aid. EFFICACY: Abstinence at 3 months, number of quit attempts, and reduction in daily





cig consumption all favored PSF-M over standard care, but none of these achieved statistical significance in our pilot sample. **CONCLUSIONS:** A smartphone-based, mHealth tobacco treatment program for PLWH was feasible and achieved moderate-high rates of engagement, acceptability, and satisfaction in a middle-aged, ethnic/racial minority group in the poorest urban community in the US.

FUNDING: Federal

CORRESPONDING AUTHOR: Jonathan Shuter, MD, Albert Einstein College of Medicine, NY, USA

## SYM26C

### DEVELOPMENT AND EVALUATION OF A SMOKELESS TOBACCO CESSATION MOBILE HEALTH PROGRAM FOR MILITARY VETERANS

Dana Christofferson<sup>\*1</sup>, Jeffrey Hertzberg<sup>2</sup>, Paul Dennis<sup>2</sup>, Jean Beckham<sup>2</sup>, Kim Hamlett-Berry<sup>1</sup>, <sup>1</sup>U.S. Department of Veterans Affairs, DC, USA, <sup>2</sup>Durham VA Medical Center, NC, USA

Although cigarette smokers make up the majority of tobacco users, rates of use and consumption of smokeless tobacco are on the rise among military personnel and the general U.S. adult population. Almost 5% of all Veterans are estimated to be current smokeless tobacco users. Research on effective interventions for smokeless tobacco users is limited and as a result, there are few tobacco cessation resources tailored to individuals who use dip or chewing tobacco. SmokefreeVET is a text message-based tobacco cessation program developed to help Veterans in the VA health care system quit tobacco. A message library specific for smokeless tobacco was developed and released as part of SmokefreeVET in February 2017 to provide tailored tips and support for smokeless tobacco users. The original SmokefreeVET message library was maintained for cigarette smokers. Upon enrollment, SmokefreeVET users were asked what type of tobacco they use and enrolled in the corresponding message library. The message libraries for cigarette smokers and smokeless users contained the same number of messages, assessment questions, message type and structure. To evaluate the differences between smokeless tobacco users and cigarette smokers using the SmokefreeVET text program, demographic information on users who set quit dates between February 23, 2017 and August 14, 2017 was analyzed and compared between cigarette smokers (N=383) and smokeless tobacco users (N=50). Smokeless tobacco users were significantly younger ( $t=2.95$ ;  $p=.0034$ ) and more likely to be male ( $\chi^2=13.58$ ;  $p=.0002$ ) compared to cigarette smokers using SmokefreeVET. After controlling for baseline demographic differences, smokeless tobacco users were found to have received significantly fewer messages from the SmokefreeVET text program after their quit date ( $F=4.78$ ;  $p=.0294$ ) and were more likely to opt-out within 7 days of their quit date than cigarette smokers ( $\chi^2=5.91$ ;  $p=.015$ ). These findings suggest differences in utilization between smokers and smokeless users and indicate further evaluation and analysis of smokeless tobacco user engagement and outcomes is necessary.

FUNDING: Federal

CORRESPONDING AUTHOR: Dana Christofferson, PhD, U.S. Department of Veterans Affairs, DC, USA

## SYM26D

### A RANDOMIZED TRIAL OF TEXT MESSAGING FOR SMOKING CESSATION IN PREGNANT WOMEN

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**INTRODUCTION:** There is a need for innovation in both the enrollment of pregnant smokers in smoking cessation treatment programs and in the type of treatment programs offered. The study tests whether an interactive and intensive text messaging program, Quit4baby, can promote smoking cessation for pregnant women already enrolled in a health text messaging program, Text4baby. **METHODS:** Between July 2015 and February 2016, a total of 35,957 recruitment text messages were sent to Text4baby subscribers. Eligible pregnant smokers were enrolled and randomized to receive Text4baby (control) or Text4baby and Quit4baby (intervention; N=497). Participants were surveyed at 1month, 3 months, and 6months post-enrollment, and saliva samples were collected at 3months for biochemical verification of smoking status. Data were collected from 2015 to 2016 and analyzed in 2016. **RESULTS:**

Using an intention-to-treat analysis, 28.80% of the intervention group and 15.79% of the control group reported not smoking in the past 7 days at 1 month ( $p<0.01$ ), and 35.20% of the intervention group and 22.67% of the control group reported not smoking in the past 7 days at 3 months ( $p<0.01$ ). Biochemical verification of smoking status at 3 months indicated no significant differences between groups (15.60% in the intervention group and 10.93% in the control group [ $p=0.13$ ]), although significant differences favoring the intervention were found for older smokers ( $p<0.05$ ) and for those who enrolled in their second or third trimester of pregnancy ( $p<0.05$ ). Self-report of late pregnancy 7- and 30-day point prevalence abstinence favored the intervention group ( $p<0.001$ ,  $p<0.01$ ). No significant differences were observed at the 6-month follow-up or in the postpartum period. **CONCLUSIONS:** Results provide limited support of the efficacy of the Quit4baby text messaging program in the short term and late in pregnancy, but not in the postpartum period.

FUNDING: Federal

CORRESPONDING AUTHOR: Lorien Abrams, ScD, George Washington University Milken Institute School of Public Health, DC, USA

## SYM27

### TOBACCO PERCEPTIONS IN VULNERABLE POPULATIONS

Allison Groom, American Heart Association and A-TRAC, TX, USA; Grace Kong, Yale School of Medicine, CT, USA; Maria Cooper, UTHealth, TX, USA; Andrea Villanti, University of Vermont, VT, USA

Tobacco perceptions, which are important determinants of tobacco use behaviors, have become more complex given the rapid rise in the use of alternative and multiple tobacco products in recent years and different risks associated with them. Less known are tobacco perceptions among sub-populations that have been traditionally vulnerable to tobacco products. This symposium presents data from the TCORS Vulnerable Populations Working Group on varying tobacco perceptions and associated factors of these perceptions among vulnerable populations (i.e., adolescents, young adults) using a variety of methods (i.e., quantitative studies using latent class analyses [LCA], a qualitative study, a systematic review study). First, a focus group study with adolescents in Appalachian communities identified tobacco as deeply entrenched in local culture and a strong influence on youth tobacco use behaviors. Second, a systematic review of hookah among adolescents indicated that adolescents perceived hookah to be less harmful than cigarettes, and these lower risk perceptions were associated with higher likelihood of hookah use. Third, two studies employed LCA to identify groups of individuals who hold similar tobacco harm perceptions. LCA of 2013-14 Population Assessment of Tobacco and Health (PATH) youth data showed that although about one third of adolescents perceived harm across various tobacco products, groups of youth also reported being unaware of the tobacco products or not knowing harm perceptions association with these products. These youths were young, non-White and low-SES. LCA of 2015 Health Information National Trends Survey (HINTS) data showed that classes of adults with inaccurate harm perceptions of cigarette smoking were associated with low education and low income. These studies show that tobacco harm perceptions are varied, depending on the product examined, and also suggest that education and prevention campaigns should focus on vulnerable adolescents/young adults to increase the awareness of tobacco harm.

**JUSTIFICATION:** Findings presented in this symposium highlight the need for targeted educational efforts on tobacco harms in vulnerable populations, including non-white and rural youth, and adults with low education and income.

FUNDING: Federal

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## SYM27A

### THE "STATE" OF TOBACCO: PERCEPTIONS OF TOBACCO AMONG APPALACHIAN YOUTH IN KENTUCKY

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**INTRODUCTION:** In Appalachia, youth tobacco use rates remain higher than the national average. In some communities, decreases in youth current combustible





cigarette use have paralleled increases in newer tobacco product use (e.g., electronic cigarettes). Past research has indicated that several factors are related to high rates of tobacco use among Appalachian youth (e.g., low SES, rural lifestyles, tobacco farming). Of the states in the Appalachian region, Kentucky has the highest rate of youth tobacco use. The aim of this study was to explore views of tobacco among Kentucky youth living in Appalachian counties. **METHODS:** In Fall 2014-Spring 2015, focus group interviews were conducted with middle school and high school students (N=112) living in Appalachian counties in Kentucky. Each focus group contained open-ended questions and was conducted by trained facilitators. Using open coding, focus group transcripts and field notes were analyzed. **RESULTS:** Across the focus groups, study participants described an entrenched culture of tobacco in their communities. Three themes exemplified this culture. First, behaviors served to enable youth tobacco use (e.g., teachers ignoring snuff use in class, adults smoking with youth). Second, tobacco is easily accessible to youth (e.g., restrictions on youth sales are often ignored, family members provide). Third, symbols of tobacco are prevalent in many areas (e.g., festival celebrating tobacco heritage, tobacco barns and logos). **CONCLUSIONS:** Youth participants described a deeply rooted tobacco culture that they believed was unlikely to change. Additional study and health education efforts are needed in these rural communities. Further, stricter enforcement of tobacco sales and marketing restrictions may be helpful in protecting this vulnerable population.

FUNDING: Federal

CORRESPONDING AUTHOR: Allison Groom, American Heart Association and A-TRAC, TX, USA

## SYM27B

### A LATENT CLASS ANALYSIS OF TOBACCO HARM PERCEPTIONS AMONG US ADOLESCENTS

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**OBJECTIVE:** To identify classes of adolescents based on their awareness and perceptions of harm regarding a variety of tobacco products (i.e., e-cigarettes, cigars, hookah, smokeless tobacco). **METHODS:** Data were obtained from Wave 1 (2013-14) of the Population Assessment of Tobacco and Health youth and parent survey (PATH; N=13,651). Latent class analyses (LCA) identified groups of adolescents with similar awareness and harm perceptions across tobacco products. Multinomial logistic regression analyses assessed the associations of demographic characteristics and tobacco use with identified classes. **RESULTS:** Adolescents were aware of e-cigarettes (87.1%), smokeless tobacco (74.6%), cigars (62.1%), and hookah (60.1%). LCA identified five classes of adolescents: 1) perceived harm across all tobacco products (36.6%); 2) perceived harm for e-cigarettes and smokeless tobacco (48.2%); 3) never heard of all tobacco products (8.6%); 4) a mix of no harm and any harm across tobacco products (5.2%); and 5) "don't know" the harm across tobacco products (1.4%). Relative to the class of adolescents who perceived harm across all tobacco products, classes of adolescents who were unaware of the products or did not know the harms were more likely to be non-White, younger, and have lower parental education, and were less likely to have tried a tobacco product. **CONCLUSIONS:** Awareness and perceptions of harm varied across adolescents. Although more than one third of adolescents perceived harm across all tobacco products, the awareness and perceptions of harm across different tobacco products varied. Education and prevention efforts focused on informing youth about tobacco harm should target vulnerable youth populations, such as non-White and young adolescents and adolescents with low parental education.

FUNDING: Federal

CORRESPONDING AUTHOR: Grace Kong, Yale School of Medicine, CT, USA

## SYM27C

### HOOCAH USE AMONG U.S. YOUTH: A SYSTEMATIC REVIEW

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**INTRODUCTION:** Hookah is currently the second most commonly used tobacco product among U.S. youth; however there is limited understanding of how youth perceive hookah and associations between hookah use and use of other products. Given the Food and Drug Administration (FDA)'s authority to regulate hookah, more research is needed to inform regulations intended to prevent youth from using hookah. This systematic review summarizes and assesses the literature related to hookah use among adolescents (ages 11-18 years of age) in the U.S. from 2009 to 2017. **METHODS:** Database searches yielded 867 peer-review articles, and after duplicates were removed, authors independently screened 461 articles to determine if they met eligibility criteria. Included articles (n=55) were coded under the following themes related to hookah use: 1) prevalence; 2) sociodemographic correlates; 3) psychosocial risk factors; 4) concurrent use of other tobacco products; and 5) concurrent use of other substances. Other themes were coded but are not presented here. Articles were also coded for study quality and their relevance to FDA's research priorities. A qualitative synthesis is presented by each theme. **RESULTS:** Thirty-five articles were cross-sectional studies, 9 were repeated cross-sectional studies, 8 were cohort studies, and 3 were mixed methods or qualitative studies. Twenty-one articles included themes on harm perceptions and other psychosocial risk factors, such as attitudes and peer use. The qualitative synthesis showed that youth perceive hookah to be less harmful than cigarette smoking, and these lower perceptions are associated with higher odds of hookah use. Measures of harm perceptions varied across studies. Prevalence of hookah use (n=45), sociodemographic correlates (n=33), concurrent use with other tobacco products (n=35), and other substances (n=10) were also common themes. All articles fell within FDA's research priority to understand behaviors related to diverse tobacco product use. **CONCLUSIONS:** Longitudinal studies are needed to determine the causal sequence between harm perceptions and hookah use to inform interventions and policies targeted to protect vulnerable youth.

FUNDING: Federal

CORRESPONDING AUTHOR: Maria Cooper, UTHealth, TX, USA

## SYM27D

### DIFFERENCES IN US ADULTS' CIGARETTE BELIEFS BY EDUCATION AND INCOME: RESULTS FROM 2015 HINTS DATA

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**SIGNIFICANCE:** Recent studies in population samples of young adults and adults demonstrate that relative harm perceptions of tobacco products predict subsequent tobacco use behavior. The goal of the current study was to identify groups of adults who hold similar cigarette harm beliefs through latent class analysis and determine correlates of those groups. **METHODS:** Latent class analysis (LCA) was applied to all adult respondents of the 2015 Health Information National Trends Survey (HINTS; n = 3,706). Variables in the latent class model included measures of cigarette harm beliefs (i.e., origin of cigarette chemicals, length of time for cigarette harms to occur, impact of a few cigarettes per day on health, impact of 10 cigarettes per day on health, absolute harm of cigarette smoking, differential harm of some types of cigarettes). Latent class models were run in Stata 15 using the LCA Stata plugin fitting two through five classes models to find the best fit. Subsequent analyses examined sociodemographic correlates of the latent classes using survey weights. **RESULTS:** The optimal model selected based on BIC identified three latent classes of cigarette harm beliefs among U.S. adults: High harm beliefs (Class 1, 81%), Moderate harm beliefs (Class 2, 18%), and Low harm beliefs (Class 3, 1%). Those in Class 3 perceived minimal harm from smoking up to 10 cigarettes per day and 67% believed that someone had to smoke for 10 or more years to be harmed by smoking. Over 60% of those in Class 3 had less than a high school education, compared to 3% of those in Class 1 and 39% of those in Class 2. Similarly, 54% of those in Class 3 reported a household income of less than \$20,000 compared to 27% of those in Class 2 and 19% in

Class 1. Current cigarette smoking was highest in Class 3 (45%) compared to Class 2 (29%) and Class 1 (12%). CONCLUSIONS: Inaccurate beliefs about the harms of cigarette smoking are correlated with cigarette smoking itself, as well as education and income, both known risk factors for smoking. Targeted educational efforts are needed to increase knowledge and beliefs about the harms of smoking in socioeconomically-disadvantaged adults.

FUNDING: Federal

CORRESPONDING AUTHOR: Andrea Villanti, University of Vermont, VT, USA

## SYM28

### REACHING ADOLESCENTS WITH DIGITAL SMOKING CESSATION INTERVENTIONS

Cendrine Robinson, PhD, MPH, National Cancer Institute, MD, USA; Yvonne Hunt, PhD, MPH, National Cancer Institute, MD, USA; Emily Grenen, Msc, ICF, MD, USA; Kisha Coa, PhD, MPH, ICF, MD, USA

The treatment of adolescent tobacco dependence is a public health priority. However, adolescent smokers are a difficult population to reach and engage in tobacco cessation interventions. Non-daily smoking and the use of alternative tobacco products (e.g., e-cigarettes) are prevalent behaviors among adolescents; many do not self-identify as smokers, and do not perceive cessation interventions as being personally relevant. In addition, adolescents may be reluctant to seek help with quitting because of confidentiality concerns. Given the unique challenges in reaching adolescents with cessation interventions, health practitioners should consider innovative approaches. Digital interventions, in particular, have the potential to reach adolescents in a way that traditional modalities cannot. Technology is fully integrated into the lives of today's adolescents, meaning digital mediums provide an opportunity to reach young people where and when they need support. The National Cancer Institute's (NCI) Smokefree.gov initiative has developed a suite of digital adolescent-focused smoking cessation resources, including a website (Smokefree Teen), mobile application (quitSTART), and text messaging program (SmokefreeTXT). However, while the Smokefree.gov initiative has successfully reached adult audiences, it has less effectively reached adolescent smokers. This symposium will provide an overview of research-based efforts the Smokefree.gov team undertook to improve adolescent reach and engagement. First, Dr. Robinson will present the results of a content analysis of adolescent-focused mobile applications. Following this, Dr. Hunt will discuss the results of an environmental scan of adolescent-focused digital intervention strategies. Ms. Grenen and Dr. Coa will present analyses of user data from two of the National Cancer Institute's adolescent-focused cessation resources, the quitSTART app and SmokefreeTXT. As discussed, Dr. Grana Mayne will reflect on how the findings inform a better understanding of how technology has been implemented to successfully reach and engage youth in behavior change, where it has faced shortcomings, and ideas for future directions.

JUSTIFICATION: Attendees will come away with a better understanding of how digital technology has been implemented to successfully reach and engage youth for tobacco cessation interventions, where it has faced shortcomings, and ideas for future directions.

FUNDING: Federal

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## SYM28A

### A CONTENT ANALYSIS OF SMARTPHONE APPS FOR ADOLESCENT SMOKING CESSATION

Cendrine Robinson<sup>1</sup>, Elizabeth Seaman<sup>1</sup>, Emily Grenen<sup>2</sup>, Latrice Montgomery<sup>3</sup>, Robert Yockey<sup>4</sup>, Kisha Coa<sup>2</sup>, Yvonne Hunt<sup>1</sup>, Erik Augustson<sup>1</sup>, <sup>1</sup>National Cancer Institute, MD, USA, <sup>2</sup>ICF, MD, USA, <sup>3</sup>University of Cincinnati College of Medicine, OH, USA, <sup>4</sup>University of Cincinnati, OH, USA

SIGNIFICANCE: Adolescent cigarette smokers have an increased risk of tobacco-related diseases. Smartphone applications (apps) for smoking cessation are a promising tool. However, research on apps designed specifically for adolescent smoking cessation is limited. In the current study, we describe the presence of evidence-based, adolescent-specific smoking cessation content in mobile apps targeting either an adolescent or a general audience (i.e., no specified age group). METHODS: Free, publicly available, adolescent and general-audience smoking cessation apps were identified by searching the Google Play and Apple

app store. Two coders examined each app to determine the presence of general evidence-based content and adolescent specific content. We created summary scores for coder ratings of general evidence-based content and adolescent specific evidence-based content, respectively. RESULTS: We identified 8 adolescent apps which we compared to the top 38 general apps (as ranked by Apple and Google). General evidence-based content that assisted with developing a quit plan (general: 73.68%; adolescent: 87.50%) and enhancing motivation by describing the rewards of not smoking (general: 76.32%; adolescent: 62.50%) were common across both general and adolescent apps. Teen specific content such as peer influence on smoking was common in teen apps but not in general apps (general: 5.26%; adolescent: 62.50%). Adolescent apps had a higher general evidence-based content summary score ( $t(44) = 2.53, p = .02$ ) and a higher adolescent specific evidence-based content summary score ( $t(7.81) = 2.45, p = .04$ ) than the general audience apps. CONCLUSIONS: Among the apps we assessed, smoking cessation apps targeted to adolescents had more evidence-based content than general audience apps. Future research is needed to determine the extent to which adolescents engage with the evidence-based content in these apps.

FUNDING: Federal

CORRESPONDING AUTHOR: Cendrine Robinson, PhD, MPH, National Cancer Institute, MD, USA

## SYM28B

### LEVERAGING LESSONS LEARNED TO IMPROVE DIGITAL ADOLESCENT TOBACCO CESSATION INTERVENTIONS: HIGHLIGHTS FROM AN ENVIRONMENTAL SCAN OF WEB AND MOBILE-BASED BEHAVIOR CHANGE RESOURCES

Yvonne Hunt<sup>1</sup>, Cendrine Robinson<sup>1</sup>, Emily Grenen<sup>2</sup>, Kisha Coa<sup>2</sup>, <sup>1</sup>National Cancer Institute, MD, USA, <sup>2</sup>ICF, MD, USA

SIGNIFICANCE: While the Smokefree.gov initiative has been successful in reaching adult smokers, like many other smoking cessation programs, it has less effectively reached adolescent smokers. An important first step to understanding how to better reach young people with digital smoking cessation content is to review the current digital intervention landscape for adolescent smoking cessation, and explore the ways in which we might leverage effective, digital intervention strategies from other health behavior change domains. METHODS: To inform efforts to increase adolescent engagement with Smokefree.gov teen resources, we conducted an environmental scan of the current landscape of digital adolescent smoking cessation and other health behavior domain interventions. RESULTS: We identified four digital smoking cessation interventions for adolescents published within the last five years. All of the interventions were text-message based. While text message interventions were effective in reducing the number of cigarettes smoked per day by participants, none resulted in significantly higher abstinence rates. The scan of other digital design solutions for adolescent health behavior change revealed that commonly used features within interventions included avatars, social networking, self-monitoring, incentives/rewards, and tailored content. CONCLUSIONS: There is a dearth of recent evidence on smoking cessation interventions for adolescents. The extant literature on digital health behavior interventions can inform the Smokefree.gov initiative's efforts to more effectively reach and engage young people, by leveraging strategies that have been successful in interventions within other health behavior domains. Already, the environmental scan has informed adolescent-tailoring improvements and design changes that are currently in development for the Smokefree Teen website.

FUNDING: Federal

CORRESPONDING AUTHOR: Yvonne Hunt, PhD, MPH, National Cancer Institute, MD, USA

## SYM28C

### REACH AND ENGAGEMENT OF ADOLESCENTS WITH A MOBILE APPLICATION FOR QUITTING SMOKING

Emily Grenen<sup>1</sup>, Kisha Coa<sup>1</sup>, Ellen Beckjord<sup>2</sup>, Maria Asencio<sup>1</sup>, Yvonne Hunt<sup>3</sup>, Erik Augustson<sup>3</sup>, <sup>1</sup>ICF, MD, USA, <sup>2</sup>University of Pittsburgh Medical Center, PA, USA, <sup>3</sup>National Cancer Institute, MD, USA

SIGNIFICANCE: Mobile applications (apps) have potential as a medium for adolescent smoking cessation interventions. However, most studies examine apps for adult populations, and focus on app content, but not user characteristics or

engagement. Therefore, this study explores adolescent characteristics and use of the National Cancer Institute's quitSTART app. METHODS: quitSTART is a free smoking cessation app, designed for adolescent (12-17) and young adult smokers, although publically available for use by anyone. We assessed differences in characteristics and app use between users ages 12-17 and over 18. RESULTS: From October 2015 - September 2016, adolescents made up 4% (N=472) of all app users. On average, adolescent users spent fewer days in the app (4.2 days), compared to older users (6.8;  $p<0.01$ ), and had fewer sessions (; 8.6) compared to adults (13.4;  $p<0.01$ ). Upon enrollment, adolescents were less likely to indicate that certain times of day triggered them to smoke (like mornings, nights and weekdays;  $p<0.01$  each). Adolescents were less likely to report health (85.7% vs. 92.3% of adults;  $p<0.01$ ) and more likely to cite sports (32.2% vs. 25.6% of adults;  $p<0.01$ ), as a reason to quit. Adolescents were less likely to cite that situations (84.8% vs. 91.0% of adults;  $p<0.01$ ) and places (52.8% vs. 59.5% of adults;  $p<0.01$ ) as smoking triggers, but more likely to cite people (69.3% vs. 64.0% of adults;  $p=0.02$ ). Adolescent users were more likely to use app features at least once, like the buttons to report a slip-up (41.3% vs 35% of adults;  $p<0.01$ ), report a craving (45.8% vs 39.4% of adults;  $p<0.01$ ), or report a positive mood status (32.3% vs 27.4% of adults;  $p=0.02$ ). CONCLUSIONS: While adolescents use and have interest in apps for cessation, they are less likely to maintain engagement compared to older users (fewer days and sessions in app), which may reduce the efficacy of these resources. Understanding how adolescent smoking patterns and motivations to quitting differ from adults may help us better tailor apps and engage young users.

FUNDING: Federal

CORRESPONDING AUTHOR: Emily Grenen, Msc, ICF, MD, USA

## SYM28D

### REACH AND ENGAGEMENT OF ADOLESCENTS WITH A TEXT MESSAGING PROGRAM FOR QUITTING SMOKING

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<sup>1</sup>ICF, MD, USA, <sup>2</sup>National Cancer Institute, MD, USA

SIGNIFICANCE: Text message interventions minimize barriers like cost, transportation, and stigma, which prevent adolescents from accessing traditional smoking cessation programs. However, most studies on text message programs for cessation have been conducted in adult populations. Understanding how adolescent smokers' use of these programs compares to adults can help us tailor programs to young audiences. In this study, we explore use patterns between adolescent (12-17) and adult users (18+) of the SmokefreeTXT (SFTXT) program. METHODS: SFTXT is a free 6-week text-messaging program with tailored versions for adults and adolescents. Smoking, craving, and mood status are assessed via messages prompting a user response. We examined SFTXT user characteristics and use data for adolescent and adult users from October 2015 - September 2016. RESULTS: There were 1,557 adolescent and 33,752 adult sign-ups. Adolescent users were more likely to sign up for the program via SMS (40.3%) versus adults (14.84%;  $p<0.01$ ), than web. There were more male adolescent users (43.7%) than male adults users (37.2%;  $p<0.01$ ). About 28.8% of adolescent users dropped out of SFTXT before their quit date, versus 13.3% of adults. Among users who *did not* opt out prior to quit date, 42.0% of adolescents completed the entire 42-day program, compared to 58.8% of adults ( $p<0.01$ ). Early in the program, response rates to smoking assessment questions were similar between adolescents and adults. After the third week, adult response rates exceeded those for adolescents. Adults consistently had higher response rates to mood and craving questions. Abstinence rate at day 42 was 7.3% for adolescents and 14.0% for adults ( $p<0.01$ ). CONCLUSIONS: While text messaging offers a promising medium for smoking cessation interventions, engagement with the SFTXT program was lower among adolescents relative to adults - limiting its potential effectiveness. Given high rates of SFTXT pre-quit day dropout among adolescents, it is particularly important that adolescent smoking cessation programs focus on early intervention retention.

FUNDING: Federal

CORRESPONDING AUTHOR: Kisha Coa, PhD, MPH, ICF, MD, USA

## SYM29

### PROGRESS AND CHALLENGES RELATED TO ELIMINATING TOBACCO RELATED HEALTH DISPARITIES IN THE UNITED STATES

Pebbles Fagan, PhD, MPH, University of Arkansas for Medical Science, AR, USA; Phillip Gardiner, PhD, University of California, CA, USA; Valerie Yerger, ND, University of California, San Francisco, CA, USA

The 1985 Surgeon General's Report, *The Health Consequences of Smoking: Cancer and Chronic Lung Disease in the Workplace*, was the first comprehensive report to highlight the tobacco and related disease burden among socially classified groups. Following this landmark report, the 1998 Surgeon General's Report, *Tobacco Use Among U.S. Racial/Ethnic Minority Groups*, provided in-depth review of the tobacco and related disease burden among racial/ethnic groups in the U.S. The 2017 National Cancer Institute monograph, *A Socioecological Approach to Addressing Tobacco-Related Health Disparities*, is the first to provide the most comprehensive review of cigarette smoking among racial/ethnic minority and low socioeconomic status groups since the publication of the 1985 and 1998 Surgeon General's Reports. This symposium discusses current progress and future challenges that may influence tobacco use and disease outcomes among groups who have historically experienced disparities. The first paper, "How far have we come in our pursuit to eliminate tobacco related health disparities?", presents data on the current trends in tobacco use and exposure among racial/ethnic, low socioeconomic status, and lesbian, bisexual, gay, and transgender groups, which is described in the National Cancer Institute monograph, *A Socioecological Approach to Addressing Tobacco-Related Health Disparities*. The second paper, "A critical examination of the role of harm reduction in reducing tobacco-related health disparities", reviews the pros and cons of emerging products as a harm reduction approach for communities experiencing disparities. The third paper, "Menthol flavored tobacco products and the importance of policy advocacy at the local levels", discusses the role of community level organizing in reducing disparities related to menthol cigarette smoking. This symposium will critically examine action steps needed to increase the pace at which populations benefit from research, evidence-based practice, and policies. The presenters will also discuss why community needs and context should be taken into consideration as solutions to eliminating disparities are developed.

JUSTIFICATION: This symposium can have implications for future research, policy, and practice related to tobacco-related health disparities.

FUNDING: Federal

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## SYM29A

### HOW FAR HAVE WE COME IN OUR PURSUIT TO ELIMINATE TOBACCO RELATED HEALTH DISPARITIES?

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The 1985 Surgeon General's Report, *The Health Consequences of Smoking: Cancer and Chronic Lung Disease in the Workplace*, was the first comprehensive report to highlight the tobacco and related disease burden among socially classified groups. Following this landmark report, the 1998 Surgeon General's Report, *Tobacco Use Among U.S. Racial/Ethnic Minority Groups*, provided in-depth review of the tobacco and related disease burden among racial/ethnic groups in the U.S. The 2017 National Cancer Institute monograph, *A Socioecological Approach to Addressing Tobacco-Related Health Disparities*, is the first to provide the most comprehensive review of cigarette smoking among racial/ethnic minority and low socioeconomic status groups since the publication of the 1985 and 1998 Surgeon General's Reports. This paper presents data on the current trends in tobacco use and exposure among racial/ethnic, low socioeconomic status, and lesbian, bisexual, gay, and transgender groups, which is described in the National Cancer Institute monograph, *A Socioecological Approach to Addressing Tobacco-Related Health Disparities*. Data from national data surveys were compiled to summarize the current trends in tobacco use and exposure among racial/ethnic, low socioeconomic status, and lesbian, bisexual, gay, and transgender groups and intersection of these groups. Data show significantly declines in tobacco use and related diseases for all racial/ethnic groups over the past 20 years except among American Indians and Alaska Natives. Unexplained lung cancer disparities still exist for African Americans and American Indians and Alaska Natives. Prevalence data beyond cigarette smoking cannot be reported at the national level for some



racial/ethnic groups or by race-gender, race-socioeconomic status because sample sizes are too small. Data also show that disparities are increasing for some socioeconomic status groups. Critical action steps are needed to increase the pace at which populations benefit from research, evidence-based practice, and policies. Innovative and collaborative work is needed to strengthen the research and practice related to reducing disparities.

FUNDING: Federal

CORRESPONDING AUTHOR: Pebbles Fagan, PhD, MPH, University of Arkansas for Medical Science, AR, USA

## SYM29B

### A CRITICAL EXAMINATION OF THE ROLE OF HARM REDUCTION IN REDUCING TOBACCO-RELATED HEALTH DISPARITIES

Phillip Gardiner\*, University of California, CA, USA

In 2017, the National Cancer Institute published the first monograph, *A Socioecological Approach to Addressing Tobacco-Related Health Disparities*, that provides the most comprehensive review of cigarette smoking among racial/ethnic minority and low socioeconomic status groups since the publications of the 1985 and 1998 Surgeon General's Reports. While progress has been made to reduce tobacco use in the U.S., some groups still experience disparities related to tobacco use, exposure to tobacco, and disease consequences. Furthermore, some groups have not benefited from evidence-based practices at the same rate as other groups, prompting the need to investigate various strategies that could potentially expedite progress in reducing the overall disease burden among historically underserved and marginalized groups. This paper reviews the pros and cons of emerging products as a harm reduction approach for communities experiencing disparities. Available data from national data surveys were compiled to summarize the current trends in emerging product use among racial/ethnic, low socioeconomic status, and lesbian, bisexual, gay, and transgender groups. Data overall show a low prevalence of electronic cigarette use among various groups for whom data exist. Prevalence data do not show disparities in the use of products like electronic cigarettes except among American Indians and Alaska Natives. While some of these products could potentially decrease the lung cancer burden among various groups, it is not clear whether these products could potentially reduce the burden of other chronic diseases. Further, if the field increases the demand for emerging products among cigarette smokers as a strategy to get them to quit cigarette smoking, it is not clear how the movement from one nicotine product to another will impact overall disparities (health, social disadvantage) for communities who have been traditionally underserved and may also deal with other substance use problems and co-morbidities. A more critical debate is needed to determine how emerging products could potentially impact a range of health and social outcomes for various communities.

FUNDING: Unfunded

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## SYM29C

### MENTHOL FLAVORED TOBACCO PRODUCTS AND THE IMPORTANCE OF POLICY ADVOCACY AT THE LOCAL LEVELS

Valerie Yerger\*, University of California, San Francisco, CA, USA

In 2017, the National Cancer Institute published the first monograph, *A Socioecological Approach to Addressing Tobacco-Related Health Disparities*, that provides the most comprehensive review of cigarette smoking among racial/ethnic minority and low socioeconomic status groups since the publications of the 1985 and 1998 Surgeon General's Reports. The monograph concluded that while progress has been made to reduce tobacco use in the U.S., menthol flavored cigarette smoking is an ongoing public health concern for communities of color, particularly African American communities. Other flavored cigarettes were banned by the Food and Drug Administration as part of the Family Smoking Prevention and Tobacco Control Act of 2009, but no actions have been taken by the Food and Drug Administration to remove menthol flavor in tobacco despite the overwhelming evidence of its harm to communities of color and socially disadvantaged communities in the U.S. Recently, the FDA announced that it will seek public comment on the role that flavors in tobacco products—including menthol—play in attracting youth, as well as the role of flavors in harm reduction. Thus, critical efforts are needed at

the community level to reduce the toll of menthol flavored tobacco products on traditionally underserved communities. This paper discussed multiple case studies of efforts to mobilize communities against the use, marketing, sales, and distribution of menthol cigarettes. These case studies provide exemplars of working with and for communities to educate communities and leadership about the harms of menthol. This paper highlight wins and challenges encountered in efforts to mobilize communities against menthol cigarettes. The presenters will also discuss why community needs and context should be taken into consideration as solutions to eliminating disparities are developed.

FUNDING: Unfunded

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## SYM30

### DEMAND MODELING TO INFORM TOBACCO REGULATORY SCIENCE: TRANSDISCIPLINARY AND INTERNATIONAL PERSPECTIVES

Bryan Heckman, PhD, Medical University of South Carolina, SC, USA; Warren Bickel, PhD, Virginia Tech Carilion Research Institute, VA, USA; Kei-Wen Cheng, PhD, University of Illinois at Chicago, IL, USA; Ce Shang, PhD, University of Illinois at Chicago, IL, USA; David Levy, PhD, Georgetown University, DC, USA

Evidence-based policy decision-making provides significant benefits to population health. Policies and regulations on e-cigarettes (ECs) are taking different courses across countries. In the United States and England, EC marketing is permitted with some limited restrictions compared to Australia and Canada, where retail sale of nicotine-containing ECs is prohibited. This symposium presents findings from behavioral economic and economic studies that test how policy environment impacts traditional cigarette and EC demand. We demonstrate how data from laboratory studies and the 2016 International Tobacco Control (ITC) 4-Country Survey (involving adult current and former smokers and vapers) can contribute to our understanding of ideal regulatory standards. Dr. Bryan Heckman will discuss the utility of integrating purchase tasks into cohort studies to test the impact of EC use on cigarette demand. Dr. Warren Bickel will present an innovative paradigm, the Experimental Tobacco Marketplace (ETM), to test the impact of price (tax and subsidy) and nicotine levels in e-liquid policies in altering cigarette demand and e-liquid substitutability. Dr. Kei-Wen Cheng estimates EC substitutability through economic analyses and examines the impact of cigarette price increases and clean indoor air policies. Dr. Ce Shang will demonstrate that relative prices are an important determinant of transitioning into EC use regardless of regulatory environment. Dr. David Levy will show how regulatory policies that influence the viability of the internet, mass retail, and vape shop sectors of the EC market are likely to impact the demand for these products through their effect on prices and product attributes. Drs. Frank Chaloupka and Kenneth Warner's will offer integrative commentary on how these findings provide important evidence to governments facing decisions on EC regulations, and provide their perspectives on the best path forward.

JUSTIFICATION: Our symposium provides evidence that can be used to guide policy decision-making optimal for population health enhancement.

FUNDING: Federal

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## SYM30A

### THE INFLUENCE OF E-CIGARETTE USE AND REGULATORY ENVIRONMENT ON CIGARETTE DEMAND: BEHAVIORAL ECONOMIC PERSPECTIVE ACROSS FOUR COUNTIES

Bryan Heckman<sup>\*1</sup>, Geoffrey Fong<sup>2</sup>, Ron Borland<sup>3</sup>, Ann McNeill<sup>4</sup>, Richard O'Connor<sup>5</sup>, Warren Bickel<sup>6</sup>, Jeffrey Stein<sup>6</sup>, Derek Pope<sup>6</sup>, Ce Shang<sup>7</sup>, K. Michael Cummings<sup>1</sup>, <sup>1</sup>Medical University of South Carolina, SC, USA, <sup>2</sup>University of Waterloo, ON, Canada, <sup>3</sup>Cancer Council Victoria, Australia, <sup>4</sup>King's College London, United Kingdom, <sup>5</sup>Roswell Park Cancer Institute, NY, USA, <sup>6</sup>Virginia Tech Carilion Research Institute, VA, USA, <sup>7</sup>University of Illinois at Chicago, IL, USA

BACKGROUND: Government regulations of e-cigarettes (ECs) have evolved rapidly over the past 10 years. In Australia (AU) and Canada (CA) the sale of nicotine containing ECs are prohibited while their sale is allowed in England (EN) and the United States (US). The impact of regulatory environment on cigarette demand





is unknown. Behavioral economics offers a time- and cost-efficient approach to assess product demand. Hypothetical cigarette purchase tasks quantify participants' cigarette consumption across escalating levels of cost, such that greater consumption/insensitivity to price indicate higher demand. Elevated demand is associated with higher levels of nicotine dependence, lower motivation to quit, and greater difficulty quitting. Only two studies have examined the influence of e-cigarette use on cigarette demand, and no study has tested cross-country comparisons. The current study will fill these gaps by examining cigarette demand among smokers from the US/EN/CA/AU in the largest cigarette purchase task study to date. DESIGN/METHODS: Data for this study were from 6,261 adult smokers who participated in the 2016 International Tobacco Control (ITC) 4-country study. The web-based survey recruited representative samples. RESULTS: Cigarette demand varied by smoking status, vaping status, and country. As expected, daily smokers had greater demand relative to nondaily smokers (weekly/<weekly). For daily smokers, daily and weekly vapers had lower cigarette demand than <weekly and non-vapers. Among nondaily smokers, daily vapers had higher cigarette demand. Smokers from AU showed the highest cigarette demand, followed by US, and then CA/EN. CONCLUSIONS: EC use and regulatory environment appear to have marked impact on cigarette demand.

FUNDING: Federal

CORRESPONDING AUTHOR: Bryan Heckman, PhD, Medical University of South Carolina, SC, USA

## SYM30B

### THE EXPERIMENTAL TOBACCO MARKETPLACE: EFFECTS OF (1) E-LIQUID NICOTINE STRENGTH AND (2) TAXES AND SUBSIDIES

Warren Bickel\*, Virginia Tech Carilion Research Institute, VA, USA

BACKGROUND: The Experimental Tobacco Marketplace (ETM) provides an experimental method to estimate, prior to implementation, the effects of new policies or new products on purchasing patterns across various available products in a complex tobacco marketplace. This presentation discusses two recent studies utilizing the ETM. Both studies investigated the effects of potential regulations in interaction with 5 cigarette prices on cigarette demand and alternate product substitutability. Study 1 examined how 4 e-liquid nicotine strengths (0-24mg/mL) alter cigarette demand and alternate product substitutability, while Study 2 examined the effects of taxing cigarettes and subsidizing e-liquid. DESIGN/METHODS: Both studies contained sampling sessions: participants were provided a particular e-liquid strength to sample for 2-days followed by ETM purchasing. Study 1: participants sampled among 4 e-liquid strengths (randomized) 2-days prior to 4 ETM sessions. Study 2: Participants sampled 24 mg/mL e-liquid twice for 2-days, followed by Taxed-ETM (5 prices taxed 0, 12.5, 25, 50%) and Subsidized-ETM (e-liquid discounted 0, 12.5, 25, 50% across price). RESULTS: Study 1 demonstrated unaltered cigarette demand across e-liquid strength. e-Liquid substitutability increased with e-liquid strength: 24 mg/mL with greatest substitutability. In Study 2 increasing cigarette taxes significantly decreased cigarette demand intensity and nominally increased demand elasticity. Subsidizing e-liquid had no effect on cigarette demand; e-liquid was the only product with significant substitutability and was maintained across all conditions. While e-liquid substitutability was unaltered by cigarette tax, it increased significantly with subsidy rate. CONCLUSIONS: Study 1 illustrated that e-liquid substitutability increases with nicotine strength up to 24 mg/mL, suggesting bans on higher strength e-liquid (> 20 mg/mL) may quell e-cigarette substitutability and limit the harm reduction associated with use. Study 2 demonstrated the efficacy and independence of tax and subsidy policies in altering cigarette demand and e-liquid substitutability, respectively.

FUNDING: Federal

CORRESPONDING AUTHOR: Warren Bickel, PhD, Virginia Tech Carilion Research Institute, VA, USA

## SYM30C

### US DEMAND FOR ELECTRONIC CIGARETTES: EVIDENCE FROM ITC US SURVEYS

Kei-Wen Cheng\*, University of Illinois at Chicago, IL, USA

BACKGROUND: Global sales of e-cigarettes (ECs) exceed \$8 billion annually, with US consumption accounting for 43% of that market. Public health concerns on

appropriate EC regulations hinge upon the relationship between the use of traditional cigarettes and innovative EC products. Our study explores the relationships between cigarette and EC use in the US by emphasizing the role of direct and indirect costs of smoking. Specifically, we investigate whether ECs have acted as cigarette substitutes or complements in response to a) cigarette price increases and b) clean indoor air policies. DESIGN/METHODS: Data came from the ITC Four-Country E-cigarette Project (2016), Nielsen ScanTrack, and American Nonsmokers' Rights Foundation (ANRF). Integration of these diverse data sources, while accounting for year and respondents' residential locations, afforded a rich dataset, containing: smoking/EC use, demographics, socioeconomic status, cigarette/EC retail prices (52 markets), and cigarette/EC clean indoor air policies (state and local). We estimated an adjusted logit model of EC use among current smokers and recent quitters. RESULTS: Among ever smokers, EC price is negatively associated with EC use (price elasticity = -0.13), cigarette price is significantly positively associated with EC use (cross elasticity = 0.33), and strong smokefree air policies significantly reduce EC use. Among current smokers, EC price is negatively associated with EC use (price elasticity = -0.13), cigarette price is positively associated with EC use (cross elasticity = 0.30), and strong smokefree air policies significantly reduce smokers' EC use. CONCLUSIONS: This study provides clear evidence that EC are acting as partial substitutes for cigarettes in the nicotine market, and as expected, EC use is price sensitive. No evidence was found that EC are acting as complements in response to clean indoor air policies. To maximize substitution that may need to be considerable price differentials favouring ECs. Future research should take into account differential impact of policies on both smoking and vaping and other product use.

FUNDING: Federal

CORRESPONDING AUTHOR: Kei-Wen Cheng, PhD, University of Illinois at Chicago, IL, USA

## SYM30D

### THE COST OF VAPING AND DEMAND FOR E-CIGARETTES: ECONOMIC ANALYSIS FROM FOUR COUNTRIES

Ce Shang\*, University of Illinois at Chicago, IL, USA

BACKGROUND: Despite different regulatory environments, the awareness and use of e-cigarettes (ECs) has grown markedly during the past decade in many high-income countries. The relative price of ECs compared to cigarettes is likely to be an important determinant of the demand for ECs. However, there is very limited evidence on how the cost of ECs, compared to cigarettes, impacts the demand for ECs. This study seeks to add evidence by estimating how demand for ECs (i.e. ever- and current EC use rates) among adults who have ever smoked in Australia (AU), Canada (CA), England (EN) and the United States (US) was associated with the relative cost of disposable, pre-filled (e.g. cartridges), and modular/ tank system (e.g. e-liquid) ECs, compared to the cost of cigarettes. DESIGN/METHODS: Data from the 2016 International Tobacco Control (ITC) Four Country Survey that contains information on EC use and purchases from 13,104 adult ever smokers (N= 2,078 in AU; 3,791 in CA; 4,412 in EN; and 2,823 in US). Because the prices of different EC types (disposables, cartridges, and e-liquid) are correlated, the associations between their relative prices to cigarettes and EC demand were analyzed separately for each EC type. Analyses were further conducted by country using logistic regressions. RESULTS: The higher EC prices are compared to cigarette prices, the less likely that ever smokers were to report ever or currently using ECs. Higher EC to cigarette price ratios for at least one EC type were associated with lower EC use among ever smokers in all four countries. Furthermore, our data suggests that for US EC users, tank systems were complements to pre-filled ECs. Tank systems were also complements to disposable and pre-filled ECs for EC users in CA. CONCLUSIONS: The cost of ECs compared to cigarettes was significantly associated with the demand for ECs among adult ever smokers in the four countries.

FUNDING: Federal

CORRESPONDING AUTHOR: Ce Shang, PhD, University of Illinois at Chicago, IL, USA



## SYM30E

### ECONOMIC MODELING TO FORECAST THE IMPACT OF VAPING: SIMULATION STUDY

David Levy\*, Georgetown University, DC, USA

**BACKGROUND:** Future use of e-cigarettes (ECs) will be shaped by the availability and cost of alternative nicotine and tobacco products and market structure. Empirical evaluations of responsiveness to price and of tobacco control policies will need to consider these rapidly evolving factors. In particular, the availability of vape shops, internet and mass retail pricing will ultimately need to be considered, as well as the role of cigarette manufacturers also selling ECs and independent firms specialized in ECs only. Drawing on the economics and marketing literature and industry documents, we developed a model of industry behavior in US EC markets in reaction to policy changes. **DESIGN/METHODS:** We explicitly consider pricing, marketing, and product content decisions in a profit-maximizing framework in both cigarette and EC markets, taking into account the structure (concentration and entry barriers) in both markets. Industry behaviors impact cost, appeal, addiction, and toxicity as perceived by consumers, which in turn affects cigarette and EC use. *Cigarette manufacturers selling ECs* are distinguished from *independent* firms specialized in ECs only. **RESULTS:** Cigarette manufacturers seek to maximize cigarette profits, whereas independent firms seek to increase ECs sales at the expense of cigarette use. Cigarette firms play a major role in the US mass retail EC market, but they currently have small market shares in the internet and vape shop market. While their incentive is to discourage ECs that are strong substitutes and have lower costs than cigarettes, their ability to influence overall EC demand is likely to be limited. Policies that discourage cigarette use and encourage EC substitution (e.g., by encouraging innovations) can increase incentives to expand EC sales at the expense of cigarette sales, thus benefiting public health. **CONCLUSIONS:** In evaluating demand and other tobacco and EC control policies on EC use, industry and the structure of the market must ultimately be considered in order to better gauge the effect of these policies on exclusive and dual use of ECs. The role of these factors will be directly influenced by FDA regulation of the EC market.

**FUNDING:** Federal

**CORRESPONDING AUTHOR:** David Levy, PhD, Georgetown University, DC, USA

## SYM31

### EAGLES — THE SECOND GENERATION: COMPARING THE SAFETY AND EFFICACY OF THE 1ST-LINE PHARMACOTHERAPIES IN SMOKERS WITH PSYCHIATRIC DISORDERS

Jaimee Heffner, PhD, Fred Hutchinson Cancer Research Center, WA, USA; Catherine Ayers, PhD, ABPP, University of California, CA, USA; A. Eden Evins, MD, MPH, Massachusetts General Hospital & Harvard Medical School, MA, USA

Evaluating Adverse Events in a Global Smoking Cessation Study (EAGLES) is the largest trial of 1st-line pharmacotherapies for smoking cessation conducted to date—finding no difference in the incidence of serious neuropsychiatric adverse events among users of varenicline, bupropion, nicotine patch and placebo in smokers with and without psychiatric disorders. EAGLES recruited the largest cohorts of smokers with bipolar, anxiety, and psychotic disorders ever assembled, providing a unique opportunity to examine the relative safety and efficacy of these medications in smokers with mental health conditions—individuals who smoke at rates 2–4 times higher than the general population, have a harder time quitting smoking, and are disproportionately affected by tobacco-related diseases and premature death. This symposium will describe the main findings from three post-hoc secondary analyses conducted in the sub-cohorts of smokers with diagnoses of bipolar disorder (n=285), anxiety disorders (n=712) and psychotic disorders (n=390). After an overview of the trial's rationale and study design by Dr. Anthenelli (University of California, San Diego), Dr. Heffner (Fred Hutchinson Cancer Research Center) will present efficacy and safety of the 1st-line pharmacotherapies for smoking cessation in individuals with bipolar I or II disorder. Dr. Ayers (University of California, San Diego) will then present the efficacy and safety results in individuals with generalized anxiety disorder, post-traumatic stress disorder and panic disorder (with or without agoraphobia). Dr. Evins (Massachusetts General Hospital & Harvard Medical School) will present similar findings in the head-to-head comparisons of smoking cessation aids and placebo in individuals with schizophrenia and schizoaffective disorder. All presentations will compare smokers diagnosed with the index psychiatric conditions with smokers without psychiatric disorders. Dr. Williams (Rutgers Robert Wood Johnson Medical School) will serve as the discussant, synthesizing the results from the presentations and integrating them

within the context of clinical practice guidelines to discuss the public health and policy implications.

**JUSTIFICATION:** This symposium will present new clinical research data on the efficacy and safety of 1st-line smoking cessation pharmacotherapies in smokers with mental health conditions that have the potential to influence clinical practice guidelines for smoking cessation in people with bipolar, anxiety and psychotic disorders.

**FUNDING:** Pharmaceutical Industry

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## SYM31A

### EFFICACY AND SAFETY OF 1ST-LINE PHARMACOTHERAPIES FOR SMOKING CESSATION IN BIPOLAR DISORDER: SUBGROUP ANALYSIS OF THE RANDOMIZED, ACTIVE- AND PLACEBO-CONTROLLED EAGLES TRIAL

Jaimee Heffner<sup>\*1</sup>, Catherine Ayers<sup>2</sup>, Cristina Russ<sup>3</sup>, David Lawrence<sup>3</sup>, Thomas McRae<sup>3</sup>, Lisa St. Aubin<sup>3</sup>, Alok Krishen<sup>4</sup>, Neal Benowitz<sup>2</sup>, Robert West<sup>5</sup>, A. Eden Evins<sup>6</sup>, Robert Anthenelli<sup>2</sup>, <sup>1</sup>Fred Hutchinson Cancer Research Center, WA, USA, <sup>2</sup>University of California, CA, USA, <sup>3</sup>Pfizer, NY, USA, <sup>4</sup>PAREXEL International on behalf of GSK, NC, USA, <sup>5</sup>University College, United Kingdom, <sup>6</sup>Massachusetts General Hospital & Harvard Medical School, MA, USA

**BACKGROUND:** Little is known about how smokers with bipolar disorder (BD) respond to 1st-line cessation medications. Aims were to: 1) determine comparative efficacy and safety of varenicline, bupropion, nicotine patch, and placebo for smokers with BD, and 2) compare rates of cessation and neuropsychiatric adverse events (NPSAEs) in smokers with BD vs. a comparison cohort of smokers without psychiatric disorders. **METHODS:** Participants in this EAGLES *post-hoc* subgroup analysis were smokers with BD I or II (n=285) and country-matched smokers without psychiatric disorders (n=2794). General linear models were used to test the effects of treatment group, psychiatric cohort, and their interaction on moderate to severe NPSAEs and biochemically-confirmed continuous abstinence at end of treatment (weeks 9–12). **RESULTS:** NPSAE rates for BD vs. non-psychiatric smokers were 14.7% vs. 1.6% for varenicline, 11.9% vs. 2.1% for bupropion, 6.3% vs. 2.8% for nicotine patch, and 8.8% vs. 2.7% for placebo. There was no significant treatment by cohort interaction or main effect of treatment. NPSAE occurrence was higher for the BD cohort (p<.0001). Week 9–12 continuous abstinence rates for BD vs. non-psychiatric smokers were 22.7% vs. 33.4% for varenicline, 11.6% vs. 21.9% for bupropion, 7.7% vs. 24.8% for nicotine patch, and 10.2% vs. 11.2% for placebo. There were no treatment by cohort interactions. For the combined cohorts, quit rates differed by treatment group (p<.001), with varenicline showing greater efficacy than bupropion, nicotine patch, and placebo. Quit rates were significantly lower in the BD cohort (p=.008). **CONCLUSIONS:** The three pharmacotherapies evaluated in this study did not differ on risk for moderate to severe NPSAEs in either cohort. Across cohorts, efficacy was greater for varenicline than for bupropion and nicotine patch. Smokers with BD are substantially more likely to experience NPSAEs during a cessation attempt and less likely to quit successfully, regardless of which pharmacotherapy is used. Novel approaches are needed to improve quit rates for smokers with BD, and clinicians should monitor for changes in their psychiatric status during tobacco treatment.

**FUNDING:** Pharmaceutical Industry

**CORRESPONDING AUTHOR:** Jaimee Heffner, PhD, Fred Hutchinson Cancer Research Center, WA, USA

## SYM31B

### EFFICACY AND SAFETY OF PHARMACOTHERAPIES FOR SMOKING CESSATION IN ANXIETY DISORDERS: SUBGROUP ANALYSIS OF THE RANDOMIZED, ACTIVE- AND PLACEBO-CONTROLLED EAGLES TRIAL

Catherine Ayers<sup>\*1</sup>, Jaimee Heffner<sup>2</sup>, Cristina Russ<sup>3</sup>, David Lawrence<sup>3</sup>, Thomas McRae<sup>3</sup>, A. Eden Evins<sup>4</sup>, Robert Anthenelli<sup>1</sup>, <sup>1</sup>University of California, CA, USA, <sup>2</sup>Fred Hutchinson Cancer Research Center, WA, USA, <sup>3</sup>Pfizer, NY, USA, <sup>4</sup>Massachusetts General Hospital & Harvard Medical School, MA, USA

**BACKGROUND:** Individuals with anxiety disorders (AD) are 2–3 times more likely to smoke and have 20% lower quit rates with bupropion or nicotine replacement



therapies than smokers without psychiatric disorders. No study has examined the efficacy of varenicline in AD smokers. We aimed to: 1) evaluate efficacy and neuropsychiatric adverse events (NPSAEs) of varenicline and bupropion relative to nicotine patch and placebo for individuals with generalized anxiety disorder (GAD), panic disorder (PD) and post-traumatic stress disorder (PTSD); and 2) compare these outcomes in AD vs. non-psychiatric smokers. METHODS: Participants were smokers with SCID-confirmed diagnoses of GAD (n=243), PD (n=277), and PTSD (n=192) or no psychiatric disorders (NPC, n=4028). General linear models included all groups combined, with continuous abstinence rates for weeks 9–12 (CAR9–12) and NPSAEs as outcomes. RESULTS: For the composite endpoint of moderate to severe NPSAEs, there were no significant differences by treatment group or treatment by cohort interactions but there was a significant AD cohort effect ( $p=.002$ ). The observed incidence of NPSAEs for GAD (5.4%), PD (6.2%) and PTSD (6.9%) were higher than the NPC (2.1%). For CAR9–12, there was a significant treatment effect ( $p<.0001$ ); all medications bettered placebo, varenicline had the highest efficacy. There were no significant treatment by cohort interactions. Quit rates were significantly lower for GAD, PD and PTSD than for the NPC ( $p<.0001$ ) across all treatments. Observed CAR9–12 for varenicline, bupropion, nicotine patch and placebo, respectively, were 31%, 18%, 17% and 9% for GAD; 29%, 14%, 26% and 5% for PD; 21%, 11%, 23% and 9% for PTSD; and 38%, 26%, 26% and 14% for NPC. CONCLUSIONS: Results from the largest study of pharmacotherapies for smoking cessation in AD smokers provide evidence of favorable efficacy and safety profiles of the 1<sup>st</sup>-line cessation medications, and varenicline in particular. Smokers with anxiety are more likely to experience NPSAEs during a cessation attempt and less likely to quit than their NPC counterparts regardless of treatment supporting the need to develop specialized treatments for AD smokers.

FUNDING: Pharmaceutical Industry

CORRESPONDING AUTHOR: Catherine Ayers, PhD, ABPP, University of California, CA, USA

## SYM31C

### SAFETY AND EFFICACY OF PHARMACOTHERAPEUTIC SMOKING CESSATION AIDS IN THOSE WITH PSYCHOTIC DISORDERS: A SUBGROUP ANALYSIS OF THE EAGLES TRIAL

A. Eden Evins<sup>\*1</sup>, Robert West<sup>2</sup>, Neal Benowitz<sup>3</sup>, Cristina Russ<sup>4</sup>, David Lawrence<sup>4</sup>, Thomas McRae<sup>4</sup>, Robert Anthenelli<sup>3</sup>, <sup>1</sup>Massachusetts General Hospital & Harvard Medical School, MA, USA, <sup>2</sup>University College, United Kingdom, <sup>3</sup>University of California, CA, USA, <sup>4</sup>Pfizer, NY, USA

BACKGROUND: People with psychotic disorders (PD) are 3–4 times more likely to smoke tobacco, have lower cessation rates, and higher prevalence of smoking-related mortality than those without psychiatric illness. We aimed to compare the safety and efficacy of varenicline and bupropion with nicotine patch (NRT) and placebo in smokers with PD and compare these outcomes with those of smokers without psychiatric illness. METHODS: Participants were smokers with SCID-confirmed diagnoses of schizophrenia or schizoaffective disorder (n=390) or no psychiatric disorder (NPC, n=4028). General linear models (GLIMMIX) were used to evaluate the primary safety and efficacy outcomes: composite rate of moderate or severe neuropsychiatric adverse events (NPSAEs); and continuous abstinence rate for weeks 9–12 (CAR9–12), respectively. RESULTS: There was no significant treatment effect or treatment by cohort interaction in NPSAE incidence. Those with PD were more likely to experience a NPSAE ( $p=.002$ ). Observed rates of NPSAEs in the safety endpoint were 6.0% in the PD group vs. 2.1% for the NPC group. There were significant effects of treatment and cohort and no significant treatment by cohort interaction for CAR9–12. Observed CAR9–12 in the PD sub-cohort were 23.2% on varenicline, 11.2% on bupropion, 13.1% on NRT, and 4.1% on placebo. Modeled odds ratios (ORs) for CAR9–12 for those with PD for active treatments vs. placebo were 7.2 (2.38–22.04) for varenicline, 3.10 (0.95–10.13) for bupropion, and 3.56 (1.11–11.38) for NRT. ORs for varenicline vs. bupropion were 2.34 (1.06–5.18) and vs. NRT 2.04 (0.95–4.34). Observed CAR9–12 were significantly lower for PD than for the NPC (26% vs. 13%;  $p<.0001$ ) across arms. CONCLUSIONS: This subcohort analysis of the largest RCT of pharmacotherapies for smoking cessation in smokers with PD, the first placebo-controlled RCT of NRT in those with PD, and the first head-to-head comparison of varenicline, bupropion, and NRT in those with PD provides evidence of favorable safety and efficacy for all three active treatments in smokers with PD and underscores the need to increase provision of evidence-based smoking cessation treatment for smokers with a PD.

FUNDING: Pharmaceutical Industry

CORRESPONDING AUTHOR: A. Eden Evins, MD, MPH, Massachusetts General Hospital & Harvard Medical School, MA, USA

## SYM32

### TOBACCO MARKETING AND VULNERABLE POPULATIONS

Megan Roberts, PhD, Ohio State University, OH, USA; Shyanika Rose, PhD, MA, Schroeder Institute at Truth Initiative, DC, USA; Brianna Lienemann, PhD, University of Southern California, CA, USA; Allison Groom, MS, American Heart Association, TX, USA

The tobacco industry has a history of directing marketing efforts to vulnerable population groups. Exposure to tobacco marketing materials is likely linked with tobacco use and potentially contributes to tobacco use disparities. However, the growth of types of tobacco products beyond cigarettes, new channels for marketing, and the ability to target vulnerable groups with increasing precision has complicated this picture. This symposium is being submitted by the Food and Drug Administration (FDA)-funded Tobacco Centers of Regulatory Science (TCORS) Working Group on Vulnerable Populations. Research presented will address exposure to tobacco marketing among youth and adult vulnerable groups and identify links with tobacco use outcomes. Dr. Megan Roberts will examine exposure to tobacco marketing using an ecological momentary assessment protocol among urban and rural adolescents. Dr. Shyanika Rose will present on tobacco coupon receipt among vulnerable population youth and the prospective relationship with tobacco use outcomes among a nationally representative sample of youth from the Population Assessment of Tobacco and Health (PATH) study. Dr. Brianna Lienemann will discuss whether vulnerable population status moderates the relationship between liking tobacco advertisements and tobacco use among young adults from the PATH Study. Ms. Allison Groom will discuss racial/ethnic differences in point of sale marketing exposure and promotions and the perceived influence of such exposure on tobacco purchase among a national sample of adults from the PATH Study. Drs. Rose and Roberts will co-chair the session and Dr. Jennifer Unger will participate as a discussant for the session and examine the public health and regulatory implications of the presented research for addressing tobacco use among vulnerable populations. The findings from this session may be of interest to the FDA or other decision makers in informing policies or regulations to mitigate the effects of tobacco marketing on vulnerable populations. Findings may also be of interest to researchers in identifying and highlighting the differential effects of marketing on vulnerable groups.

JUSTIFICATION: The findings from this session may be of interest public health decision makers in informing policies or regulations to mitigate the effects of tobacco marketing on vulnerable populations.

FUNDING: Federal

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## SYM32A

### VULNERABILITIES TO TOBACCO MARKETING: AN ECOLOGICAL MOMENTARY ASSESSMENT STUDY WITH URBAN AND RURAL ADOLESCENTS

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Rates of overall adolescent tobacco use have not declined in the past five years—current cigarette use has decreased somewhat among high school students, but the decline was offset by an increase in e-cigarette and hookah use. Also troubling are urban/rural differences in adolescent tobacco use: Rural regions of the U. S. have among the highest cigarette and smokeless tobacco use rates in the country. Although extensive research indicates that adolescent exposure to tobacco marketing is related to higher pro-tobacco attitudes and behaviors, little work has examined differences among who is exposed or who is most sensitive to exposure. We examined this topic using ecological momentary assessment (EMA), which allowed us to measure, with high accuracy, exposures to tobacco marketing and advertising in numerous locations. This study enrolled over 200 male adolescents from either urban Columbus Ohio or one of nine rural Appalachian counties in Ohio. Participants were part of a larger cohort study examining tobacco use and health behaviors. Adolescents were eligible to take part in the EMA study if they were either past 30-day tobacco users or non-users matched by age and county. For ten days, participants were prompted 2–3 random times/day to complete a brief survey about their exposures and responses to tobacco-related advertising. Findings indicated that, of the reports of tobacco exposure, 66% included sightings at convenience stores or gas stations. Greater exposures to tobacco marketing during EMA was associated with more positive attitudes to the tobacco ads, tobacco use during the EMA period, and expectancies to use in the future. Compared to non-users, tobacco users had greater overall exposure to tobacco marketing.



Rural youth likewise reported more positive attitudes toward the tobacco advertisements that they saw. Overall, these findings signal the magnitude of tobacco marketing exposures and their pernicious effects on vulnerable populations.

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## SYM32B

### TOBACCO COUPON RECEIPT, VULNERABILITY CHARACTERISTICS, AND TOBACCO USE OUTCOMES AMONG US YOUTH: LONGITUDINAL ANALYSIS OF WAVES 1 AND 2 OF THE PATH STUDY

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Tobacco marketing contributes to tobacco use among youth. This study prospectively examines youth tobacco coupon receipt, characteristics of recipients, and channels of receipt (Wave 1) with subsequent tobacco use (Wave 2). Data came from the Wave 1 and 2 Population Assessment of Tobacco and Health (PATH) Study, 2013 to 2015. Wave 1 results were used to identify demographics, marketing receptivity, and vulnerability characteristics of US youth (age 12-17) (n=13,651) who received coupons and examine correlates of coupon receipt through different channels. Multivariable regression models examined the association of Wave 1 coupon receipt with subsequent Wave 2 ever use of tobacco, past 30-day use, and new tobacco product use (ages 13-18) (n=10,606). Overall, 7.5% of US youth reported tobacco coupon receipt in the past 6 months at Wave 1. In adjusted models, coupon receipt was more likely among females, youth outside urban areas, those living with a tobacco user, former vs. never tobacco users, individuals with high vs. low internalizing mental health symptoms, and those with a favorite tobacco advertisement. Among those who received coupons, the main channels were direct mail (56%), product packs (28%), and online (25%). Correlates differed by channel. After controlling for demographic and vulnerability factors, coupon receipt at Wave 1 was significantly associated with ever use of tobacco at Wave 2 among Wave 1 never users (aOR=1.42 95% CI 1.06, 1.91), use of a new tobacco product between Wave 1 and Wave 2 (aOR=1.67 95% CI 1.18, 2.36), and any past 30-day tobacco use at Wave 2 (aOR=1.81 95% CI 1.31, 2.49). One in 14 US youth are exposed to tobacco coupons through a variety of channels. Coupon receipt is associated with greater odds of tobacco use among never users, greater odds of trying a new tobacco product, and greater odds of current use among all youth. Limiting youth coupon exposure or adding stronger age verification for promotional efforts may be valuable strategies to reduce youth tobacco use.

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## SYM32C

### THE ASSOCIATION OF LIKING TOBACCO ADVERTISEMENTS AND TOBACCO USE AMONG YOUNG ADULTS: FINDINGS FROM POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) WAVE 1

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Young adulthood is a crucial period in the development of long-term tobacco use patterns. Tobacco industry marketing exposure during this critical period might influence tobacco use behavior. This cross-sectional study explores whether liking tobacco advertisements is associated with greater likelihood of tobacco use among different vulnerable young adult populations. Analysis was conducted with 18-24 year olds (n = 9,109) of the nationally representative Population Assessment of Tobacco and Health (PATH) Study Wave 1 Adult dataset 2013-14.

Participants viewed 20 tobacco advertisements and indicated whether they liked each ad. Independent variables included: ad liking, gender, race/ethnicity, sexual orientation, education, poverty level, and military service. Outcome variables included: past 30-day use of cigarettes, e-cigarettes, cigarillos, and hookah. Logistic regression analysis suggested that liking tobacco ads was associated with greater odds of cigarette, e-cigarette, cigarillo, and hookah use. We then examined the interaction between ad liking and demographic characteristics. When comparing those who liked the tobacco ads to those who did not like the ads, the odds of past-month tobacco use were larger for Black vs White (cigarette: aOR = 3.75 vs 2.21), less than high school vs a bachelor's degree or higher (cigarette: aOR = 2.91 vs 1.89; hookah: aOR = 2.00 vs 1.10), high school vs. a bachelor's degree or higher (cigarette: aOR = 2.93 vs 1.89; cigarillo: aOR = 2.93 vs 1.56; hookah: aOR = 2.24 vs. 1.10), female vs. male (e-cigarette: aOR = 2.47 vs 1.87; cigarillo: aOR = 2.65 vs 1.85), and those below the poverty level vs. at or above twice the poverty level (e-cigarette: aOR = 2.64 vs 1.33). No other interactions of ad liking and demographics were significantly related to use of any other product. These findings suggest a potential need for tobacco control campaigns or other intervention efforts for young adult Black individuals, individuals with a high school education or less, females, and those below the poverty level to counteract the potential negative influence of tobacco advertising.

FUNDING: Federal

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## SYM32D

### TOBACCO POINT-OF-SALE MARKETING BY RACE AND ETHNICITY

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BACKGROUND: Prior research has shown that tobacco companies target point-of-sale (POS) marketing in minority communities. However, it is unclear if racial/ethnic minority smokers are more likely to notice POS advertisements and if awareness influences brand purchase. This research assessed racial and ethnic differences by retail location of tobacco purchase, awareness of promotions, and influence on tobacco brand selection. METHODS: Using Population Assessment of Tobacco and Health Study Wave 1 Adult data (2013-14), this analysis compared frequencies of promotion awareness and purchase influence among current smokers by race/ethnicity, specifically non-Hispanic Whites, non-Hispanic Blacks, and Hispanics/Latinos. The sample was weighted. A Rao-Scott Chi-Square Test was conducted in SAS. RESULTS: Among Current Cigarette Users, non-Hispanic Blacks are significantly more likely than non-Hispanic Whites or Hispanics/Latinos to buy their cigarettes at convenience stores or gas stations and to notice tobacco ads or promotions in stores. However, non-Hispanic Blacks are less likely than non-Hispanic Whites and Hispanics/Latinos to report purchasing a brand other than their usual brand because of a promotion they saw in the past 30 days. Awareness of tobacco POS promotion differs by type of retail outlet. Respondents are significantly more likely to notice tobacco ads or promotions in convenience stores and smoke shops than in supermarkets or other retail outlets. They are also more likely to have reported purchasing a brand other than their usual brand because of a promotion they noticed in a convenience store or tobacco shop. CONCLUSIONS: The findings indicate that non-Hispanic Blacks are more likely than non-Hispanic Whites or Hispanics/Latinos to be exposed to tobacco POS ads and promotions. Tobacco POS marketing appears to be more prevalent in outlets where non-Hispanic Black smokers buy tobacco. However, additional research is needed to assess POS marketing's influence on brand purchase among racial/ethnic minorities. These findings may lead to further FDA policies for retail sales of tobacco encompassing in-store sales, marketing/promotion, and advertising.

FUNDING: Federal

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## PODIUM PRESENTATION 1

PAPER SESSION 1: EXPANDING  
TOBACCO-FREE POLICIES

## PA1-1

EXAMINING SELF-REPORTED TOBACCO SMOKE EXPOSURE  
AND EMERGENCY DEPARTMENT UTILIZATION AMONG  
US ADOLESCENTS WITH ASTHMA FROM WAVE 1 OF THE  
POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH)  
STUDY

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**SIGNIFICANCE:** Tobacco smoke exposure (TSE) adversely affects adolescents with asthma. Emergency Departments (EDs) are considered "safety nets" that annually care for a large number of asthmatic adolescents who potentially have limited access to other healthcare sources and have high rates of TSE. A better understanding of the relationship between TSE and ED utilization among asthmatic adolescents is needed to provide important information to healthcare providers and policy makers about the need for TSE-related interventions in the ED setting. **OBJECTIVE:** The aim of the current study was to examine the relationship between self-reported TSE measures and ED utilization among adolescents with asthma using wave I data from the Population Assessment of Tobacco and Health (PATH) Study. **METHODS:** A secondary analysis of PATH data from wave 1 (2013-2014) was performed including adolescents from 12 to 17 years of age who have been ever told by a health professional that they have asthma and are not current smokers ( $N=2,357$ ). We built multivariable logistic regression models to assess the relationships between self-reported TSE measures and ED utilization for asthma while controlling for adolescent age, sex, race, ethnicity, and parental education level. TSE measures included adolescent report of: living with a smoker; home TSE; and number of hours of TSE in the past seven days. **RESULTS:** Nearly one-third (31.3%) of asthmatic adolescents lived with a smoker and one-fifth (19.9%) reported that the use of combustible tobacco products was allowed inside the home. The mean number of hours of TSE in the past seven days was 4.53 hours (standard deviation=16.69). Asthmatic adolescents who lived with a smoker were 1.65 times more likely (95% confidence interval=1.14, 2.28,  $p<.01$ ) to have had an ED or Urgent Care visit for asthma than those who did not live with a smoker. **CONCLUSIONS:** TSE is associated with increased healthcare utilization in asthmatic adolescents. Thus, ED visits may be an opportune time to intervene with caregivers and discuss the role tobacco may play in their child's ED visit, and to initiate tobacco cessation and TSE reduction efforts.

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## PA1-2

TOBACCO-FREE HOME POLICIES: LONGITUDINAL FINDINGS  
FROM WAVE 1 (2013-14) AND WAVE 2 (2014-15) OF THE  
POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH)  
STUDY

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**SIGNIFICANCE:** Smoke-free home policies are shown to facilitate cessation among smokers as well as decrease the likelihood of initiation among non-smoking children. However, little research has been done on how smoke-free policies are related to non-cigarette tobacco products, and no previous research examines the prevalence of home policies that prohibit the use of non-combustible forms of tobacco like smokeless tobacco and e-cigarettes. This study examines the prevalence and correlates of in-home bans on combustible tobacco, non-combustible tobacco, and all tobacco, and examines the association between these policies and use of combustible and non-combustible tobacco products. **METHODS:** Data come from 26,138 adults (18+ years of age) who participated in Wave 1 (2013-

2014) and Wave 2 (2014-2015) of the Population Assessment of Tobacco and Health (PATH) Study, a nationally representative study of tobacco use in the U.S. Participants self-reported current cigarette, e-cigarette, traditional cigar, cigarillo, filtered cigar, hookah, smokeless tobacco, snus, and dissolvable tobacco use in Waves 1 and 2, and rules about use of combustible and non-combustible tobacco products in their homes in Wave 1. **RESULTS:** The majority of respondents (69%) reported a ban on all tobacco, and this was more common among never and former tobacco users, older participants, women, those with greater household incomes, and in households with children under 18. Overall 13% of participants reported a ban on only combustible tobacco in their homes but allowed non-combustible tobacco, and 4% percent reported a ban on only non-combustible tobacco but allowed combustible tobacco. Bans of combustible and non-combustible products at Wave 1 were associated with increased quitting of tobacco products at Wave 2. **CONCLUSIONS:** The PATH questionnaire item assessing use of non-combustible forms of tobacco provides additional information about home tobacco policies beyond the standard item on smoke-free home policies. The findings suggest that the types of tobacco included in home tobacco policies varies, and quitting tobacco products is linked with banning both combustible and non-combustible products.

**FUNDING:** Federal

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## PA1-3

CHILDREN'S UPTAKE OF TOBACCO-RELATED TOXICANTS  
WHILE LIVING IN VAPING, SMOKING, AND NON-TOBACCO USING  
HOMES

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Approximately 40% of U.S. parents believe children's exposure to secondhand aerosol from e-cigarettes causes "little" or "no harm." While surface levels of nicotine in vaping homes have been found to be significantly lower than in smoking homes, children's level of exposure to tobacco-related toxicants while living in vaping homes has not been examined. The present study examined the level of cotinine (nicotine biomarker) and NNAL (potent lung carcinogen) among children living with a parent(s) who neither vaped nor smoked (non-user), only vaped, or only smoked, and assessed parental smoking/vaping behavior, and rules about smoking/vaping in the home. Vaping ( $n=12$ ), smoking ( $n=17$ ), and non-using ( $n=20$ ) parents ( $M=36.0$  years, 73% female) and their child ( $M=10.6$  years) completed self-report measures of tobacco use history, current tobacco use behaviors, home smoking/vaping rules, and provided urine for cotinine (ng/mL) and NNAL (pmol/mL) analysis. All vaping parents reported using a tank-style device, an average e-liquid nicotine concentration of 3.12 mg/mL, and consuming 12.2 mL of e-liquid per day. Smoking parents averaged 13.0 cigarettes per day. All vaping parents had a home smoking ban, but 92% allowed vaping in the home. Compared to the cotinine levels of children of non-users ( $M=0.43$ ), children of vapers had cotinine levels 15-times higher ( $M=6.45$ ) and children of smokers 39-times higher ( $M=16.63$ ); however, only cotinine levels between children of non-users and smokers were significantly different ( $p=.001$ ). Compared to NNAL levels of children of non-users ( $M=.009$ ), children of vapers had NNAL levels 3-times higher ( $M=.027$ ), and children of smokers 7-times higher ( $M=.065$ ), with children of smokers NNAL levels significantly higher than both children of vapers ( $p=.009$ ) and non-users ( $p<.0001$ ). While children living with parents who neither smoke nor vape are exposed to the lowest levels of tobacco-related toxicants, children living with parents who vape, compared to those who smoke, are also exposed to significantly lower levels of a potent lung carcinogen.

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## PA1-4

### SMOKE-FREE POLICY ENFORCEMENT, COMPLIANCE AND THE PROVISION OF SMOKING CESSATION CARE IN HOSPITALS

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**SIGNIFICANCE:** Smoke-free hospital policies are becoming increasingly common to promote good health and quit attempts among patients who smoke. This study aims to assess: staff perceived enforcement and compliance with smoke-free policy; current provision of smoking cessation care; and the characteristics of staff most likely to report provision of care to patients. **METHODS:** An online cross-sectional survey of medical, nursing, and allied staff from two Australian public hospitals was conducted. Staff report of: patient and staff compliance with smoke-free policy; perceived policy enforcement; provision of the 5As for smoking cessation (Ask, Assess, Advise, Assist, Arrange follow-up); and provision of stop-smoking medication are described. Logistic regressions were used to determine respondent characteristics related to the provision of the 5As, and stop-smoking medication use during hospital admission. **RESULTS:** A total of 805 respondents participated. Self-reported enforcement of smoke-free policy was low (60.9%), together with compliance for both patients (12.9%) and staff (23.6%). Provision of smoking cessation care was variable, with the delivery of the 5As ranging from 18.1% (arrange follow-up) to 74.7% (ask). Senior medical staff (OR= 2.4, CI= 1.29, 4.53, p= 0.007) and full time employees (OR= 2.15, CI= 1.12, 4.13, p= 0.022) were more likely to provide smoking cessation care always/most of the time. Stop-smoking medication provision decreased with increasing age of staff (OR= 0.97, CI= 0.96, 0.99, p= 0.005). **CONCLUSIONS:** Smoke-free policy enforcement, compliance, and provision of smoking cessation care remains low in hospitals. Efforts to improve smoking cessation delivery by clinical staff are warranted.

FUNDING: Federal

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## PA1-5

### ENHANCING SMOKE-FREE POLICY IMPLEMENTATION STRATEGIES IN LOW INCOME HOUSING: FINDINGS FROM A RANDOMIZED CONTROLLED TRIAL

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**SIGNIFICANCE:** Smoke-free housing policies offer a unique opportunity to reduce marked disparities in tobacco use and harms among low-income populations. However, best practice strategies for policy implementation are not well understood. To inform best practice implementation, a novel smoke-free policy implementation intervention was assessed in 12 affordable housing developments in 4 eastern US states. **METHODS:** A longitudinal, cluster-randomized design assessed the impact of *enhanced* implementation (public meetings; tailored gain-framed messages; "nudge" principle of public pledges; increased cessation and SHS information via Facebook page; n=6 properties) compared with *control* (usual best practices; n=6 properties). Participants (n=70 smokers; n=168 non-smokers) were surveyed prior to, and at 6 & 12 months after adoption of a smoking ban on measures of: attitude to the policy and self-reported SHS exposure. **RESULTS:** The proportion of respondents reporting never smelling smoke increased from baseline to 6-month (p<0.001) and 12-month follow-ups (p<0.001). There was a significant reduction in the proportion of residents who believed the smoke free policy was a bad idea at 12-months compared to baseline and 6-months (p=0.021). The proportion of smokers who believed the smoke-free rule was a bad idea between decreased significantly from baseline to 12-month follow-up (p=0.036). In adjusted estimates (including race, gender, smoking status and education level) the intervention was not associated with support for the ban or with smelling SHS at 12-month follow-up. However, each 0.1 point increase in collective efficacy at 12-months was associated with a 2.4 times increased odds of supporting the ban at 12-months (p = 0.032). **CONCLUSIONS:** Enhanced implementation strategies did not confer additional benefits to standard implementation, yet marked improvements in residents' attitudes and self-reported SHS exposure were observed in the year following policy adoption. While tailored implementation approaches that address resident preferences and promote collective efficacy are preferred, successful implementation may nonetheless be achieved with standard communications.

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## PA1-6

### ATTITUDES TOWARDS ELECTRONIC VAPOR PRODUCT USE IN INDOOR PUBLIC PLACES AMONG US ADULTS, 2017

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**SIGNIFICANCE:** The U.S. Surgeon General has concluded that electronic cigarette (e-cigarette) aerosol is not harmless. As of June 2017, eight states, the District of Columbia, and over 500 localities have included e-cigarettes and other electronic vapor products (EVPs) in comprehensive smokefree laws that otherwise prohibit tobacco smoking in indoor areas of worksites, restaurants, and bars. This study describes attitudes among U.S. adults towards allowing use of EVPs in indoor public places. **METHODS:** Data came from the 2017 Styles Survey, a nationally representative, web-based survey of U.S. adults aged 18 years or older (N=4,107). Respondents were asked, "Do you favor or oppose allowing the use of electronic vapor products in indoor public places such as workplaces, restaurants, and bars?" Respondents were classified as opposing the idea if they responded "strongly oppose" or "somewhat oppose" (versus "somewhat favor" or "strongly favor"). Descriptive statistics were calculated overall and by sex; age; race/ethnicity; education; income; U.S. region; EVP use; cigarette smoking; other tobacco product use; tobacco product use among others living in the household; and rules about EVP use inside personal vehicles or homes. Multivariate Poisson regression was used to calculate adjusted prevalence ratios (aPR) of opposition. **RESULTS:** Overall, 82.4% of adults strongly or somewhat opposed the use of EVPs in indoor public places, compared to 28.0% of current (past 30-day) EVP users and 54.9% of current cigarette smokers. The adjusted likelihood of opposition was significantly lower among current (aPR=0.50) and former (aPR=0.89) EVP users compared with never users, and among current cigarette smokers (aPR=0.84) compared with never smokers. Opposition was higher among those who do not permit EVP use inside their personal vehicles (aPR=1.19) or homes (aPR=1.44) compared with those who permit EVP use in those settings. **CONCLUSION:** More than 8 in 10 adults, including over one-quarter of EVP users, oppose allowing EVP use in indoor public places. Including EVPs in smokefree policies protects bystanders from the health risks of both secondhand smoke and EVP aerosol exposure.

FUNDING: None

CORRESPONDING AUTHOR: Teresa Wang, Centers for Disease Control and Prevention, GA, USA, yxn7@cdc.gov





## PAPER SESSION 2: TOBACCO PRODUCT WARNINGS: RESEARCH TO POLICY

### PA2-1

#### HOPE + SHAME = GREATER INTENTIONS TO QUIT: EMOTIONAL RESPONSES TO EXPERIMENTAL CIGARETTE WARNING LABELS

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**OBJECTIVE:** Pictorial warning labels are effective because they are emotional. While warning labels, like other fear appeals, evoke multiple emotions, we do not know the role of discrete emotions in smokers' perceptions and intentions. Past studies examined negative emotions in general, or fear and disgust, leaving other discrete emotions largely unexplored. We evaluated to what extent discrete emotional responses to cigarette warning labels are related to intentions to quit and perceived harm of smoking. **METHODS:** A national sample of 2,700 adult non-smokers, transitioning smokers (quit smoking in the past 2 years or currently trying to quit), and current smokers (n=900 for each group) were randomized to see either higher-emotion or lower-emotion pictorial warning labels, or current US cigarette warnings (control) and reported how much they felt sad, angry, afraid, guilty, disgusted, worried, ashamed, hopeful, confused, and amused. Data were analyzed using linear regression models, controlling for demographics, pre-exposure quit intentions and experimental condition. **RESULTS:** Intentions to quit smoking in the next 6 months were related to higher hope (Beta = 0.17) and worry (0.16) and lower anger (-0.13) and confusion (-0.12) while looking at labels. Similar results were seen for intentions to quit in the next month; shame was also positively related (0.26). Greater perceived harm of cigarettes was related to higher sadness (0.08), guilt (0.06), disgust (0.05) and hope (0.05) and lower anger (-0.06), amusement (-0.06), and confusion (-0.07). Those reporting greater worry (0.19), hope (0.18), and guilt (0.12) and less anger (-0.08) and confusion (-0.09) rated labels as more effective regardless of condition. **DISCUSSION:** Less-studied emotions (such as hope and shame) can be used in anti-smoking messages to motivate quitting. Anger was counter-productive and likely reflects the reactance to these warnings. Studies on anti-tobacco messages should evaluate the role of discrete emotions other than fear and disgust and assess the role of positive emotions, such as hope, in combination with negative emotions prominently featured in anti-tobacco communications.

FUNDING: Federal

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### PA2-2

#### EFFECTS OF VISUAL FEATURES IN GRAPHIC TOBACCO WARNING LABELS ON QUITTING INTENTION: A LEAST ABSOLUTE SHRINKAGE AND SELECTION OPERATOR (LASSO) APPROACH

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**SIGNIFICANCE:** Previous research on graphic tobacco warning labels (GTWLs) tends to narrowly focus on a small number of labels and a limited set of visual features. By employing regularized regression (LASSO), the current research identified persuasive visual features out of more than 60 features coded from 319 GTWLs—the largest set studied in the literature to date. Compared with standard analytical approaches, lasso regression avoids the risk of overfitting and provides evidence for out-of-sample effectiveness of identified visual features. **METHODS:** GTWLs (N = 319) were collected from online databases including GTWLs implemented on cigarette packs in English-speaking countries and other print anti-tobacco warning messages. The research team coded these GTWLs extensively and identified more than 60 content features. Current adult smokers (N = 1378, mean age 44 years, 57.6% females, and 87% white) each viewed a random selection of six GTWLs. After viewing all GTWLs, participants reported quitting intention in the next 30 days averaged across six items (e.g., "Try to quit smoking", "Call a smoking quit-line",  $\alpha = .72$ ). For each coded visual feature, its presence across six viewed GTWLs was summed up per smoker. Lasso regression was employed to model relationships between aggregated visual features and quitting intention, with 10-fold cross-validation to determine the optimal value for the penalty parameter that minimizes predictive errors. **RESULTS:** The inclusion of oral damages,

diseased body parts, and text in multiple places in GTWLs increased smokers' quitting intention, whereas presenting female characters, fixating text in the center, and using computer-generated images decreased quitting intention. Comparisons with ordinary least squares regression results were also offered. Conclusion, The combination of a large set of GTWLs, randomized multiple message design, and LASSO regression, provided methodological rigor to identify GTWL visual features predictive of quitting intention. Identified visual features likely to either increase or decrease quitting intention are of relevance for FDA's design of the next generation GTWLs.

FUNDING: Federal

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### PA2-3

#### THE IMPACT OF HEALTH WARNING LOCATION, FRAMING, TYPE, IMMEDIACY, AND SEVERITY ON VISUAL ATTENTION AND SELF-REPORTED AVOIDANCE

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**BACKGROUND:** Using eye-tracking technology, we have previously shown that daily smokers avoid health warning labels (HWLs). Given HWLs' importance in communicating risk, reducing appeal and deterring uptake, reducing HWL avoidance is an important area of research. Over four eye-tracking studies, we examined the impact of HWL location (Study 1), framing (Study 2), immediacy (Study 3) and severity (Study 4) on visual attention and self-reported avoidance. **METHODS:** All studies used unfamiliar HWLs; the number of fixations to HWL vs. branding was the primary outcome. In Study 1, participants (n=36) were shown HWLs on the upper or lower half of a cigarette pack. In Study 2 (n=117), HWLs presented the negative consequences of smoking (i.e., loss-framed) or positive benefits of quitting (i.e., gain framed). In Study 3 (n=75), the HWLs depicted short-term or long-term consequences of smoking and in Study 4 (n=79), HWLs presented moderately- or highly-severe images. In Studies 2-4 we also assessed self-reported avoidance of HWLs. **RESULTS:** In Study 1, visual attention to HWLs was greater when these appeared on the upper vs. the lower half of the pack. In Study 2, we found higher self-reported avoidance of loss-framed vs. gain-framed HWLs, but little evidence for a difference in visual attention to these HWLs. In Study 3, we observed greater self-reported avoidance of long-term vs. short-term HWLs, but paradoxically, greater visual attention to the long-term HWLs. Study 4 found greater avoidance of highly severe HWLs vs. moderately severe HWLs, but no difference in visual attention to these HWL types. **CONCLUSIONS:** Our two measures of HWL avoidance (explicit self-report and implicit eye-tracking) obtained different outcomes, suggesting that these measure different constructs. Visual avoidance of HWLs indicates disengagement with (i.e. genuine lack of attention to) that HWL, while self-reported avoidance may show engagement with a HWL (i.e. cognitive processing and elaboration). We therefore suggest that HWLs should be located on the upper half of the pack, and should use loss-framed, long-term, highly-severe images to increase engagement.

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### PA2-4

#### HOW DO CONVERSATIONS ABOUT PICTORIAL CIGARETTE PACK WARNINGS IMPACT QUIT ATTEMPTS? A MULTIPLE MEDIATIONAL ANALYSIS OF A RANDOMIZED CONTROLLED TRIAL

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**SIGNIFICANCE:** Pictorial warnings elicit more quit attempts than text-only warnings. Conversations about the warnings may mediate this relationship. We sought to establish whether smokers' conversations about warnings explain the effect of

pictorial warnings on quit attempts. **METHODS:** US adult smokers ( $n=2,149$ ) participated in a controlled trial that randomly assigned them to have their cigarette packs labeled with pictorial or text-only warnings for four weeks. Surveys were completed at baseline and at the subsequent four weekly visits and assessed the number of conversations sparked by pictorial warnings, theoretical mechanisms, and conversational content at each visit. Analyses used structural equation modeling to test our theorized mediational model. **RESULTS:** The number of conversations about the warnings mediated the positive relationship between exposure to pictorial warnings and quit attempts ( $p<.001$ ). In serial mediation analysis examining possible theoretical mechanisms, the number of conversations was associated with greater cognitive elaboration, which in turn was associated with more quit attempts ( $p<.05$ ). Examining the role of conversation content showed that conversations about negative emotional reactions to the warnings mediated the path from warnings to quit attempts ( $p<.05$ ), while conversations about other topics did not. **CONCLUSIONS:** Conversations about pictorial warnings are one way that pictorial warnings influence quit attempts, and these results indicate that cognitive elaboration is a possible theoretical mechanism that explains why. Furthermore, what people say during their conversations about the warnings matters; conversations about negative emotional reactions to the warnings influence quit attempts while other topics do not. These results support designing warnings that increase conversations about the warnings.

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## PA2-5

### ASSESSING CIGARETTE PACKAGING AND LABELING POLICY EFFECTS ON EARLY ADOLESCENTS: RESULTS FROM A DISCRETE CHOICE EXPERIMENT

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**SIGNIFICANCE:** Countries have increasingly adopted larger pictorial warnings, plain packaging, and flavor bans. In international litigation, tobacco industry experts critique public health research methods that support these policies, claiming that discrete choice experiments (DCEs) are more valid. This study used a DCE to assess the effects of key packaging and labeling attributes on Mexican adolescents. **METHODS:** A DCE was conducted with 4321 middle-school students in Mexico, where pictorial warnings cover 30% of the front of packs. Experimental manipulations included: warning topic (emphysema, oral cancer); warning size (30% vs 75%); brand (Camel, Marlboro, Pall Mall); tobacco flavor (menthol, regular); flavor capsules (0, 1, 2); marketing claims (e.g., reduced odor); plain packaging (with vs without logos, design elements or colors). An alternative-specific block design was used, with 48 contrasting sets of 3 packs (each from a different brand family). Participants were randomly assigned to evaluate 8 sets. For each set, participants indicated which packs were most and least: attractive; of interest for trial; and harmful. All evaluations included a "no difference" option, and only participants who chose at least one pack across choice sets were included in the analysis ( $n=3318$  for attractiveness;  $n=2268$  for interest in trial;  $n=2361$  for harm). After effects coding pack options (1=most; -1=least; 0=other), linear mixed models were used to evaluate the impact of pack characteristics on choices. **RESULTS:** Plain packaging had the strongest effect on reducing pack attractiveness ( $B=-0.15$ ;  $p<0.001$ ) and interest in trial ( $B=-0.06$ ;  $p<0.001$ ). For these outcomes, larger warning size had the second strongest effect on attractiveness ( $B=-0.09$ ;  $p<0.001$ ) and interest in trial ( $B=-0.04$ ;  $p<0.001$ ), although it had the strongest effect on relative harm ( $B=0.01$ ;  $p=0.001$ ). Tobacco flavor (menthol) and flavor capsules had weaker, but positive significant influences on appeal and interest. **CONCLUSIONS:** Study results indicate that increasing pictorial warning label size, adopting plain packaging, and banning flavors will reduce the appeal of smoking for Mexican adolescents.

**FUNDING:** Federal

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## PAPER SESSION 3: CONTEXTUAL, BEHAVIORAL, AND DEMOGRAPHIC PREDICTORS OF SMOKING CESSATION SUCCESSES

### PA3-1

#### SCHOOL-LEVEL DISADVANTAGE AND FAILED CESSATION TREATMENT AMONG ADOLESCENT SMOKERS

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**SIGNIFICANCE:** While understanding factors that lead to successful adolescent smoking cessation are necessary, it is also prudent to determine conditions that contribute to cessation failure. The present study posits that adolescents' proximal environments—such as schools—may influence the cessation treatment outcomes. **METHODS:** Using aggregated and geographically referenced data from multi-year school-based cessation trials in 5 states, the present study developed and applied a tobacco-specific socio-spatial model inclusive of Hierarchical Linear Modeling. Specifically, this novel approach spatially joined individual data files ( $n=8,855$ ) with measures of school ( $n=807$ ) and county socio-economic factors. Once linked multi-level analyses explored the extent to which cessation treatment failure was explained by the interplay of individual, school and county level factors. Treatment was deemed as failing to meet its primary goals if participants continued to smoke cigarettes, measured 3-months post baseline. **RESULTS:** Ten percent of the variation in cessation treatment failure was attributable to school-level variables. Controlling for myriad variables associated with cessation, adolescent smokers were more likely to experience failure to quit in a) school districts with large percentages of the population having less than a high school education and b) schools with a higher ratio of students to teachers. The strength of the relationship between cessation self-efficacy and treatment success was further weakened among adolescents attending schools with a higher percentage of students eligible for free and reduced lunch programs. **CONCLUSIONS:** This study suggests that specific place-based factors such as school-level socio-economic disadvantage may reduce the benefits of tobacco cessation interventions, despite adolescents' high levels of self-efficacy to quit. Understanding the interplay of proximal school environments and individual-level factors may provide insights to educators, policy makers, and practitioners into the complexities that inhibit or strengthen an adolescent's smoking cessation treatment experience.

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### PA3-2

#### IN-THE-MOMENT CONTEXTUAL INFLUENCES ON "TRYING TO QUIT" EPISODES AMONG YOUNG ADULT SMOKERS

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**SIGNIFICANCE:** Studies in young adults indicate that situational contexts, including smoking by others and drinking alcohol, are strongly correlated with smoking behavior. Some contexts may also facilitate cessation; however, this has received little attention. **METHODS:** The purpose of this study was to examine correlates of "in the moment" trying to quit smoking episodes data collected in a subsample of young adults ( $n=43$ ) recruited in the Chicago, IL metropolitan area who responded to all four types of using ecological momentary assessment (EMA) events: 1) random prompts, 2) smoke events, 3) "can't smoke – other reason," and 4) "can't smoke – trying to quit" over two waves of data collection. Correlates examined were being at home, with others, others smoking nearby, smoking allowed in the location, the use of alcohol and marijuana in the hour prior to the report, and mood prior to the report. Mixed effects hierarchical multinomial logistic regression models compared between and within-subject differences for smoke events, can't smoke – other reason events, and trying to quit events to random prompts. Each model controlled for gender, wave, and weekend (vs. weekday) reporting and allowed



for random subject effects and correlations between random effects. RESULTS: There were no between-subject effects of being at home, with others, or alcohol/marijuana use on "trying to quit" events. However, significant within-subject effects were present for several mood variables. Compared to random prompts, higher negative affect (OR 1.13), being tired (OR 1.12), being bored (OR 1.12), and reporting the urge to smoke (OR 1.39) were associated with higher odds of reporting a "can't smoke – trying to quit" event. A higher positive affect was associated with lower odds (OR 0.87) of a "trying to quit" event. These relationships were also present in the "can't smoke – other reason" reports compared to the random prompts. CONCLUSIONS: Findings from this study highlight that mood, rather than social context, is correlated with non-smoking events among young adult smokers. Interventions designed to improve or stabilize mood in-the-moment may improve longer-term bouts of abstinence.

FUNDING: Federal

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### PA3-3

#### A SOCIO-SPATIAL APPROACH TO BROADENING EXPLANATIONS OF ADOLESCENT TOBACCO CESSATION OUTCOMES

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SIGNIFICANCE: While individual-level factors associated with adolescent tobacco cessation are important, it is also important to understand the influence of a multitude of socio-environmental factors. The complexities of tobacco control necessitate innovative models to explain these broader influences. Armed with knowledge of 'potent' factors, tobacco control experts can assess which factors are malleable to policies and interventions to increase success. To address this need, we established a socio-spatial model to explain how person, place, and social factors influence smoking cessation among adolescents enrolled in cessation programming. The innovation of this study was in the application of a multi-level socio-spatial model to predict individual cessation outcomes. We describe steps involved in developing the approach and lessons learned. METHODS: Geographically referenced measures of physical and social environments from three separate databases (state-level, county-level, school-level) were spatially joined with individual-level data (N=8,855) from an adolescent cessation program delivered in five diverse states, 1997-2012 to form a relational database. Multilevel analysis inclusive of HLM and GIS explored the extent to which cessation outcomes were explained by the interplay of multi-level factors. CONCLUSIONS: The socio-spatial approach demonstrated how a range of socio-environmental factors dynamically interrelate to influence individual adolescents' cessation of tobacco. This approach allowed us to uncover how a change in one socio-environmental level can change another level nested within. The model, for instance, identified that 10% of individual-level failure to quit was attributable to school-level disadvantage, irrespective of individual-level motivation. The approach illuminated various interactions that occurred at the school-level and more precisely, what factors (e.g., student-teacher ratios, enrollment size) within the schools were most influential. The study offers valuable lessons for future applications of this model. Methods as presented may allow us to track upstream "causes of the causes" that lead to individual tobacco cessation failure.

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### PA3-4

#### DYNAMIC PATTERNS OF SELF-EFFICACY AND QUITTING SMOKING: AN ECOLOGICAL MOMENTARY ASSESSMENT STUDY

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SIGNIFICANCE: Self-efficacy (confidence in one's ability to abstain from smoking) plays a key role in theories of smoking cessation. However, the assessment of

self-efficacy can be problematic given that it is conceptualized as context-specific. There is a high degree of intra-individual variability in self-efficacy, and dynamic patterns of self-efficacy during a quit attempt (e.g., increasing/decreasing levels; volatility) may predict smoking behavior. This study used ecological momentary assessment (EMA) to examine whether trajectories of self-efficacy predict abstinence. METHODS: Participants were 258 adult smokers (32% Caucasian, 33% African American, 33% Hispanic) receiving cessation treatment. For 6 days after the quit date, participants completed up to 4 daily random EMAs to rate their abstinence self-efficacy. For each participant, the mean, slope, and volatility were calculated for the 6-day self-efficacy trajectory, controlling for number of cigarettes per day. Biochemically-confirmed 24-hour abstinence was assessed at 1 and 4 weeks post-quit. Associations between EMA parameters (in separate and combined models) and abstinence at weeks 1 and 4 were examined, controlling for demographics and quit day abstinence. RESULTS: In separate models predicting week 1 abstinence, higher mean self-efficacy ( $p=.017$ ) and increasing slope ( $p=.007$ ) predicted higher likelihood of abstinence, and greater volatility ( $p=.055$ , approaching significance) predicted lower abstinence. However, in a combined model, only increasing slope ( $p=.018$ ) predicted higher abstinence. In predicting week 4 abstinence, only increasing slope predicted higher abstinence, both in separate ( $p<.001$ ) and combined ( $p=.001$ ) models. CONCLUSIONS: Over and above higher mean self-efficacy and less volatility, steeper increases in self-efficacy over the first week predicted abstinence at both 1 and 4 weeks after quitting, suggesting that individuals who feel increasingly confident over the course of the first week are more likely to successfully quit. Research should continue to study not only general levels of self-efficacy but also dynamic patterns of self-efficacy as they relate to lapse and relapse.

FUNDING: Federal

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### PA3-5

#### MENOPAUSAL STATUS IS ASSOCIATED WITH FAILURE TO QUIT SMOKING IN A 10-YEAR EPIDEMIOLOGICAL SAMPLE: RESULTS FROM THE STUDY OF WOMEN'S HEALTH ACROSS THE NATION (SWAN)

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SIGNIFICANCE: Smoking rates remain relatively high among 45-65 year old females, despite increased smoking-related health concerns in this population. To date, no study has examined transitions in smoking behaviors across premenopausal, (early/late) peri-menopausal, and postmenopausal females. This information may provide necessary insights to help develop targeted interventions for cessation among females during the menopausal transition. The present study sought to investigate the effect of menopausal status on quitting versus continued smoking behavior over a 10-year period. METHODS: Participants included 3,225 midlife (42-52 years old at enrollment) females who were followed annually in the SWAN, a 10-year multi-wave longitudinal, epidemiological dataset, which assessed for changes in smoking (smoking vs not smoking since last assessment) and menopausal statuses yearly (surgical menopause, post-menopause, late peri-menopause, early peri-menopause and premenopause). Age was included as a covariate in all analysis. RESULTS: Overall, results demonstrated that women who are late peri- or post-menopausal had decreased likelihood of quitting smoking in the following year, when compared to premenopausal women. For example, post-menopausal status at waves 2 through 8 was associated with reduced odds of quitting smoking in the following year (OR's ranging from 0.21-0.46). Additionally, women in late peri-menopause also had decreased likelihood of quitting smoking (waves 2 through 6; OR's ranging from 0.30-0.47) compared to premenopausal women. CONCLUSIONS: Menopausal status was associated with reduced odds of quitting across the menopausal transition. RESULTS: such as these provide evidence that the hormonal, psychosocial and/or physical changes unique to postmenopausal status are associated with a reduced ability to quit smoking. These findings provide insight on the importance of targeting subgroups within the menopausal transition, particularly postmenopause, when developing novel cessation interventions.

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## PAPER SESSION 4: STRATEGIES FOR OPTIMIZING AND PERSONALIZING SMOKING TREATMENT

### PA4-1

#### INCREASING THE DOSE OF NICOTINE REPLACEMENT TREATMENT TO INDIVIDUAL NEEDS: A PILOT STUDY

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**SIGNIFICANCE** Nicotine replacement treatment (NRT) is widely used for smoking cessation but its efficacy is modest. This may be, in part, because many smokers receive less nicotine from NRT than smoking. There is some evidence that higher dosing and the use of NRT prior to quitting may help, where NRT may lessen the desire to smoke by weakening the conditioned link between smoking behaviour and nicotine reward. A promising approach would be to increase the NRT dose prior to quitting, with the aim of achieving nicotine levels which make smoking unrewarding or even aversive. The objectives of this study were to examine the feasibility and potential efficacy of an individualised, increasing NRT dosing regimen for smoking cessation. **METHODS:** Fifty smokers were instructed to gradually increase the dose of nicotine patches (up to 84mg) based on individual reactions (enjoyment of smoking or nausea) over four weeks prior to quitting, followed by gradual reduction to standard dose (21mg) over three weeks post-quit. We measured the number progressing through each stage of dosing, treatment adherence, user ratings, adverse effects, changes in CO, cigarettes smoked per day (cpd), and enjoyment of smoking before quitting, and abstinence rates post-quit. **RESULTS:** High-dose nicotine patch use whilst smoking was well-tolerated. 36, 9, and 3 smokers used 84mg, 63mg, and 42mg, respectively. One smoker could not increase patch dose and one withdrew before commencing treatment. An increasing patch dose was associated with a significant decrease, between baseline and quit date, in mean rating of enjoyment of smoking (3.0 to 1.9,  $p < 0.001$ ), cigarette consumption (20.5 to 6.3 cpd,  $p < 0.001$ ), and CO in expired breath (19.4 to 9.7 ppm,  $p < 0.001$ ). Overall 41 (82%) of participants were abstinent (CO validated) from smoking at 4-week follow-up. **CONCLUSIONS:** Individualising the dose of nicotine required to reduce the enjoyment of smoking prior to quitting is a feasible approach and may improve short-term quit rates. This approach should be examined in a randomised controlled trial.

**FUNDING:** Pharmaceutical Industry

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### PA4-2

#### OPTIMIZING SMOKING TREATMENT ON BOTH EFFECTIVENESS AND COST AS PART OF THE MULTIPHASE OPTIMIZATION STRATEGY (MOST)

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While abstinence is a critical treatment outcome, translation into real-world clinical practice in primary care settings requires that smoking cessation interventions be affordable for patients and cost-effective for healthcare systems. One step in the Multiphase Optimization Strategy (MOST) is the selection of promising combinations of intervention components based on a targeted, optimization criterion. In the current research, we used data from a 2x2x2x2x2 factorial screening experiment (N=637) conducted in primary care clinics to select promising component combinations based on a criterion of *cost-effectiveness*. We used estimated abstinence rates for each treatment condition and the costs derived from the Medicaid portal for providing the treatment per protocol to estimate the cost/quit for the 10 intervention combinations with the highest estimated 26-week self-reported abstinence rates (40-54%). The two treatment combinations with the lowest cost/quit for the healthcare payer (<\$770) were: 1) 3 weeks of prequit and 8 weeks of postquit nicotine patch+gum and 6 counseling sessions, and 2) 3 weeks of prequit patch, 8 weeks of postquit patch+gum, and 3 prequit and 3 postquit phone counseling sessions. These data were compared to a treatment that was optimized based on effectiveness alone and that was evaluated in a randomized controlled

trial (RCT: N=623). This RCT compared an Abstinence-Optimized Treatment (A-OT; 3 in-person and 8 phone counseling sessions, automated medication adherence calls, and 26 weeks of patch+gum) developed using MOST with a Recommended Usual Care treatment (R-UC; 1 in-person counseling session, referral to a quitline, and 8 weeks of nicotine patch). The A-OT had higher cost/quit (\$2270) while the R-UC had a lower cost/quit (\$660) but a low abstinence rate (18%). We also estimated cost-effectiveness using costs based on treatment utilization. This research illustrates treatment optimization based on cost-effectiveness, contrasts it with effectiveness-based optimization, and suggest that the former optimization criterion holds promise for identifying treatments that are attractive to healthcare systems and appropriate for primary care.

**FUNDING:** Federal

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### PA4-3

#### PREDICTING SUCCESSFUL QUITTERS: A CLASSIFICATION-BASED APPROACH TO GROUP CBT RESPONDERS

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**SIGNIFICANCE:** Early identification of treatment responders benefits the healthcare system. Patients benefit by efficiently reaching their goals (e.g., smoking cessation) while burden is reduced on providers by streamlining patients to treatments that work. Here, we identify key characteristics to predict outcome in group cognitive behavioral therapy (CBT). **METHODS:** Two cohorts (C1: N=107, C2: N=87) of cigarette smokers completed a 6-week protocol for smoking cessation. Generalized estimating equations were used to identify baseline predictors of treatment outcome based on breath CO and urine cotinine at post-treatment and 3-month follow-up in C1. Significant measures were then entered as candidate variables to train classification trees to predict quit status. The resulting classification trees were used to predict outcomes following treatment and at follow-up in the out-of-sample C2 participants. **RESULTS:** Significant baseline predictors included rate of delay discounting, the Locus of Control Scale, and the Fagerström Test of Nicotine Dependence among other variables. Classification trees predicting quit status at post-treatment and 3-month follow-up were constructed using significant predictors for CO and cotinine, respectively. The first split in three of the four trees was delay discounting (average split point:  $\ln(k) = -7.33$ ). The C1 (training) participants were correctly classified 78% of the time and the C2 (validation) participants were correctly classified 66% of the time. **CONCLUSIONS:** The current study provides a first step to personalized care for smoking cessation by identifying baseline characteristics of treatment responders. These classification-based analyses are readily translated into algorithms to predict patient treatment outcomes in group CBT. Future work is needed to identify individuals that are likely to be successful in distinct treatments beyond group CBT.

**FUNDING:** Federal

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### PA4-4

#### EVALUATION OF A WEIGHTED GENETIC RISK SCORE MODEL FOR THE PREDICTION OF NICOTINE METABOLISM

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**SIGNIFICANCE:** The Nicotine Metabolite Ratio (NMR, 3-hydroxycotinine/cotinine) is an index of CYP2A6's nicotine metabolic inactivation, associated with smoking behaviours and cessation treatment outcomes. Heritability estimates for NMR range from 60 to 80%. Genome-wide association (GWA) studies of NMR indicate ~98% of hits are in/near CYP2A6; GWAS-identified CYP2A6 novel variants can explain a distinct portion of NMR variation. Our aim was to integrate GWAS CYP2A6 novel variants with established variants to create a genetic risk score (GRS) to predict CYP2A6 activity/NMR from CYP2A6 genotypes. **METHODS:** Training set: N=935 treatment seeking European-American smokers recruited to the Pharmacogenetics of Nicotine Addiction and Treatment (PNAT) Clinical Trial,



with NMR biomarker measures. Laboratory-based pharmacokinetic study: N=99 European-American smokers and non-smokers. 6-hour NMR ratios were derived from oral administration of deuterium-labeled nicotine(d2). NMR was determined in plasma by LC-MS/MS. An additive weighted genetic risk score (wGRS) was calculated as the sum of risk alleles multiplied by their effect sizes (betas were estimated from frequentist additive linear regression models). RESULTS: The final model contained 7 genetic variants, including independent GWAS signals and established *CYP2A6* variants. In the training set, the 7-variant wGRS explained 36.7% of the variance in the NMR phenotype. The wGRS model explained 33.1% of the variance in NMR-d2. The model also shows reasonable effectiveness in explaining alternative measures of nicotine metabolism including cotinine-d2/nicotine-d2+cotinine-d2, explaining 24.1% of the variance. The wGRS compared favourably to other earlier gene scores (Bloom et al., 2011). CONCLUSIONS: Here we present a simple 7-variant approach to translate *CYP2A6* genotypes into a gene activity score that improves on previous approaches in predicting *CYP2A6* activity. The final wGRS model provides improved predictive power in both *ad libitum*, and laboratory-based, measures of nicotine metabolism. This model can be utilized in studies looking to study the influence of *CYP2A6* activity in the absence of metabolite quantification.

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## PA4-5

### CAN WE INCREASE SMOKING CESSATION MEDICATION ADHERENCE AND DOES IT MATTER?

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SIGNIFICANCE: Adherent use of smoking cessation medication is strongly related to abstinence, but it has proven difficult to improve adherence and show this improves outcomes. This study examined, to the best of our knowledge, the most comprehensive data to date on cessation medication adherence, derived from electronically monitored nicotine gum use collected as part of a factorial experiment. This study characterized use patterns, examined the effects of adherence and cessation intervention components on medication adherence, and tested whether adherence was related to cessation success. METHODS: Smokers motivated to quit ( $N = 513$ ; 59% female; 87% Caucasian) participated in a  $2 \times 2 \times 2 \times 2 \times 2$  factorial experiment evaluating: 1) Medication Adherence Counseling vs. None; 2) Automated Medication Adherence Calls vs. None; 3) Electronic Medication Monitoring with Feedback and Counseling vs. e-Monitoring Alone; 4) 26 vs. 8 Weeks of Nicotine Patch + Nicotine Gum; and 5) Maintenance Counseling vs. None. Medication adherence was assessed over the first 6 weeks of the quit attempt via an electronic medication dispenser (nicotine gum) and timeline follow-back (nicotine patch). RESULTS: In the first 6 weeks of the quit attempt, 12% of participants used no patches or gum, and 40% used the patch every day. Participants used a mean of 2.3 pieces/day of gum, less than half the recommended amount. Only 1.4% of participants used both the patch and gum adherently every day in the 6 weeks post-target quit day. E-Monitoring Counseling increased gum use (from 1.9 to 2.6 pieces/day;  $p < .001$ ) but did not increase abstinence. Consistent patch and gum use in the first 6 weeks were each associated with higher point-prevalence abstinence rates through 1 year (e.g., abstinence rates were ~20 percentage points higher for those using the patch on at least 95% of days versus on 25-94% of days). CONCLUSIONS: This large experiment with electronic monitoring of nicotine gum adherence showed that e-Monitoring Counseling increased gum use but did not increase abstinence. Adherence to patch and nicotine gum was strongly related to abstinence, but the causal basis of this relation is unclear.

FUNDING: Federal

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## PODIUM PRESENTATION 2

## PAPER SESSION 5: SOCIAL AND ENVIRONMENTAL FACTORS FOR TOBACCO USE AMONG SPECIAL POPULATIONS

### PA5-1

#### TOBACCO ABSTINENCE POTENTIATES ATTENTIONAL BIAS TOWARD RACIAL DISCRIMINATION-RELATED STIMULI IN AFRICAN AMERICAN SMOKERS

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**SIGNIFICANCE:** Nicotine has been proposed to have a 'sociopharmacological' effect of reducing the extent to which sociocultural stressors (e.g., racial discrimination, neighborhood deprivation and problems) are distracting and distressing in minority populations. However, it is unknown whether tobacco abstinence may unmask and potentially exacerbate the attentional biases toward racial discrimination in minority smokers. In the present laboratory study, we examined the effect of tobacco abstinence on attentional processing of racial discrimination-related (vs. neutral-matched) stimuli in a sample of African American daily cigarette smokers. **METHODS:** African American smokers ( $N = 404$ ; 32% female;  $M$  age = 51 years old) completed a baseline session and two counterbalanced experimental sessions in which smoking abstinence was manipulated (16-hr smoking abstinence vs. non-abstinent). At both experimental sessions, participants completed a modified emotional Stroop task in which they identified the color of racial discrimination-related words and neutral words presented in randomized order. Multi-level models assessed fixed effects of word-type (discrimination vs. neutral), abstinence (abstinent vs. non-abstinent), and the word-type x abstinence interaction. **RESULTS:** We found that participants exhibited greater response times to trials with racial discrimination-related stimuli compared to neutral-matched stimuli (i.e., a 'Stroop effect': 803.22 – 766.63 milliseconds [ $ms$ ] = 36.59  $ms$ ,  $p < .0001$ ). We also found that participants had significantly longer response latencies to racial discrimination-related (vs. neutral) stimuli during smoking abstinence compared to the non-abstinent condition (word type x abstinence interaction: Stroop effect of 36.59 vs. 25.09  $ms$ ,  $p < .001$ ). **CONCLUSIONS:** Findings suggest that tobacco abstinence may increase the salience of racial discrimination-related stimuli in African American smokers. Future public policies, community and individual-level interventions, and educational efforts to reduce exposure to racial discrimination or alleviate its psychological effects may benefit smoking cessation efforts among African American smokers.

**FUNDING:** Nonprofit grant funding entity; Federal

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### PA5-2

#### HATE STRESS? RACIAL/ETHNIC DIFFERENCES IN PERCEIVED DISCRIMINATION AND RELATIONSHIP TO OVERALL SMOKING QUIT ATTEMPTS

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**SIGNIFICANCE:** Racial/ethnic minorities have greater difficulty becoming tobacco free compared to majority group smokers. Perceptions of stress correlate robustly with tobacco use, and perceived racial/ethnic discrimination is also associated with smoking. Little research has examined subgroup differences in perceived discrimination among tobacco smokers, and its relationship to cessation attempts. The current study investigated (a) racial/ethnic differences in past-year and lifetime

racial discrimination experiences and (b) associations between racial discrimination and quit attempts. We hypothesized that racial/ethnic minorities would report greater discrimination and that irrespective of subgroup, such experiences would be related to fewer quit attempts. **METHODS:** The sample included treatment-seeking enrollees in a multisite randomized controlled trial testing a group cessation intervention ( $N=232$ ). Participants self-identified as white non-Hispanic (36%), African American (46%), and Hispanic (18%). The sample was mostly female (54%), lower income (63%, \$20,000 or less), completed high school or more (87%), and middle aged ( $M=50$  years,  $SD=10$ ). At baseline, participants completed the Perceived Stress Scale, General Ethnic Discrimination scale, and measures of smoking history. ANCOVAs and multivariable regression (adjusted for sociodemographics) were conducted. **RESULTS:** We found associations between race/ethnicity and racial discrimination experiences. African Americans and Hispanics reported greater past-year ( $p=.04$ ) and lifetime perceived discrimination ( $p<.001$ ) compared to whites. After controlling for covariates, we found significant and positive associations between both past-year ( $p<.001$ ) and lifetime ( $p<.001$ ) racial discrimination experiences and global perceived stress. Past-year perceived racial discrimination was significantly associated with quit attempts, such that a greater number of experiences was related to fewer quit attempts ( $p=.04$ ). **CONCLUSIONS:** Perceived racial/ethnic discrimination is greater in minority group smokers, but may negatively impact quit attempts across racial/ethnic groups. These data have implications for intervention delivery.

**FUNDING:** State

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### PA5-3

#### ASSOCIATION BETWEEN CONCERN OVER SOCIETAL INCREASES IN DISCRIMINATION AND SMOKING AMONGST ADOLESCENTS DURING 2016-2017

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**SIGNIFICANCE:** Recently, there has been marked increases in discrimination and hostility directed toward minority groups at the societal level. Such trends have been pronounced in the U.S. during the presidential candidacy and election of Donald Trump. Teens may vulnerable to the adverse effects of polarizing societal events on mental health and risky behaviors, such as smoking—particularly youth of color. To address this concern, the present study tested whether adolescents who expressed greater worry about increasing discrimination in society reported greater increases in cigarette smoking from spring 2016 (baseline) to spring 2017 (12-month follow-up)—an observation period that coincided with the candidacy, election, and first few months of the Trump presidency. **METHOD:** Students in 10 high schools in Los Angeles, CA, USA ( $N=2921$ ; 47% Hispanic, 18% Asian, 5% Black, 6% Multiracial, 7% Other, 17% White; 12% highest parental education < high school diploma; baseline age,  $M[SD]=17.1[.39]$ ) completed surveys assessing cigarette smoking and concern/worry/stress about "increasing hostility and discrimination against people because of their race, ethnicity, sexual orientation/identity, immigrant status, religion, or disability status in society" at baseline and 12-month follow-up. **RESULTS:** Each 1SD unit increase in reported concern over societal discrimination at baseline was associated with 56% more days smoked in the past month at follow-up controlling for demographics and baseline smoking ( $IRR[95\%CI]=1.56[1.41-1.74]$ ). Increases in societal concern about discrimination from 2016 to 2017 were associated with significantly greater escalation in smoking frequency by 2017 in Black ( $IRR[95\%CI]=2.93[1.60-1.43]$ ), Hispanic ( $IRR[95\%CI]=1.32[1.12-1.61]$ ), and Asian ( $IRR[95\%CI]=1.24[1.05-1.56]$ ) students. Changes in concern over discrimination and smoking were not positively related in other racial/ethnic groups. **CONCLUSION:** Societal increases in animosity directed toward minorities may adversely impact the tobacco burden and health disparities by increasing smoking in youth, especially those of color. Urgent attention and response from the tobacco control community is warranted.

**FUNDING:** Federal

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## PA5-4

### FDA COMPLIANCE VIOLATIONS AMONG INDEPENDENT TOBACCO RETAILERS IN SOCIOECONOMICALLY DISADVANTAGED RACIAL/ETHNIC MINORITY COMMUNITIES

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The Family Tobacco Control Act of 2009 gave the Food and Drug Administration (FDA) authority to regulate tobacco in the retail environment, protecting youth from tobacco addiction and advancing overall public health. This study examines compliance with FDA regulations across tobacco retailers from five ethnic/racial low-income communities (American Indian (AI), African American (AA), Non Hispanic Whites (NHW), Hispanic/Latinos (H/L), Korean (K)). METHODS: Using the Standardized Tobacco Assessments for Retail Settings (STARS) observation tool, we conducted store audits among 775 independent tobacco retail stores. Stores were considered non-compliant with FDA regulation if they were observed to sell FDA banned tobacco products, cigarette packs with less than 20, open packages of cigarettes or chew, self-service displays, or distributed free samples for either cigarettes, chew, or cigarillos, and/or violated age identification requirements. RESULTS: Fourteen percent of the 775 retailers were considered non-compliant. There were more retailers in the NHW (19.4%) and AA (16.5%) communities that were non-compliant compared to tobacco retailers in other ethnic communities (5.8% in H/L, 11% in K, and 13.5% in AI) ( $X^2_{(4)}=17.3359$   $p<0.002$ ). Of the 775 stores, 137 (17.6%) stores were observed for underage identification checks (individuals who looked under 27 years old purchased tobacco while the observation was being conducted). Of these stores, 85 (62%) did not request identification from a customer that looked under 27 years old. Retailers in the NHW community were more likely to ask for identification (65%), compared to 22% in the AA, and 38% in the K community ( $(X^2_{(4)}=15.309$ ,  $p<0.004$ ). CONCLUSIONS: All low SES communities seem to be vulnerable to FDA violations. Compliance differences were found among ethnic communities; and types of violations differed by community. Identification of areas of violation within each community can assist the FDA with implementation of point of sale restrictions and potentially reduce youth initiation rates.

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## PA5-5

### AFRICAN AMERICAN SMOKERS WITH STRONG SOCIAL SUPPORT ACHIEVE SMOKING CESSATION AT HIGHER RATES COMPARED TO CAUCASIANS REGARDLESS OF MOTIVATION TO QUIT

Samantha Schiavon\*, Michelle Sisson, Karen Cropsey, University of Alabama at Birmingham, AL, USA

Tobacco use is the leading cause of preventable deaths nationwide. Previous research has shown that African Americans tend to report greater motivation to quit smoking, but greater difficulty achieving smoking cessation. Research further asserts that African American women with strong social support networks have greater odds of achieving abstinence. However, none have examined the interaction between race, motivation to quit and social support on achieving smoking cessation. The present study examined how race (Black v. White) moderates the moderation of social support on the relationship between motivation to quit and change in smoking among a disenfranchised group of smokers. 500 participants were recruited at a community correctional facility in Birmingham, AL. Participants were enrolled in a clinical trial evaluating the effects of bupropion on smoking outcomes. All participants received 12 weeks of bupropion and were followed up for 12 months. Questionnaires assessed participants' smoking history, smoking characteristics and demographics. PROCESS macro for SPSS was used to examine the three-way interaction between race, social support, and motivation to quit on change in smoking at 3-months post-baseline. Probing the interaction revealed that among Black smokers with moderate and high levels of social support there was a significant negative relationship between motivation to quit and change in smoking, such that greater motivation to quit was associated with reduced smok-

ing. There were no significant interactions among Black smokers with low levels of social support or White smokers. These results suggest that for Black smokers, regardless of their motivation to quit, moderate to high levels of social support may be a necessary component to achieve reductions in smoking. RESULTS: may help individually tailor cessation interventions to increase smoking abstinence among Black smokers.

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## PAPER SESSION 6: TOBACCO REGULATORY SCIENCE AND POLICY DEVELOPMENT

### PA6-1

#### MISPERCEPTIONS ABOUT THE HARM OF VERY LOW NICOTINE CIGARETTES: A NATIONAL SURVEY OF US ADULT SMOKERS

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**SIGNIFICANCE:** The US has proposed a very low nicotine content (VLNC) cigarette standard. We sought to characterize the prevalence and correlates of the incorrect belief that smoking VLNC cigarettes is less likely to cause cancer than smoking other cigarettes. We also examined whether this misperception is associated with a predicted likelihood of quitting if a VLNC policy is enacted. **METHODS:** We conducted an online survey with a nationally-representative sample of 650 adult smokers in the US before news of the VLNC proposal became public. Multivariate weighted analyses were conducted to calculate odds ratios and a chi square test was used to consider associations. **RESULTS:** Overall, 47.1% of smokers believed that smoking very low nicotine cigarettes for 30 years would be less likely to cause cancer than smoking other cigarettes. This misperception was more common among smokers who were ages 55 or older (56.6%) and Black (57.4%). Additionally, 23.9% of smokers believed they would be less likely to quit if the US adopted a VLNC regulation. Thinking that VLNC are safer than other cigarettes was positively associated with anticipating continued smoking behavior under a VLNC regulation ( $p < .01$ ). **CONCLUSIONS:** Almost half of smokers had the misperception that smoking VLNC cigarettes is less likely to cause cancer than smoking other cigarettes. About a quarter of smokers believed that a VLNC regulation would make them less likely to quit smoking. The perceived risk and predicted likelihood of quitting beliefs were associated, indicating that a VLNC regulation may reduce quit intentions among some smokers by making cigarettes seem less harmful. A VLNC regulation may be more effective if accompanied by a communications campaign that emphasizes the continued toxicity of VLNC cigarettes.

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### PA6-2

#### COUNTY-LEVEL ASSOCIATIONS BETWEEN TOBACCO RETAILER DENSITY AND SMOKING PREVALENCE IN THE USA, 2012

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**SIGNIFICANCE:** Living in areas with a greater concentration of tobacco retailers increases exposure to point-of-sale marketing and reduces travel costs to purchase tobacco. Additionally, higher tobacco retailer density is associated with greater smoking frequency, lower efficacy to quit and higher odds of relapse in studies of specific geographies or populations. In this study, we examine associations between tobacco retailer density and adult smoking prevalence in all United States (U.S.) counties with populations greater than 5,000 people ( $n=2,828$ ). **METHODS:** We built an analytic dataset by merging a list of likely tobacco retailers from the National Establishment Time-Series in 2012 with smoking prevalence data from the Behavioral Risk Factor Surveillance System, county-level demographic data from the U.S. Census, and cigarette tax data from the State Tobacco Activities Tracking and Evaluation System for the same year. We modeled adult smoking prevalence as a function of tobacco retailer density (in quartiles), controlling for county demographics and state cigarette taxes, and accounting for clustering of counties within states. The analyses compared a crude estimate of number of tobacco retailers per 1,000 county residents with a measure that uses adaptive kernel estimation to adjust for proximity of residents to stores. **RESULTS:** Average density in US counties was 1.25 retailers per 1,000 people (range=0.3-4.5). Counties with more than 1.6 tobacco retailers per 1,000 people have smoking prevalences that are 1.56 percentage points higher than counties with fewer than 1 retailer per 1,000 ( $p<.001$ ). Our analyses identified the same size of association ( $\text{Beta}=1.56, p<.001$ ) for a \$1.00 difference in state excise taxes. Models using

the two measures of density produced similar results. **CONCLUSIONS:** Adjusting for population demography and cigarette tax, tobacco retailer density is positively associated with adult smoking prevalence at the county level. Longitudinal studies are required to tease out whether oversupply stimulates demand. Policies that require tobacco retailer licensing, and reduce tobacco retailer density, may hold promise as tobacco control strategies.

**FUNDING:** Federal

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### PA6-3

#### RISK ASSESSMENT FOR TOBACCO REGULATION

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**SIGNIFICANCE:** "Risk assessment" is to the process of "evaluating the relative merits of various options (or interventions) for managing risk" through a transparent, reproducible, and pre-established methodology. Risk assessment is regularly used by a wide array of federal agencies to inform regulatory decisions. Though risk assessment is a well-established regulatory tool, its application to tobacco regulation is new. An objective and transparent risk assessment process is particularly important in the context of tobacco regulation, where important regulatory decisions are likely to be challenged in court. **METHODS:** We examined publications related to risk assessment from the EPA, National Research Council (NRC), FDA (non-tobacco related), and other government agencies to identify and characterize core elements of risk assessment frameworks used by federal agencies. We then used a web search to locate all references to risk assessment in FDA Center for Tobacco Products documents, tobacco-related IOM reports, and NCI monographs, to analyze the application of risk assessments principles to federal tobacco regulation. **RESULTS:** The four-step risk assessment process developed by the EPA and NRC—hazard identification, dose-response assessment, exposure assessment, and risk characterization—is used throughout the federal government to inform regulatory decisions. However, risk assessments in other contexts rely almost exclusively on examination of individual-level risks, whereas risk assessments intended to inform the FDA's tobacco regulations must reflect the Tobacco Control Act's population-level public health standard. Additionally, the unique nature of tobacco products in comparison to other environmental hazards—particularly the important role of behavioral factors and industry marketing—makes direct application of the established EPA/NRC methodology difficult. Tobacco risk assessments to date have not fully engaged with these complications. **CONCLUSION:** Researchers should work with the FDA to develop a tobacco-specific approach to risk assessment that reflects the TCA's regulatory framework and the distinctive features of tobacco products and tobacco use.

**FUNDING:** Federal

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### PA6-4

#### MODIFIED RISK TOBACCO PRODUCTS: SOCIAL SCIENCE RESEARCH TO INFORM PRODUCT REVIEW AND REGULATION

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**SIGNIFICANCE:** In 2009, the Family Smoking Prevention and Tobacco Control Act (Tobacco Control Act) (Public Law 111-31), granted the Food and Drug Administration (FDA) the authority to regulate the manufacture, distribution and marketing of tobacco products, including modified risk tobacco products (MRTPs). MRTPs are tobacco products sold or distributed for use to reduce harm or the risk of tobacco-related disease associated with commercially marketed tobacco products. **METHODS:** An overview of the MRTP application process and information considered by the FDA/Center for Tobacco Products (CTP) when reviewing an MRTP application will be presented and discussed, including current CTP Social Science research that can help to inform future modified risk application reviews. **RESULTS:** FDA may authorize the marketing of a MRTP if the product is determined to significantly reduce harm and risk of tobacco-related disease to individual tobacco users and benefit the health of the population, including both users and non-users of tobacco products, and that such an order would be appropriate to promote public health. A manufacturer may submit a modified risk



tobacco product application if seeking to market a product to reduce the harm of tobacco-related disease. An overview of current research related to modified risk currently being conducted to inform tobacco regulation at FDA/CTP in the Social Science Branch, Division of Population Health Sciences, Office of Science, will be presented including: qualitative and quantitative consumer perceptions research, and developmental research on risk perception measures, to inform future studies addressing potential modified risk tobacco products. CONCLUSIONS: Information presented can inform the MRTP process and application pathway for a diverse audience of researchers, public health officials, tobacco control advocates, and the tobacco industry. This improved understanding can inform both future research and applications received for review in the MRTP pathway.

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## PA6-5

### SMOKERS' SUPPORT FOR POLICIES TO REGULATE THE CONTENTS OF TOBACCO PRODUCTS IN CANADA, THE US, AUSTRALIA, AND ENGLAND: FINDINGS FROM THE ITC FOUR COUNTRY SURVEY

Janet Chung-Hall<sup>1\*</sup>, Geoffrey Fong<sup>2</sup>, Pete Driezen<sup>1</sup>, Lorraine Craig<sup>1</sup>, David Hammond<sup>1</sup>, K. Michael Cummings<sup>3</sup>, Sara Hitchman<sup>4</sup>, Ron Borland<sup>5</sup>, Richard O'Connor<sup>6</sup>, <sup>1</sup>University of Waterloo, ON, Canada, <sup>2</sup>University of Waterloo, Ontario Institute for Cancer Research, ON, Canada, <sup>3</sup>Medical University of South Carolina, SC, USA, <sup>4</sup>King's College London, United Kingdom, <sup>5</sup>Cancer Council Victoria, Australia, <sup>6</sup>Roswell Park Cancer Institute, NY, USA

SIGNIFICANCE: Regulating the contents of tobacco products have the potential to reduce the harms of tobacco use. National bans on flavors (except menthol) in cigarettes have been implemented in the US (2009), Canada (2010) and England (2017), and in some jurisdictions in Australia (2006-11). National menthol bans are forthcoming in Canada (Oct 2017) and England (May 2020). This study measures smokers' support in Australia (AU), Canada (CA), England (EN) and US for a total ban on additives/flavors (A/F) and menthol in cigarettes/tobacco (C/T). This study establishes a baseline for comparing smokers' support across four countries and refutes industry claims that smokers would oppose strong regulatory measures. METHODS: Data are from Wave 1 of the ITC 4 Country Survey (2016), a web-based cohort survey of adult smokers from AU (n=1439), CA (n=3216), EN (n=3886) and US (n=2327). Smokers were asked how strongly they supported or opposed laws to ban all A/F and menthol in C/T. Weighted multivariate logistic regression assessed predictors of support by demographics, country, smoking status, e-cigarette use, CPD and quit intentions. RESULTS: Support for a total A/F ban ranged from 31% in EN to 44% in AU (no country differences). Support for a menthol ban was higher in CA (31%) than AU (18%) and EN (14%) (p<.05), with no differences in the US (21%) vs other countries. Menthol smokers in all countries were less likely to support a total A/F ban (p<.001) and a menthol ban (except AU; p<.001). Support for both bans was higher among smokers who were married, non-daily users and those with intentions to quit; and lower among females (all p<.05). Smokers with lower CPD were more likely to support a total A/F ban (p<.01) but less likely to support a menthol ban (p<.001). Cigarette only users were less likely to support a menthol ban (p<.001). CONCLUSIONS: Smokers in all four countries support laws to regulate the contents of tobacco products. Support for a menthol ban was strongest in CA, where a national ban began in Oct 2017. Support for the 2017 flavor ban and 2020 menthol ban in EN should increase over time, given evidence that support for policies goes up after implementation.

FUNDING: Federal; State

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## PAPER SESSION 7: ELECTRONIC NICOTINE DELIVERY SYSTEMS: INITIATION AND SUBSEQUENT SMOKING INITIATION

### PA7-1

#### DETERMINANTS OF E-CIGARETTE AND CIGARETTE USE INITIATION AMONG YOUNG ADULTS IN THE SOUTHERN CALIFORNIA CHILDREN'S HEALTH STUDY

Natalie Kintz\*, Mengyu Liu, Chih-Ping Chou, Robert Urman, Rob McConnell, Jessica Barrington-Trimis, Keck School of Medicine, University of Southern California, CA, USA

SIGNIFICANCE: Previous youth tobacco research documents the strong relationship between e-cigarette and cigarette initiation among adolescents, but few studies assess determinants of e-cigarette initiation. We examine the role of a tobacco-friendly e-cigarette or cigarette social environment, tobacco marketing exposure, and susceptibility to smoking or vaping on the initiation of e-cigarette and cigarette use. METHODS: 11<sup>th</sup>/12<sup>th</sup> grade students enrolled in the Southern California Children's Health Study were surveyed in 2014 (Time 1 [T1], N=2097), and again in 2015 (T2, N=1553). Two separate structural equation models were used to investigate associations of susceptibility, marketing, and social environment latent factors with cigarette or e-cigarette initiation at T2. For e-cigarette initiation, never e-cigarette users (N=1197) at T1 were analyzed controlling for T1 cigarette use. For cigarette initiation, never cigarette users (N=1293) at Time 1 were analyzed controlling for T1 e-cigarette use. Additional covariates included gender, ethnicity, parental education, and T1 cigar and hookah use. RESULTS: E-cigarette susceptibility, marketing, and social environment latent factors, but not cigarette use at T1, were significantly associated with e-cigarette initiation at T2 (Ps<0.05). Cigarette susceptibility, marketing, and social environment latent factors, and e-cigarette use at T1 were significantly associated with cigarette initiation at T2 (Ps<0.05). Importantly, hookah users (vs. nonusers) at T1 were more likely to initiate both e-cigarette (OR=5.53; 95% CI=3.47-8.79) and cigarette use (OR=2.35; 95% CI=1.62-3.40) at T2. CONCLUSIONS: Hookah and e-cigarette use were strongly associated with subsequent initiation of cigarettes, suggesting a potential role as introductory tobacco products. Further examination of how product characteristics contribute to tobacco use initiation may provide insight into regulatory and health policy strategies to reduce use in young adults.

FUNDING: Federal

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### PA7-2

#### E-CIGARETTES: COMPARING THE POSSIBLE RISKS OF INCREASING SMOKING INITIATION WITH THE POTENTIAL BENEFITS OF INCREASING SMOKING CESSATION

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Many of the staunchest opponents of e-cigarettes focus laser-like on their potential to increase smoking among young people. In contrast, many e-cigarette supporters emphasize the products' potential to increase adult smoking cessation. While both effects are the subject of intense debate, what few analysts have done is to examine the net impact if, in fact, both effects proved to be true. Using a validated dynamic model of US smoking prevalence, we simulate the number of life-years gained or lost through the year 2070 if e-cigarettes simultaneously increase smoking initiation and cessation. We derive our estimates of the increases in initiation and cessation from empirical research regarding both effects, and perform sensitivity analyses to test the implications of a variety of assumptions regarding both initiation and cessation. This presentation will describe data sources, assumptions, and analytical methods and present results. Our base case analysis assumes a 2% annual increase in the smoking initiation rate and a 10% increase in the smoking cessation rate. With these assumptions, the US would experience a net gain of nearly 3.3 million life-years by the year 2070. Were the only impact of e-cigarettes to increase smoking initiation (i.e., no effect on cessation), there would be a loss of just over 258,000 life-years. If, instead, e-cigarettes increased cessation but did not impact initiation, the benefit would be a gain of over 3.5 million life-years. The most conservative sensitivity analysis employs three pes-





simistic assumptions: First, e-cigarettes increase the annual smoking initiation rate by 6%. Second, the cessation rate increases by 5%. Third, everyone who quits smoking with e-cigarettes loses 25% of the mortality savings associated with quitting smoking without e-cigarettes. (This is analogous to assuming that e-cigarettes are 25% as risky as smoking and that no one who switches from smoking to e-cigarettes ever quits using the latter.) Under these assumptions, the benefits of extra cessation (life-years gained) are nearly double the costs of extra initiation (life-years lost). The net impact is a gain of 723,000 life-years.

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## PA7-3

### E-CIGARETTE USE IS ASSOCIATED WITH FUTURE CIGARETTE INITIATION AMONG NONSMOKERS AND RELAPSE AMONG DISTANT FORMER SMOKERS: RESULTS FROM TWO WAVES OF THE PATH STUDY

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**SIGNIFICANCE:** Any potential harm reduction benefit of e-cigarettes to smokers could be offset by nonsmokers initiating e-cigarette use and then transitioning to combustible cigarette use. This longitudinal study examines cigarette use at one-year follow-up among adult distant former and never smokers based on e-cigarette use at baseline. **METHODS:** Results are from 26,447 adults (ages 18+) surveyed in Waves 1 and 2 of the Population Assessment of Tobacco and Health (PATH) Study. Two populations are examined; distant former smokers who quit before 2009 and never smokers. Analyses compared cigarette use at Wave 2 by e-cigarette use at baseline (never-trier, ever-trier, past 30-day use). Two variables assess cigarette use at Wave 2. Adult never to ever cigarette smokers in Wave 2 are adults who started smoking cigarettes between waves. Wave 2 current established cigarette smokers have smoked at 100 cigarettes and currently smoke every day or some days. **RESULTS:** Among distant former smokers, past 30-day users (9.3%) (OR=7.6, 95%CI:3.0-19.4) and ever-triers (6.7%) (OR=5.4, 95%CI:2.9-10.2) were more likely to have relapsed to current smoking at one year follow-up than were never-trier distant former smokers (1.3%),  $p < .001$ . Among never smokers, those who reported past 30-day e-cigarette use (25.6%) (OR=16.4, 95%CI:9.8-27.5) and ever-trying (13.9%) (OR=7.7, 95%CI:5.4-11.0) were more likely to have transitioned from never to ever cigarette smokers than never-triers (2.1%),  $p < .001$ . Past 30-day e-cigarette users (7.0%) (OR=25.5, 95%CI:10.6-61.4) and ever-triers (1.7%) (OR=5.9, 95%CI:1.7-20.7) were more likely to have transitioned from never smoker to established smoker than never-triers (0.3%),  $p < .001$ . **CONCLUSIONS:** Never smoking adults who use or try e-cigarettes are at significantly increased risk of later initiation of cigarette use. Distant former smokers who e-lapse to e-cigarette use have significantly higher rates of later relapse to cigarette use. Policies and clinical counseling should consider the increased risk of combustible tobacco use that these products place on non-smokers, in addition to any potential harm reduction benefits to current cigarette smokers.

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## PA7-4

### YOUTH TOBACCO USE TRAJECTORIES OVER TIME: E-CIGARETTE USE PREDICTS SUBSEQUENT CIGARETTE SMOKING

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**SIGNIFICANCE:** E-cigarette use rates are high among youth, and there are concerns that e-cigarette use leads to future conventional cigarette use. The current study examined longitudinal associations between past-month cigarette and e-cigarette use to characterize the stability and directionality of these tobacco use tra-

jectories over time. **METHODS:** High-school students (N=808, 53% female) completed longitudinal surveys across three waves (2013, 2014, 2015) in three public schools in Connecticut. Autoregressive cross-lagged models examined the potential bidirectional relationships between past-month cigarette and e-cigarette use over time. Models adjusted for covariates related to tobacco use (i.e., sex, race/ethnicity, socioeconomic status, and use of other tobacco products). **RESULTS:** Past-month e-cigarette use at each wave significantly predicted future cigarette use (wave 1 to 2: Odds Ratio (OR)=7.08, 95% Confidence Interval (CI)=2.34-21.42,  $p=.001$ ; wave 2 to 3: OR=3.87, 95%CI=1.86-8.06,  $p<.001$ ). The reverse directionality was not significant; past-month cigarette use did not predict future e-cigarette use (wave 1 to 2: OR=2.02, 95%CI=0.67-6.08,  $p=.21$ ; wave 2 to 3: OR=1.90, 95%CI=0.77-4.71,  $p=.16$ ). Additionally, frequency of cigarette and e-cigarette use increased over time. By wave 3, more than 26% of past-month cigarette users and 20.5% of past-month e-cigarette users reported using 21-30 days out of the past month. **CONCLUSIONS:** E-cigarette use was associated with future cigarette use across three longitudinal waves, yet cigarette use was not associated with future e-cigarette use. Future research needs to examine the mechanisms through which e-cigarette use increases risk for future cigarette use. E-cigarette regulation and prevention programs are critically needed to prevent future use of cigarettes among youth.

FUNDING: Federal

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## PA7-5

### RISKY BUSINESS: EXAMINING CIGARETTE SMOKING INITIATION AMONG SUSCEPTIBLE AND NON-SUSCEPTIBLE E-CIGARETTE USERS

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**SIGNIFICANCE:** Given that many adolescent e-cigarette users are never smokers, the possibility that e-cigarettes may act as a gateway to future cigarette smoking has been discussed in various studies. Additional longitudinal data are needed to explore the pathway between e-cigarette and tobacco cigarette use, particularly among different risk groups. This study examined whether baseline use of e-cigarettes among a sample of susceptible and non-susceptible never-smoking youth was associated with cigarette smoking initiation over a 2-year follow-up period. **METHODS:** A sample of 9th to 11th grade never-smoking students (n=9501) was identified at baseline using longitudinal data from the COMPASS study. Two logistic regression models assessed the association between current (past 30 day) e-cigarette use at baseline and cigarette smoking initiation at 2-year follow-up among baseline susceptible and non-susceptible never-smoking youth, controlling for relevant covariates. **RESULTS:** At 2-year follow-up, 76.4% of current e-cigarette users reported ever trying a cigarette compared to 27.1% of non-current e-cigarette users. Overall, current e-cigarette users at baseline were more likely to try cigarette smoking 2 years later. This association was stronger among the sample of non-susceptible never smokers [Odds Ratio (OR)=5.38] compared to susceptible never smokers (OR=2.94). **CONCLUSIONS:** The findings from this large, longitudinal study support public health concerns that e-cigarette use may contribute to the development of a new population of cigarette smokers, even among adolescents that hold no intentions to smoke in the future. These findings underscore the need for sustained efforts to prevent e-cigarette use among youth populations, especially those at lowest risk for smoking.

FUNDING: Federal

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## PA7-6

### ELECTRONIC AND CONVENTIONAL CIGARETTE USE IN A GENETICALLY INFORMATIVE SAMPLE OF YOUNG ADULTS: GENETIC AND ENVIRONMENTAL INFLUENCES

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Although rates of electronic cigarette (e-cigarette) use continue to increase in adults across all age groups, young adults ages 18-25 have the highest prevalence of initiation in the United States. Future efforts preventing e-cigarette initiation among young adults are likely benefit from the experience in the control of combustible cigarette use. In particular, it is important to estimate the degree to which additive genetic and shared environmental factors influence e-cigarette and combustible cigarette initiation and determine whether they function in a similar manner for both products. A sample of 346 young adult twins ages 17–22 years (mean = 19.5 years) from the Adolescent and Young Adult Twin Study was measured for combustible- and e-cigarette initiation. Genetic and environmental effects for combustible- and e-cigarette initiation were estimated in 70 monozygotic and 103 dizygotic twin pairs using structural equation modeling in OpenMx. Nearly 16.5% of the sample reported using an e-cigarette in their lifetime, while 18.4% reported using a combustible cigarette. The magnitude of shared environmental effects across adolescence was substantial ( $C = 0.48$  (95%CI = 0 – 0.76)). The contribution of additive genetic effects was negligible ( $A = 0.19$  (0 – 0.84)). There was a moderate contribution due to unique environmental influences ( $E = 0.32$  (0.12-0.57)) influences. The magnitude of genetic and environmental influences for combustible cigarettes was similar to that of e-cigarettes ( $A = 0.11$  (0.0 – 0.68),  $C = 0.49$  (0.05-0.69),  $E = 0.40$  (0.2-0.59)). These results emphasize the need for prevention and education against e-cigarette smoking initiation among young adults. Further, these results suggest that future public health approaches which address e-cigarette initiation in a similar manner to those focused on combustible cigarette use may be of benefit to preventing long-term e-cigarette use.

FUNDING: Federal

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## PAPER SESSION 8: ELECTRONIC NICOTINE DELIVERY SYSTEM: OXIDANT AND ALDEHYDE EMISSIONS AND EXPOSURE

## PA8-1

### EXPOSURE TO TOXIC AND/OR CARCINOGENIC VOLATILE ORGANIC COMPOUNDS IN DUAL USERS DURING SMOKING, VAPING, AND ABSTINENCE

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**SIGNIFICANCE:** One of the most common reasons given for e-cigarette use among adults is to reduce harm from tobacco smoking. However, the toxicological profiles of e-cigarettes likely vary across generations of devices. **METHODS:** We conducted a within-subject, crossover study in a hospital research ward, during which dual users of combustible cigarettes and e-cigarettes were randomized to each product (their usual brands) for 24 hours, followed by 24 hours of enforced abstinence from both products at the end of the second block. 24-hour urine was collected for measurement of mercapturic acid metabolites of volatile organic compounds (VOCs). Of 18 participants, 8 used 1<sup>st</sup> generation/cigalike e-cigarettes and 10 used 2<sup>nd</sup>/3<sup>rd</sup> generation (tanks) e-cigarettes. **RESULTS:** Excretion of metabolites of acrylamide, acrylonitrile, 1,3-butadiene, benzene, crotonaldehyde, ethylene oxide, and propylene oxide was significantly higher with combustible cigarette compared to e-cigarette use and abstinence, and not significantly different between e-cigarette use and abstinence. The acrolein metabolite followed a similar trend but its levels were elevated with e-cigarette use compared to abstinence (nonsignificant after correcting for multiple pairwise comparisons). The metabolites of methylating agents were not significantly different between the study conditions. No differences in VOC metabolite concentrations or VOC metabolite concentrations normalized to total nicotine equivalents were observed between types of e-cigarettes. **CONCLUSION:** E-cigarette use results in significantly lower systemic exposure to toxic VOCs compared to smoking. Our results are consistent with studies that show significant reductions in these same VOC metabolites in smokers who switch to e-cigarettes over extended periods. Compared to smoking, e-cigarette use likely results in reduced risk of diseases associated with these VOCs. However, the trend towards increased systemic exposure to acrolein raises concern about some cardiopulmonary risk. We found no difference in toxicological profile between types of e-cigarettes, but a definitive conclusion is limited by the relatively small number of devices studied.

FUNDING: Federal

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## PA8-2

### EFFECT OF FLAVORING CHEMICALS ON FREE RADICAL FORMATION IN ELECTRONIC CIGARETTE AEROSOLS

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**SIGNIFICANCE:** Since their inception, flavoring chemicals, or flavorants, have been used in electronic cigarettes (e-cigarettes). Despite their inclusion, little is known about their toxicological effects. E-cigarette aerosols are now known to contain reactive carbonyls and free radicals that have recently been shown to induce oxidative stress that result in damage inflammation, proliferation, and survival cellular pathways. Previous studies have found that aerosols generated from the common e-liquid solvents, propylene glycol (PG) and glycerol (GLY), alone contain high levels of free radicals; however, few have looked at how these solvent-derived radicals are modulated by flavorants. **METHODS:** We analyzed the free radical production from 49 different nicotine-free e-liquids flavors using a temperature controlled e-cigarette device. Free radicals from the aerosols were captured and analyzed using electron paramagnetic resonance (EPR). The constituent flavorant molecules in each e-liquid flavor were identified using gas chromatography mass spectroscopy. The abundance of each flavorant was correlated with their parent e-cigarette flavor's radical content. Ten compounds with the strongest positive or



negative correlations were then used to analyze their individual impact on free radical generation. RESULTS: Nearly half of the 49 flavors analyzed appeared to modulate free radical production as compared to a base of PG:GLY (60:40). The flavorants identified and analyzed were  $\beta$ -damascone,  $\delta$ -tetradeacalactone,  $\gamma$ -decalactone, citral, dipentene, ethyl maltol, ethyl vanillin, ethyl vanillin PG acetal, linalool, and piperonal. Free radical formation was promoted in a concentration-dependent manner with the addition of dipentene, ethyl maltol, citral, linalool, or piperonal. Conversely, free radical formation was inhibited in a concentration-dependent manner with the addition of ethyl vanillin. Conclusion These results suggest that flavorants play an important role in modulating the production of free radicals in flavored e-cigarette aerosols. Based on this information, regulatory strategies are needed for reducing the potential harm from flavored e-cigarette to the consumer.

FUNDING: Federal

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## PA8-3

### ALDEHYDE EMISSIONS FROM HIGH-POWER "SUB-OHM" ELECTRONIC CIGARETTE DEVICES

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SIGNIFICANCE: Electronic cigarettes (ECIGs) are battery powered devices that rely on an electrical heating coil to heat and vaporize a nicotine-containing liquid to produce an inhalable aerosol mist. ECIG designs have evolved rapidly over the past decade, and recent models include high-power devices with heating coils that operate at <1 Ohm (sub-Ohm devices; SODs). Because emissions of volatile aldehydes (VAs), an important class of pulmonary toxicants, increase with power, SODs may expose users and bystanders to greater VA levels. However, because SOD designs have larger heating coils, the greater power input is distributed over a larger surface, resulting in lower temperatures, potentially offsetting VA production. To date, there are no published data on VA yields from SODs. METHODS: In this study we measured VA yields from four popular SOD models at a constant power (50W) and from one SOD at 50, 75, and 100W, using a liquid with a propylene glycol/vegetable glycerin ratio of 1:1 by volume. For comparison, we also measured VA yields from a conventional ECIG that is not an SOD at two power levels: 4, 11W. Aerosols were generated using a digital vaping machine and analyzed by HPLC. We also disassembled samples of each ECIG device and measured total coil surface area. RESULTS: and Conclusions We found that although operated at an order of magnitude higher power, SODs did not necessarily emit greater quantities of VA than the conventional low-power device. In fact, across devices power did not predict VA emissions. However power normalized by coil surface area (W/m<sup>2</sup>) was highly correlated with VAs, suggesting that area-normalized power is the relevant governing parameter for VA emissions. Additionally, VAs and liquid consumed were correlated highly. Because nicotine yields are directly proportional to the amount of liquid consumed, this finding is particularly relevant to potential regulatory strategies aimed at reducing liquid nicotine concentrations: users of low nicotine concentration liquids may switch to high-power devices to maintain a given nicotine intake, and in the process be exposed to higher levels of VAs.

FUNDING: Federal

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## PA8-4

### EXPOSURE TO TOXIC VOLATILE ORGANIC CHEMICALS FROM E-CIGARETTE USE IN ADOLESCENTS

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SIGNIFICANCE: Given the rapid uptake of e-cigarettes (e-cigs) among teens, there is an urgent need to understand the safety of these products in adolescents, including toxicant exposure. We sought to identify the presence of chemical toxicants associated with e-cigs use. METHODS: Adolescents aged 13-18 who used an e-cig on 1+ days in the past 30 and at least 10 lifetime were recruited from

the San Francisco area. Saliva was collected within 24 hours of last e-cig use for cotinine and urine for the tobacco-specific nitrosamine NNAL and toxic volatile organic compound (VOC) analyses. Participants were categorized as e-cig only users (no traditional combustion cigarettes (TCs) in the past 30 days and levels of NNAL less than 1 pg/mg creatinine), dual users (NNAL > 30 and use of TCs in the past 30 days in addition to e-cigs), or controls (never users of e-cigs or TCs). Regression analyses compared e-cig to dual and control on levels of 10 VOCs suspected as cardiovascular, pulmonary and/or carcinogenic toxins. RESULTS: The sample consisted of 67 e-cig-only users, 16 dual users, and 20 controls, and was 16.4 years on average, 67% male and 56.7% non-Hispanic white. E-cig-only users reported using their e-cigs a mean of 12.8 days (SD=8.9) a month compared to 25.5 (SD=6.6) for dual users ( $p<.001$ ). There was no difference in time since last use of e-cigs (1:58 versus 2:02 hours,  $p>.99$ ) between e-cig-only and dual users. Urine excretion of metabolites of benzene, ethylene oxide, acrylonitrile, acrolein, and acrylamide was significantly higher in dual users vs. e-cig only users and controls (all  $p<.05$ ). Excretion of metabolites of 1,3-butadiene, acrylonitrile, acrolein, propylene oxide, acrylamide, and crotonaldehyde were significantly higher in e-cig-only users compared with controls (all  $p<.05$ ). CONCLUSIONS: This is the first study to evaluate e-cig toxicant levels in adolescents. E-cig-only using adolescents had significantly greater exposure to six VOC toxicants compared to non-users, suggesting that e-cigs expose adolescent users to potentially harmful chemicals. VOC exposure was higher in dual users, which may be related to greater e-cig use and/or cigarette smoking.

FUNDING: Federal; State

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## PA8-5

### THE CATALYTIC ROLE OF THE METALLIC COILS OF ELECTRONIC CIGARETTES IN ALDEHYDE FORMATION

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Carbonyls are the most studied toxicants in the liquids and aerosols of electronic cigarettes (ECIGs), yet there exists high variability in the levels and identities of the measured carbonyls. Formaldehyde, one of the most abundant aldehydes in ECIGs, shows concentrations from trace amounts to 50 mg/puff. This range has been attributed to the different characteristics of ECIG devices, liquids, and aerosol preparations. Several studies have attempted to correlate the carbonyl emissions with the humectants used, battery power outputs, ECIG design characteristics, user puffing behaviors, and the number, position, temperature, and age of the coils. The results show that the carbonyl emissions are mainly related to the power output. The power outputs commonly used in ECIGs provide coil temperatures sufficient to induce pyrolysis rather than combustion. These elevated temperatures on the coil surface are associated with the "dry puff" phenomenon, which has been causing spikes of carbonyls that are mainly the products of cracking and oxidation reactions of propylene glycol (PG). In this study, we looked for the first time at the catalytic role of ECIG metallic wires in reducing the activation energy of aldehyde formation. By studying the pyrolysis of PG in a tubular-flow quartz reactor and trapping the aldehydes formed with 2, 4-dinitrophenylhydrazine cartridges, we evaluated the carbonyl product distribution and the relative yields of PG from reactions in the presence of nitrogen, air, and the widely used ECIG coil wire materials Kanthal, nichrome, and stainless steel. Our experiments showed that ECIG coils have a catalytic effect on PG degradation. The carbonyls started forming at 80 °C in the presence of the metallic wires compared to 360 °C and 430 °C in air and nitrogen, respectively. New nichrome wires were found to be less reactive than Kanthal and stainless steel wires, but when used for the second time, the nichrome wires exhibited reactivities similar to those of the Kanthal and stainless steel wires. The results of this study indicate that the materials of construction may turn out to be an important variable for regulation.

FUNDING: Federal

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## PAPER SESSION 9: COMPREHENSIVE ASSESSMENT OF IMPACT OF FLAVORS: CONSTITUENTS TO PERCEPTIONS

### PA9-1

#### FLAVOR CONDITIONED REINFORCERS DOSE-DEPENDENTLY INCREASE MOTIVATION AND EXTRACELLULAR DOPAMINE IN RATS.

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Flavor additives in tobacco products are 'conditioned reinforcers' (CRs). Nicotine (NIC) is a weak primary reinforcer, but enhances responding for CRs. We investigated whether flavor CRs included in NIC self-administration could promote dependence-like behavior. Male rats were randomly assigned to one of two flavor conditions, Neutral (n=30) or CR (n=36). The flavor-conditioning procedure included access to two drink bottles for 40 min per day for 24 days. One bottle contained the tobacco flavor additive licorice root extract (LRE, 1% v/v) and the other contained grape Kool-Aid (gKA, 0.5% w/v). Sucrose (20% w/v) was added to LRE for the CR group and to gKA for the Neutral group; the alternate flavor was unsweetened. Rats were instrumented for iv self-administration and randomly assigned to receive 0, 7.5, 20 or 40 ug/kg unit NIC doses (n=6-10 per dose/group). During subsequent self-administration testing licks at two sipper tubes were recorded by the computer; meeting the schedule of reinforcement at the sipper tubes resulted in delivery of fluid in the sipper. Both groups (CR and Neutral) self-administered IV NIC with LRE (0.12 ml, unsweetened), which was a conditioned reinforcer in the CR group and a familiar but neutral flavor in the Neutral group. Following acquisition under a fixed ratio (FR) 10 schedule of reinforcement, all rats were tested under a progressive ratio (PR) to measure high motivation and with quinine hydrochloride (0.1, 0.3, and 1 mM) added to the licorice to measure responding in the face of negative consequences. CR rats self-administered more NIC under the FR schedule of reinforcement at the lower unit doses (7.5 and 20 ug/kg). However, the CR group showed greater motivation under the PR and increased willingness to respond for NIC in the face of the quinine punisher at the 40 ug/kg unit dose. A subset of rats showed that the flavor CR also increased extracellular DA and that this increase was enhanced by experimenter-administered IV NIC infusions. These findings indicate the interaction between NIC and flavor CRs can result in dependence-like behavior and enhancement in DA release when the CRs are self-administered with NIC.

FUNDING: Federal; Academic Institution

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### PA9-2

#### ANALYSIS OF FLAVOR ENHANCERS USED IN ELECTRONIC CIGARETTE REFILL SOLUTIONS

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BACKGROUND: The variety of flavors available in electronic cigarette refill solutions is an important factor in the maintenance of e-cigarette use by current and former smokers. In addition, flavors in e-cigarettes liquids are highly appealing to youth. Manufacturers of refill solutions and some experienced users add flavor enhancers to nicotine solutions to boost the sensation from vaping. This study examined the chemical composition of popular flavor enhancers. METHODS: A convenience sample of 241 concentrated solutions of flavor enhancers were purchased from US-based online vendors. Prior to analysis we analyzed health warnings included on product containers. Then, samples were qualitatively analyzed using GC-MS method. The full-scan data was collected with MS software and a library search was performed using mass spectra databases. We also searched toxicological databases for available information on inhalation risk of each identified compound. RESULTS: On average, each solution of flavor enhancer contained 6 ingredients in bottles with limited to non-existent warning labeling. The most common chemicals found in analyzed products were vanillin, isovanillin, ethyl maltol, triacetin, benzyl alcohol, benzaldehyde and menthol. The majority of the flavor enhancers contained known respiratory irritants, including benzaldehyde, triacetin

and acetyl pyrazine. No nicotine was detected in any of the samples. CONCLUSIONS: The majority of the chemicals used in flavor enhancers are compounds commonly used as food flavorings or fragrances. Many of these chemicals have not been deemed safe to use for inhalation. There was limited warning on these products to indicated their potential inhalation hazards to the e-cigarette users. Future regulation of e-cigarettes should take into consideration potential health effects of inhaling flavor enhancers.

FUNDING: Federal

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### PA9-3

#### AN FMRI STUDY ON THE IMPACT OF ADVERTISING FOR FLAVORED E-CIGARETTES ON SUSCEPTIBLE COLLEGE-AGE YOUTH

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SIGNIFICANCE: E-cigarettes are sold in flavors such as "skittles," "strawberrylicious," and "juicy fruit," and no restrictions are in place on marketing e-cigarettes to young people. Fruit and sweets depicted in e-cigarette advertisements may not only increase their appeal but also interfere with communication of health risks in warning labels. This study tested a brain biomarker of product preference for sweet (fruit/candy) versus tobacco flavor e-cigarettes, and whether advertising for flavors interfered with health warnings. METHODS: Participants (n=26) were college age youth who had tried an e-cigarette and were susceptible to future e-cigarette use. They viewed advertisements in fMRI for sweet and tobacco flavor e-cigarettes, menthol and regular cigarettes, and control images of flavors with no tobacco product. Advertisements randomly contained warning labels, and recognition of health warnings was tested post-scan. Visual attention was evaluated using eye-tracking. RESULTS: There was a significant effect of e-cigarette condition (sweet/tobacco/control) on activity in the nucleus accumbens, a brain biomarker for product preference, that was not found for cigarette condition (menthol/regular/control). Nucleus accumbens activity was greater for sweet versus tobacco flavor e-cigarette advertisements, and did not differ from control images. Greater nucleus accumbens activity was associated with poorer post-scan recognition of health warnings. Visual attention was greater for advertising content on sweet flavor e-cigarette advertisements, and greater for warning labels on tobacco flavor e-cigarette advertisements. Finally, more time spent viewing e-cigarette advertising content and less time spent viewing warning labels was associated with greater liking and intent to try e-cigarettes. CONCLUSIONS: These findings demonstrate that depicting fruit/candy flavors on e-cigarette advertisements evokes a neural reward response and interferes with processing of health warnings. These findings can inform regulation of tobacco product flavors, labelling and marketing, to potentially prevent tobacco use initiation and reduce the public health toll of tobacco.

FUNDING: Academic Institution; Federal

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### PA9-4

#### THE ROLE OF SWEETENERS IN SMOKELESS TOBACCO PRODUCT PREFERENCE IN MICE

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BACKGROUND: The FSPTCA gives FDA the authority to regulate the manufacture, distribution, and marketing of tobacco products, including smokeless tobacco. The use of smokeless tobacco has been on the rise in the last ten years. The prevalence is much higher in high school students (overall-6 percent; males-10 percent; females-1.8 percent) compared to adult population (overall-3.4 percent; males-6.7 percent; females-0.3 percent). We recently quantified several sweeteners in USA-marketed snus and snuff products and found that these products contained high levels of synthetic sweeteners like sucralose and saccharin, in some cases 24-fold higher than in confectionary products. The intense sweetness of smokeless products could potentially encourage use initiation and reinforcement, especially in adolescents. METHODS: To model the role of sweeteners in



preference or aversion in beginning users of smokeless products, we developed a single-tube oral consumption model for mice. In this model, aqueous snus extract (Camel mellow) was prepared and its nicotine and sucralose concentrations were estimated by gas chromatography and LC-MS respectively. Next, naïve mice were given this snus extract that was calibrated to contain ~155 microgram/ml-nicotine and ~160 microgram/ml-sucralose, concentrations in the range present in saliva of a snus user. The extract was presented to the mice for a period of 4 nights and consumption was compared between wild-type animals and animals deficient in the sweet taste receptor, *Tas1r2* (*Tas1r2*<sup>-/-</sup>). RESULTS: Wild-type mice consumed approximately the same amount of snus extract as water, suggesting that – at concentrations estimated in users - there is a balance between aversive and preferable flavorant effects. In contrast, *Tas1r2*<sup>-/-</sup> mice consistently drank less of the snus extract, suggesting that intense sweetness, due to addition of sucralose in the product, suppresses the otherwise aversive sensations elicited by snus constituents. CONCLUSIONS: These data suggest that sweetener addition facilitates smokeless tobacco product use initiation by decreasing aversion.

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## PA9-5

### FLAVORS INCREASE SUSCEPTIBILITY TO CIGARILLO USE BY INCREASING PERCEPTIONS OF TASTE AND BY INCREASING THE WEIGHT GIVEN TO PERCEPTIONS OF TASTE

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SIGNIFICANCE: Tobacco marketing greatly influences smoking uptake and continuation. One domain where this might be especially true concerns flavored tobacco products where marketing can exploit people's rich store of associations with well-liked flavors. The present research explored how flavors influence susceptibility to cigarillo use. METHODS: Participants were non-smoking 18-26 year old US residents who were randomized to one of two conditions: flavored vs. control cigarillos. Participants in the flavored cigarillos condition viewed five flavored cigarillo packs ("Sweet," "Wine," "Grape," "Jazz," and "Tropical"), while those in the control condition viewed five standard, tobacco-flavored cigarillo packs (e.g., "Burley"); each image included a description of the pack "flavor". Participants completed a measure of approach bias toward cigarillos, followed by items regarding their perceptions of taste, smell, social acceptability, enjoyment, harm of cigarillos, as well as susceptibility to use. RESULTS: After screening, 102 individuals were eligible to participate and were randomized to the control condition ( $N = 53$ ) or flavors condition ( $N = 49$ ). Using MANOVA, we found that participants exposed to the flavored cigarillos had significantly more favorable perceptions of taste and smell, greater social acceptability, anticipated enjoyment of, and increased susceptibility to, cigarillo use than those in the control condition ( $ps < .01$ ). Mediation analyses showed that taste ratings fully mediated the relationship between flavors condition and susceptibility to use. We also observed that condition significantly moderated the relationship between taste and susceptibility to use, such that taste better predicted susceptibility in the flavors condition ( $B = 18.89, p < .001$ ) than in the control condition ( $B = 13.57, p < .001$ ). CONCLUSIONS: Flavors likely increase susceptibility to cigarillo use via two routes. First, flavors improve perceptions of the taste of cigarillos and thereby increase susceptibility. Second, flavors increase the weight given to perceptions of taste in determining susceptibility to use.

FUNDING: Academic Institution

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## PODIUM PRESENTATION 3

## PAPER SESSION 10: EMERGING TOPICS IN REDUCED NICOTINE TOBACCO PRODUCTS

### PA10-1

#### ELECTROPHYSIOLOGICAL RESPONSES TO VARYING LEVELS OF NICOTINE IN CIGARETTES

Mauricio Rangel-Gomez\*, Raul Cruz-Cano, Azib Kidanu, Spencer Fix, Edward Bernat, Pamela Clark, University of Maryland, MD, USA

**SIGNIFICANCE:** Reduction of nicotine concentration in cigarettes is being considered as a method for reducing population levels of nicotine addiction, and thus morbidity and mortality from cigarette smoking. The lowest level of nicotine that generates neuro-activation, potentially contributing to the initiation and continuation of use of tobacco products, is not known. **METHODS:** Established smokers smoked cigarettes with 6 different levels of nicotine (0.4 to 15.8 mg/g) in separate sessions, while four hours abstinent. In single-use sessions, 13 participants engaged in three tasks before, during and after smoking, while electroencephalographic (EEG) data were recorded. These tasks included picture-viewing, go/no-go, and gambling feedback tasks, indexing cognitive processes relevant to nicotine exposure (cue-reactivity, inhibitory control, and reward/loss). Data were analyzed using innovative time-frequency decomposition methods developed by our research group. Preliminary analyses focused on comparing the lowest to the highest level, to verify that changes in response occurred in the tested nicotine range. **RESULTS:** Results indicated a continuation or exacerbation of withdrawal symptoms at the lowest nicotine level, and a reversal of withdrawal symptoms at the highest level. The picture task revealed increases in response to pleasant pictures for the high nicotine level and decreases for the low nicotine level. The unpleasant stimuli operated in the opposite direction, consistent with the idea of increased negative affect in withdrawal, and increased reactivity to pleasant stimuli when sated. Similar effects were observed for the go/no-go task, with increased executive function for the high nicotine level and decreased executive function for the lowest nicotine level. **CONCLUSIONS:** Given these promising results, ongoing analytic efforts are assessing the change point in this observed reversal between high and low nicotine levels, to make inferences about relevant nicotine thresholds for abuse liability. **RESULTS:** will inform the FDA about the maximum nicotine level that fails to result in neuro-activation, guiding regulation of allowable nicotine levels.

FUNDING: Federal

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### PA10-2

#### ABRUPT NICOTINE REDUCTION INCREASES ESSENTIAL VALUE OF NICOTINE AND EXACERBATES REINSTATED NICOTINE SEEKING

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Reduction of nicotine content in tobacco products is a regulatory control strategy intended to decrease smoking dependence that reduces nicotine content (although does not reduce content to zero). This strategy is hypothesized to produce reductions of nicotine intake and dependence. Here we examined whether abrupt nicotine reduction following maintenance on standard (i.e., higher) doses of nicotine influences nicotine essential value, evaluated through behavioral economics (BE), and subsequent relapse vulnerability, evaluated through reinstatement. Male Sprague-Dawley rats were trained to self-administer nicotine (0.06 mg/kg/infusion, paired with contingent conditioned cues; Phase 1). All rats then completed a BE phase, during which progressively decreasing doses of nicotine were presented (Phase 2). Following this protocol, rats then either self-administered the training dose of nicotine (Group 1), or were abruptly switched to a low dose of nicotine

(0.001 mg/kg/infusion, Group 2; Phase 3). The 0.001 mg/kg/infusion dose is 60 times more costly than the training dose. Following Phase 3, both groups underwent a second BE period (Phase 4). In Phase 5, responding for nicotine was extinguished over the course of 14 sessions or until extinction criteria were met. Reinstatement (Phase 6) was then induced by presentation of the cue duration previously associated with the dose that induced maximum responding (0.0056 mg/kg/infusion, or 0.56 sec). Rats allowed to self-administer reduced nicotine (Group 2) had increased consumption relative to rats maintained on the training dose of nicotine (Group 1). Rats for whom nicotine was abruptly reduced from 0.06 to 0.001 mg/kg/infusion (Group 2) showed decreased demand elasticity and increased nicotine seeking (Phase 6) compared to Group 1. Rats in Group 1 showed no difference in their demand curves in Phases 2 and 4. These results suggest that abruptly decreasing the dose of nicotine following self-administration of a higher dose may increase nicotine reinforcement value and relapse vulnerability. Translationally, these results indicate that alternative strategies may be needed to achieve positive smoking cessation outcomes.

FUNDING: Federal

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### PA10-3

#### PREFERENCES FOR VERY LOW NICOTINE CONTENT CIGARETTES IN SMOKERS

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**INTRODUCTION:** Reducing nicotine content of cigarettes to non-addictive levels has been proposed as a public health approach for significantly reducing smoking-related morbidity and mortality. Previous research has shown that smokers dislike the taste of very low nicotine content (VLNC) cigarettes, which may impact uptake of such products. A double-blind, randomised, controlled cross-over trial was conducted to compare the acceptability to smokers of two types of VLNC cigarettes, one with a carbon filter and one without. **Method:** Participants were daily smokers of non-menthol tobacco cigarettes, aged  $\geq 18$  years, who had their first cigarette within 30 minutes of waking. Participants were recruited using community advertising in Auckland, New Zealand. Participant smoked one of their own regular cigarettes before randomised to the order they smoked the test cigarettes. There was a washout period of 45 minutes between each product. Test cigarettes were MAGIC 0 (with carbon filters, nicotine yield 0.04mg/cigarette, tar yield 4.1mg/cigarette, 22<sup>nd</sup> Century Group, Inc) or MAGIC (nicotine yield 0.04mg/cigarette, tar yield 4.1mg/cigarette, 22<sup>nd</sup> Century Group, Inc). Primary outcome was acceptability, measured by the satisfaction domain of the modified Cigarette Evaluation Questionnaire. Secondary outcomes included psychological reward, enjoyment of the respiratory tract sensations and craving reduction. Thirty-two participants were sought for 90% power ( $p=0.05$ ) to detect a difference in satisfaction scores of at least 0.5 points on a 7-point scale. **RESULTS:** Twenty-three participants were recruited and completed the trial. Higher satisfaction ratings were found with the VLNC cigarettes with a carbon filter, compared to those without (Mean difference = 1.00, 95% CI 0.47-1.53,  $p=0.0008$ ). Significant differences were reported for all secondary outcomes, with participants preferring the VLNC cigarettes with a carbon filter. Over 86% of participants indicated that they would/may consider using the MAGIC 0 to make a quit attempt, compared with 60% using MAGIC. **CONCLUSIONS:** VLNC cigarettes with carbon filters are more acceptable to smokers than similar cigarette without filters.

FUNDING: State

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## PA10-4

### A CROWD-SOURCED EVALUATION OF REDUCED-NICOTINE CIGARETTE FRAMING ON BEHAVIORAL ECONOMIC DEMAND CURVES

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**SIGNIFICANCE:** The Food and Drug Administration has expressed interest in examining the potential policy impacts of reducing, but not completely eliminating, nicotine in combustible cigarettes. Recently, there have been several investigations examining the effects of reduced-nicotine cigarettes. Some of these studies have examined effects within the framework of the behavioral economic purchase task and, relatedly, demand curve analysis. Research on hypothetical purchase tasks has shown close correspondence between hypothetical and potentially real rewards. To our knowledge, there has not been an investigation looking at strictly hypothetical outcomes as they relate to differing concentrations of nicotine cigarettes. It may be the case that participants' reports for commodities with which they have no experience (e.g., reduced-nicotine cigarettes) may not reflect reports when they do have experience. Therefore, the purpose of the current study was to examine behavioral economic demand for cigarettes with different levels of nicotine concentrations within a purely hypothetical task to accompany in-lab, experience-based efforts. **METHODS:** Participants recruited using Amazon Mechanical Turk completed Cigarette Purchase Tasks for conventional and hypothetical experimental cigarettes with one of six randomly assigned concentrations of nicotine. **RESULTS:** Within-subject analyses of the Cigarette Purchase Task indicated differences in demand between conventional cigarettes and reduced-nicotine cigarettes. That is, in higher nicotine concentration groups, participants said they would purchase fewer numbers of cigarettes compared to those in the lower concentration groups. **CONCLUSIONS:** Framing the nicotine concentration as percent reduction rather than a stated percentage appeared to show greater effects. This suggests that perceptions of initial purchasing decisions of reduced-nicotine cigarettes may be differentially affected by product descriptions.

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## PAPER SESSION 11: HEALTH IMPACT OF TOBACCO PRODUCTS

### PA11-1

#### IMPACT OF ELECTRONIC CIGARETTE USE ON LUNG FUNCTION (FEV1) AMONG ADULT SMOKERS ATTEMPTING TO REDUCE THEIR CIGARETTE CONSUMPTION

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**BACKGROUND:** Electronic cigarettes (e-cigs) may expose users to fewer tobacco-related toxicants than combustible cigarettes, but the effects of e-cigs on lung function are unknown. This study investigated the short-term effects of e-cig use on pulmonary function in cigarette smokers interested in reducing cigarette use while using an e-cig as compared to those using a plastic cigarette substitute (CS; QuitSmart). **METHODS:** 267 participants were randomly assigned to receive an e-cig or CS and were encouraged to reduce their cigarette consumption by 75% while substituting with their assigned product. Carbon monoxide (CO), CPD, and FEV1 were collected at baseline and 4 weeks later. At 4 weeks, e-cig puffs/day was collected. Changes between groups in FEV1, CPD, and CO were evaluated using independent t-tests. A stepwise linear regression model was used to evaluate changes in FEV1 (independent variables: demographics, baseline CPD, CPD change, average e-cig puffs, and e-cig use days). **RESULTS:** There were 68 CS and 199 e-cig participants. The e-cig group used their product 23.4/28 days with an average of 83.6 e-cig puffs/day. Reductions in CPD and CO were significantly higher for the e-cig group (CPD change: -8.7 e-cig vs. -5.5 CS,  $p < 0.001$  and CO change: -6.1 ppm e-cig vs. -2.9 ppm CS,  $p = 0.021$ ). There were no significant differences in FEV1 changes between groups. In the regression model, decreased CPD relative to baseline was a significant predictor of improved FEV1 ( $p = 0.04$ ). **CONCLUSION:** No differences were found in lung function (FEV1) between cigarette smokers using an e-cig and those who did not. However, those in the e-cig group had significantly greater decreases in CO and CPD. Cigarette reduction, even in the presence of e-cig use, was a significant predictor of improved lung function.

**FUNDING:** Federal

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### PA11-2

#### THE SIGNIFICANCE OF 15-LIPOXYGENASE METABOLITES IN SMOKERS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE, A HIGH RISK POPULATION FOR LUNG CANCER

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In addition to cigarette smoking, there are many factors that have been reported to contribute to the development of lung cancer. Among these other factors, chronic obstructive pulmonary disease (COPD) has been well described. Though the risk of lung cancer is significantly higher in the population of smokers with COPD than the general population, lung cancer will eventually occur only in a small subpopulation of smokers with COPD. Frequently, these lung cancer patients are diagnosed at the advanced stage due to the lack of early diagnostic methods. Therefore, the development of biomarkers for early diagnosis of smoking-related lung cancer is urgently needed. Our early study has demonstrated a significant reduction of 15-lipoxygenase (15-LOX) in smoking-induced lung cancer. In this study, we monitored the levels of 15-LOX metabolite 15(S)-hydroxy-eicosatetraenoic acid (15S-HETE) and 13(S)-hydroxyoctadecadienoic acid (13S-HODE) in smokers, COPD patients and health subject. Our results showed that the level of 15S-HETE was increased in smokers and COPD patients, particularly in smokers with COPD. However, the level of 13S-HODE was only marginally higher in smokers with COPD. Significantly, we found that 15S-HETE level was markedly increased in 3 smokers with COPD who were later diagnosed with non-small cell lung cancer (NSCLC). In summary, our findings suggest that 15S-HETE is a potential biomarker for early detection of NSCLC in the population of smokers with COPD. (Ming-Yue Li, Ho RL, Leung BC, Fanny WS Ko, Bin Wu, Xiang Long, Jing Du, Jun Wu, Calvin



SH Ng, Innes YP Wan, Tony SK Mok, David SC Hui, and Malcolm J Underwood contributed to this study)

FUNDING: Academic Institution

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## PA11-3

### THE ROLE OF SMOKING IN THE RELATIONSHIP BETWEEN MULTIPLE HEALTH BEHAVIORS AND ALL-CAUSE MORTALITY AMONG US ADULTS

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**SIGNIFICANCE:** While some risk health behaviors occur together, the impact of multiple health behaviors on mortality has not been fully examined in the literature. Previous studies estimated the mortality risks based on the cumulative number of risk behaviors. However, this may not only hide important interactions among these behaviors, but it also implicitly assumes that the specific combination of risk-behaviors does not matter. Therefore, this study was aimed to examine each combinations of multiple health behaviors on all-cause mortality using a nationally representative sample of U.S. adults. **METHODS:** National Health Interview Survey (NHIS) data from 1997 through 2005 were linked to the National Death Index (NDI) with a follow-up to December, 31, 2011. The primary dependent variable was all-cause mortality; the predictors included four multiple risk health behaviors (current smoking, heavy drinking, physical inactivity, and obesity). Confounding variables included demographics, socio-economic status, and health insurance. The analyses included U.S. residents who were 30 years old and older (N=180,875, Population Estimate: 205 million). The primary statistical analysis relied on fitting Cox proportional hazards models. **RESULTS:** Among the U.S. population of adults, 22.3% engaged in at least two risk behaviors and 60% of smokers had at least one additional risk behavior. Mortality risks varied by the combinations of risk behaviors. When the combinations included smoking, the mortality risks were high. When the combinations include obesity, the mortality risks were low. Smokers had a 2.6 times higher mortality risk when they engaged in one additional risk behavior simultaneously and 2.8 times higher for two additional behaviors, compared to those with zero risk behavior groups. **CONCLUSIONS:** When multiple health behaviors include smoking, mortality risks are higher. Such finding indicates smokers are at greater risk for premature deaths when they engage in other risk behaviors simultaneously. Multiple health behavior interventions addressing not only smoking but also other risk behaviors, will prevent millions of premature deaths.

FUNDING: None

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## PA11-4

### WIDESPREAD TOBACCO-SMOKING ASSOCIATED CHANGES IN DNA METHYLATION AND GENE EXPRESSION IN LUNG TISSUE OF SMOKERS

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**SIGNIFICANCE:** Epigenome-wide association studies (EWAS) have identified thousands of cytosine-guanine dinucleotides (CpGs) showing smoking-associated DNA methylation changes in blood cell DNA. Their relationship to smoking-associated methylation differences in lung and their molecular link to lung cancer development remain poorly understood. **METHODS:** We performed an EWAS using Infinium HumanMethylation450K BeadChip data from The Cancer Genome Atlas (TCGA) for 393 eligible lung adenocarcinoma tumor samples and replicated in 27 adjacent normal tissue samples. Epigenetic marks near these CpGs were then examined in both primary lung cells and lung adenocarcinoma cell lines. Smoking-associated changes in gene expression were assessed using TCGA lung adenocarcinoma gene expression data and linked to the differentially-methylated CpGs. **FINDINGS:** 37,372 probes were significantly-differentially methylated with respect to smoking in TCGA adenocarcinoma tumor samples after Benjamini Hochberg correction ( $p < 0.05$ ). 1,774 probes replicated at a nominal level in the adjacent normal samples ( $p < 0.05$ ), including 154 probes previously associated with smoking in at least one blood EWAS. 625 of the 1,774 replicated probes were located within 2 kb of a likely functional region carrying a histone mark of

active enhancers in primary lung cells and/or lung cancer cell lines. 537 of these 625 probes were within 1 Mb of a gene showing a significant, smoking-associated expression difference. Cg14817490, one of the top-10 most-replicated CpGs in blood-based smoking EWAS, was linked to smoking-induced upregulation of the aryl hydrocarbon receptor repressor (AHRR) gene, which is involved in the cellular xenobiotic response and has been implicated in lung cancer risk. **CONCLUSIONS:** Many smoking-associated methylation changes in lung tissue are located in the vicinity of potentially functional genomic regions in lung tissue, and could be driving expression of smoking-associated genes that may affect lung cancer risk.

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## PA11-5

### ANOTHER SMOKING GUN (MODEL): MODELLING THE TIME VARYING EFFECT OF TOBACCO USE AND SMOKE EXPOSURE ON MEAN TELOMERE LENGTH BY RACE/ETHNICITY IN THE US

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**SIGNIFICANCE:** Telomeres are a tandem repeat of nucleotide sequences at the end of chromosomes that act as protective caps and allow for proper cell division. Human telomere length is primarily used as an indicator for biological ageing as each time a cell divides, telomeres shorten. Behavioral and environmental factors related to tobacco are known to affect telomere length. Shorter and longer than expected telomeres are associated with an increase in cancer risk and other chronic diseases. While it is known that telomere length varies by racial/ethnic group and is affected by lifestyle and environmental factors, the research on how tobacco use and exposure affects telomere length over age by racial/ethnic group is scarce. **METHODS:** Time varying effects modeling (TVEM) allows the observation of change over time from active tobacco use and environmental tobacco smoke on telomere length. We used the National Health and Nutrition Examination Survey (NHANES) for continuous years 1999 to 2002 to observe the effects of active tobacco use and environmental exposure - measured through serum cotinine - and mean telomere length for adults 19 to 80 years of age (N=7827; M=1.03, SD=0.28). Models were run by Mexican American, other Hispanic, Non-Hispanic White, Non-Hispanic Black, and Other/Multi-racial to allow for time-varying group differences and controlled for sex, SES, education, and ever-smoker [Note: results are presented as figures as coefficients estimated in continuous time]. **RESULTS:** The results indicate a high level of mean telomere length (mTL) differences between different racial/ethnic groups. The association of serum cotinine levels and mTL vary across age by racial/ethnic groups. Serum cotinine levels had the strongest observed effect on Mexican American mTL across time. There was a significant increase in mTL at age 31 with a mean score of .0037 with another significant increase at age 52 with mean score .0078. **CONCLUSIONS:** Findings reveal a further need to focus additional support and resources to intervene upon disparate health outcomes from tobacco use and smoke exposure for already vulnerable groups and focusing efforts for particular adult age groups.

FUNDING: Academic Institution

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## PAPER SESSION 12: IMPACT OF ECONOMIC TOBACCO CONTROL POLICY INTERVENTIONS

### PA12-1

#### STATE-LEVEL CIGARETTE AFFORDABILITY AMONG CURRENT US SMOKERS: FINDINGS FROM THE ITC US SURVEY, 2003-2015

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**SIGNIFICANCE:** Cigarette taxes reduce demand for cigarettes. Inflation undermines the effects of taxes when tax increases do not keep pace with rising incomes. Cigarette tax policy must consider price in relation to smokers' incomes. This study uses small area estimation methods to estimate state-level cigarette affordability from 2003-2015. **METHODS:** Data came from Waves 2-9 of the International Tobacco Control (ITC) US Survey, a nationally representative cohort survey of smokers aged 18+. Cigarette affordability was defined as the proportion of a smoker's income spent on 100 packs of 20 cigarettes using self-reported prices and annual per capita household incomes. At each wave, individual affordability was estimated using linear mixed effects models in R (Version 3.3.3). Fixed effects were sex, age group (18-24, 25-39, 40-54, 55+), race (white, black, Hispanic, other), education ( $\leq$  high school vs. more) & employment status (employed vs. not). State was entered as a random intercept. Model parameters were combined with auxiliary information to estimate state-level affordability. Auxiliary information (state-level proportion of smokers at each category of fixed effect covariates), was estimated from the Behavioral Risk Factor Surveillance System survey contemporaneous to the ITC wave. **RESULTS:** Affordability varied across states in most years. Before 2008, smokers spent less than 3% of their income on cigarettes. Cigarettes became less affordable in 2008. By 2010, smokers spent 3.7% of their income on cigarettes. Cigarettes were least affordable in southern states from 2010-2013. Cigarettes became more affordable as economic conditions improved by 2015 but did not return to levels observed prior to the 2009 federal cigarette tax increase. Affordability varied most in southern states in 2015, ranging from 3% in Virginia to 5.2% in the District of Columbia. **CONCLUSIONS:** Reductions in cigarette affordability are likely due to the 2008 economic recession and the 2009 federal tax increase. **RESULTS:** demonstrate that if prices remain unchanged following improved economic conditions, cigarettes remain affordable. Tax increases must keep pace with improved economic conditions.

**FUNDING:** Federal; Nonprofit grant funding entity

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### PA12-2

#### AN EMPIRICAL ANALYSIS OF THE IMPACT OF INCOME CHANGE AND CIGARETTE TAXATION IN A PRICE-TIERED CIGARETTE MARKET OF BANGLADESH

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Taxing tobacco products is one of the most effective measures of tobacco control. However, in a tiered market structure where multiple tiers of taxes co-exist the anticipated impact of tobacco taxes on tobacco consumption is complex. This paper investigates changing smoking behavior in the face of rising prices (from taxes) and changing income in such a tiered market structure. Do taxes successfully lead smokers to reduce consumption or simply move to a different price tier and hence enjoy reduced taxes? How does a change in income affect smoking behavior? A panel dataset from the ITC Bangladesh surveys is used for the analysis. The nature of dataset allowed for observing the impact of tax and income change on the smoking behavior of the same individual over a length of three years. For preliminary analysis transition matrices are developed. Transition matrices show significant movement of smokers across price tiers from one wave to the next. Then, probit regressions are used to identify the effects of changes in prices and changes in income along with other control variables. It is observed in the regres-

sion results when smokers face higher cigarette prices, their probability to down-trade increases and probability to up-trade decreases. Interestingly higher taxes do not increase the probability to quit smoking. Such results demonstrate how the presence of a price-tiered market allows smokers to down-trade when facing higher prices rather than quit smoking altogether. Also, higher income raises the probability to up-trade and decreases the probability to quit. The findings of the paper hold strong policy relevance. It is evident from the results that a price-tiered market provides smokers more flexibility to accommodate their smoking behavior when faced with price and income change. Therefore, tiered structure of the tax system should be replaced with uniform taxes so that all price tiers are taxed with equal aggression. Thus, higher taxes will not encourage smokers to down-trade but rather push them to quit smoking altogether. **RESULTS:** also reveal the need for overall cigarette taxes to be raised so that it off-sets any positive effects of income growth.

**FUNDING:** Nonprofit grant funding entity

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### PA12-3

#### TOBACCO PRODUCT COUPONS: RECEIPT AND USE AMONG ADULT SMOKERS IN THE UNITED STATES

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**SIGNIFICANCE:** Direct-to-consumer price promotions of tobacco products, including tobacco coupons undermine effectiveness of tobacco control strategies (e.g., taxation, minimum price) and may encourage tobacco product consumption, particularly among socioeconomically disadvantaged groups. To identify related socioeconomic disparities, this research examined demographic and socioeconomic correlates of tobacco coupon receipt, source, and use among adult U.S. smokers. **METHODS:** Data came from Wave 1 of the Population Assessment of Tobacco and Health (PATH) Study. Smokers were classified as those who received industry coupons via email only, mail only, email and mail, or had not received such coupons in the past 6 months. Smokers were also classified as those who had used industry coupons to buy a tobacco product vs. those who did not in the past month. Logistic and multinomial regression models estimated the relationship between coupon receipt, source (email, mail, or both), and coupon use and demographic and socioeconomic variables. Models predicting coupon use included coupon source as an explanatory variable. **RESULTS:** Thirty seven percent of smokers received tobacco industry coupons; 5% via email only, 15% via mail only, and 17% via email and mail. Twenty three percent of smokers used coupons to buy a tobacco product in the past month. Middle-aged, female, White, and more nicotine dependent smokers were more likely to receive coupons via mail or via email and mail. Whereas associations between education, income, and employment with coupon receipt, source, and use were inconsistent, difficulty-paying bills was associated with greater odds of coupon receipt via mail and via email and mail, and with coupon use. Those who received industry coupons via mail only or via email and mail were 3 times and 5 times more likely than those who received them via email only to use coupons to buy a tobacco product, respectively. **CONCLUSIONS:** Tobacco coupons sent to smokers are likely to lead to product purchase, especially if sent via mail or simultaneously via email and mail. Smokers with financial difficulties may be vulnerable to tobacco industry tactics that involve price promotions.

**FUNDING:** Federal

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### PA12-4

#### PROXIMITY TO FIRST NATIONS RESERVES AND LIKELIHOOD OF ILLICIT CIGARETTE PURCHASING IN ONTARIO AND QUEBEC: FINDINGS FROM THE ITC CANADA SURVEY 2002-2014

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**SIGNIFICANCE:** Contraband tobacco products provide price-sensitive smokers with incentives to avoid higher-taxed cigarettes. Some Canadian smokers avoid taxes by purchasing cigarettes from First Nations Reserves (FNR). This study es-





timated the effect of proximity to FNR on the odds of last purchasing cigarettes from FNR in Ontario (ON) & Quebec (QC), where contraband tobacco is more prevalent. **METHODS:** The analysis was based on current smokers aged 18+ from ON (n=2126) & QC (n=1441) who completed at least 1 of the 9 waves of the International Tobacco Control Canada Survey (2002-2014). The weighted prevalence of last purchasing from FNR was estimated using SAS version 9.4. The Euclidean distance between smokers' postal code of residence to the nearest FNR was computed using QGIS version 2.18. Weighted generalized estimating equations (GEE) tested the effect of distance on the odds of purchasing on-reserve, controlling for sociodemographics (sex, age, ethnicity, income, education) & smoking behaviors (cigarettes/day, quit intentions). GEE regression also tested if FNR purchasing was associated with past year quit attempts. **RESULTS:** In 2002, 2.4% of ON smokers last purchased cigarettes from FNR. By 2008, 22% of smokers last purchased from FNR; since then, prevalence remained stable. In QC, prevalence increased from 1.1% in 2002 to 7.3% in 2007 and declined to 3.2% in 2014. Across all waves and controlling for sociodemographics & smoking behaviors, proximity to FNR was associated with purchasing from FNR only in ON where a 10 km decrease in distance increased the odds of purchasing from FNR (OR=1.31, p<0.01). ON smokers who last purchased from FNR had significantly lower odds of trying to quit in the past year (OR=0.69; p<0.01). These relationships were not observed in QC smokers. **CONCLUSIONS:** In 2008, QC took measures to curb contraband tobacco; the declining prevalence of FNR purchases since then suggests these measures are effective. The prevalence of FNR purchasing has remained stable in ON since 2007. Policies that deter non-aboriginal smokers from purchasing on reserve or ensure payment of applicable taxes if they do may curb contraband tobacco purchasing in ON.

**FUNDING:** Federal; Nonprofit grant funding entity

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## PA12-5 MARKETING NATURAL AMERICAN SPIRITS: CIGARETTE SALES GROWTH AND PRICE VARIATION IN CALIFORNIA NEIGHBORHOODS

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**SIGNIFICANCE:** Natural American Spirit (NAS) cigarettes are marketed as organic, 100% additive-free, and environmentally friendly. Its packaging associates the brand with American Indians, a population with the highest smoking rate in the US. Natural and native marketing may be particularly appealing in California, a state with the second lowest smoking rate and the largest population and proportion of American Indian/Alaska Natives (AIAN) in the US. Research focused on the content and perceptions of NAS advertising and packaging indicates that youth and young adults perceive the brand as "healthier." Less is known about how brand sales vary over time and whether the price varies by neighborhood demography. **METHODS:** We analyzed two sources of data for NAS marketing in California: (1) quarterly cigarette sales data from Nielsen (2013-2016) and (2) in-store observations of brand availability and price in a statewide, random sample of 1,277 licensed tobacco retailers in January-March 2017. Ordinary least squares regression modeled NAS price (before sales tax) as a function of store type and neighborhood demography, defined by a 1/2-mile roadway network. **RESULTS:** NAS displaced Newport as the third most popular cigarette brand in California. From 2013 to 2016, NAS market share (% total dollar sales) increased by 50%, in a state with 10.5% smoking prevalence among adults and 28.1% among AIAN. In 2017, 76.6% of licensed tobacco retailers sold NAS. Average price was \$7.03 (SD=\$0.66), which was typically \$0.75 more than the price of Newport in the same store. However, the price of NAS cost significantly less in store neighborhoods with a higher proportion of residents who are AIAN (coef = -0.05, p<0.05) and school-age youth (aged 5-17) (coef = -0.11, p<0.01). Comparisons with price for Marlboro, Newport, Camel, Pall Mall will indicate whether these patterns are unique to NAS. **CONCLUSION:** This study is the first to document lower prices for NAS in neighborhoods with a higher proportion of AIAN residents and school-age youth. Misperceptions that NAS cigarettes are "healthier" may contribute to increasing market share for the brand, which could be corrected through regulation.

**FUNDING:** Federal; State

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## PA12-6 DISPARITIES IN CIGARETTE TAX EXPOSURE BY RACE, ETHNICITY, POVERTY AND SEXUAL ORIENTATION, 2006-2014, USA

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**SIGNIFICANCE:** Cigarette excise taxes are an effective smoking prevention strategy but they vary geographically due to differences in state and local taxation. There are also pronounced sociodemographic differences in community composition, suggesting that different population groups might face different cigarette excise tax rates. In this study, we examine how cigarette excise tax rates differ for population groups defined by race, ethnicity, poverty status, and sexual orientation, and how these differences have evolved over time. **METHODS:** We constructed annual cigarette tax rates in 109 mutually exclusive taxing jurisdictions within the United States between 2006-2014: 58 localities (cities, counties, American Indian areas), 13 state areas net those localities, and 38 states without any local taxing areas. After merging with Census sociodemographic data, we calculated annual cigarette excise tax exposures for each population group as the average of each place-based tax, weighted by the proportion of the group living there. **RESULTS:** In 2014, the average U.S. resident was required to pay \$2.68 in cigarette taxes, more than 60% of which was due to state and local taxation. On average, Asian/Native Hawaiian and Other Pacific Islander populations faced the highest average tax (\$2.95), which was \$0.44 more than American Indian populations, a result of growing differences between American Indian populations and other racial and ethnic groups over time. Local taxes augmented state and federal taxes disproportionately for non-White populations, same-sex couples, and people living in poverty. **CONCLUSIONS:** Geographic variation in cigarette excise taxes produces sociodemographic variation in cigarette tax exposure. Raising cigarette taxes specifically in those places where groups at risk for tobacco-related disease live could reduce important disparities in cigarette smoking.

**FUNDING:** Federal

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## PAPER SESSION 13: SMOKING CESSATION INTERVENTIONS FOR PATIENTS WITH MEDICAL AND PSYCHIATRIC CO-MORBIDITIES

### PA13-1

#### BARRIERS TO THE IMPLEMENTATION OF A BEHAVIOR CHANGE COUNSELING SESSION ON TOBACCO CESSATION FOR TUBERCULOSIS PATIENTS IN PAKISTAN: FIRST FINDINGS FROM A MIXED METHODS PROCESS EVALUATION

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**SIGNIFICANCE:** The dual burden of tuberculosis (TB) and tobacco-related illness in South Asia puts lives at risk. Tobacco use increases chances of TB infections and hinders recovery. The EU-funded TB&Tobacco study (ISRCTN43811467) assesses effectiveness and implementation of cytisine and behavior support vs. behavior support and placebo. This abstract describes first findings from the process evaluation of a behavior support (BS) intervention implementation in Pakistan. **METHODS:** The BS intervention was developed in 2016. Messages on TB, tobacco risks, and tobacco cessation are based on behavior change techniques (BCT) and delivered via a flip book, leaflet and posters. All materials are image-heavy to be understood by illiterate patients and were developed in consultation with National TB Programs and health workers before being piloted among patients and health workers. Health workers were trained to deliver the behavior support. The process evaluation collects quantitative trial data from all 11 study sites, and conducts a qualitative assessment of BS implementation at three case study sites in Pakistan. **RESULTS:** Preliminary results suggest that even a condensed counseling session is difficult to implement under immense time constraints in routine TB care. Of 227 recruited patients among 10 already initiated sites, only 90 persons (40%) actually received some form of BS counseling during their initial consultation. While the sample of health workers interviewed are highly motivated to deliver messages to patients, due to severe time constraints, lack of private space for counseling, and high patient load they tend to summarize these messages and not use the provided flip book to illustrate the behavior change advice as intended. **CONCLUSIONS:** Implementation of a brief tobacco cessation behavior support intervention into routine TB care in Pakistan is even more challenging than expected. Due to constraints, health workers further adapt the intervention to their needs by shortening the messages. We will continue to monitor which elements of the BS intervention can feasibly be implemented in routine TB care, and further explore the impact of these changes on quit rates.

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### PA13-2

#### ENGAGEMENT IN SMOKING REDUCTION TREATMENT IN PRIMARY CARE AMONG SMOKERS INITIALLY UNWILLING TO QUIT

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**SIGNIFICANCE:** Smoking reduction treatments can increase abstinence among smokers initially unwilling to quit (Moore, 2009). However, such treatments are typically quite long (6-18 months), which is not only costly but could also discourage dissemination and produce high attrition over time. This research compared rates of treatment engagement among smokers unwilling to quit but willing to reduce their smoking across two smoking reduction experiments that varied treatment duration (6-12 weeks [Study 1] versus 52 weeks [Study 2]). **METHODS:** Smokers were recruited by medical assistants in primary care clinics in southern Wisconsin. Smokers presenting for clinic visits were offered two different treatments: 1)

reducing their smoking or 2) quitting within the next 30 days. Study 1 enrolled 517 smokers (63% women, 91% white) and Study 2 enrolled 528 smokers (60% women, 77% white) into reduction treatment. Study 1 offered 7 treatment contacts over a 6-week period, with an option to repeat reduction treatment for an additional 6 weeks. Study 2 offered 11 treatment contacts over a 1-year period. Participants from both studies could elect to receive cessation treatment at any point during study participation. **RESULTS:** In Study 1, attendance at the weekly treatment visits ranged from 85% at Visit 1 to 76% at the last treatment contact (Week 6). In Study 2, attendance ranged from 84% at Visit 1 to 50% at the last treatment contact (Week 47). Despite the much shorter duration of Study 1, the proportion of smokers opting to receive cessation treatment in each study was similar: 19% of those enrolled in Study 1 and 20% of those enrolled in Study 2. **CONCLUSIONS:** Results show that a 6-12 week Smoking Reduction treatment promotes increased treatment engagement and does not reduce the proportion of unmotivated smokers who eventually make an aided quit attempt. Briefer, front-loaded reduction treatments may be an efficient strategy for engaging smokers initially unwilling to quit and motivating them to make aided quit attempts.

**FUNDING:** Federal

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### PA13-3

#### A PREOPERATIVE CONTINGENCY MANAGEMENT INTERVENTION FOR SMOKING ABSTINENCE IN CANCER PATIENTS

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**BACKGROUND:** A majority of people who smoke will continue to smoke after a cancer diagnosis. For patients who receive cancer surgery, continued smoking may lead to preventable complications post-surgery such as increased rates of wound infection and respiratory complications. The preoperative time frame can serve as a teachable moment to encourage cessation, and developing robust pre-operative tobacco treatment interventions for people who smoke is imperative. **Study Objective:** To evaluate a preoperative contingency management smoking cessation intervention that offered monetary incentives for smoking abstinence, and establish effect size estimates for the intervention. We compared biochemically-confirmed smoking cessation rates between participants who received Standard Care (SC; counseling + NRT + breath tests with no payments) versus Contingency Management (CM; counseling + NRT + monetary payment delivered contingent on abstinence). **METHODS:** This multisite, randomized pilot clinical trial recruited 40 patients from Hollings Cancer Center and Yale Cancer Center (20 per site) who were currently smoking and diagnosed with or suspected to have any type of operable cancer with a scheduled surgery within the next 10 days to 5 weeks. All patients received individual counseling and NRT patches. Breath CO tests were administered 3 times per week from the quit date until their surgery date. Patients in the CM group who were abstinent earned payments on an escalating schedule of reinforcement with a reset (self-report of no smoking confirmed by breath COs 6ppm). Seven-day point prevalence abstinence rates on the day of surgery and at 3-month follow up were compared between treatment groups using generalized linear mixed effects risk regression models. **RESULTS:** On the day of surgery, 7-day point-prevalence abstinence was 48% in the CM group compared to 16% of the patients in SC [RR=4.8 (1.4-16.1)]. At the 3-month follow-up, 43% of CM patients were abstinent compared to 5% in the SC group [RR=13.0 (1.3-128.2)]. **CONCLUSION:** Providing abstinence-contingent monetary incentives prior to cancer surgery produces significant improvements in smoking abstinence rates.

**FUNDING:** Federal

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## PA13-4

### A CLUSTER RANDOMISED CONTROLLED TRIAL OF ORGANISATIONAL CHANGE FOR SMOKING CESSATION IN AUSTRALIAN DRUG AND ALCOHOL TREATMENT CENTRES

Billie Bonevski<sup>1\*</sup>, Ashleigh Guillaumier<sup>1</sup>, Eliza Skelton<sup>1</sup>, Anthony Shakeshaft<sup>2</sup>, Flora Tzelepis<sup>1</sup>, Chris Paul<sup>1</sup>, Catherine D'Este<sup>3</sup>, Michael Farrell<sup>2</sup>, Chris Oldmeadow<sup>4</sup>, <sup>1</sup>University of Newcastle, Australia, <sup>2</sup>University of New South Wales, Australia, <sup>3</sup>Australian National University, Australia, <sup>4</sup>Hunter Medical Research Institute, Australia

**SIGNIFICANCE:** In Australia, like other high income countries, up to 95% of people entering drug and alcohol treatment smoke tobacco. Yet, smoking cessation support is not provided as routine care. Organisational systems change approaches have been found to be feasible and acceptable for integrating smoking cessation support into routine care, however no trials have established effectiveness at improving client smoking cessation. The primary aim of this trial is to determine the effectiveness of an organisational change intervention in increasing verified 7-day point prevalence abstinence (PPA) at 6 weeks follow-up. Secondary outcomes examined included self-reported abstinence, quit attempts, reductions in cigarettes smoked, and self-reported use of NRT, at 6 weeks and 6 months. **Methods:** A cluster randomised controlled trial was conducted with 32 drug and alcohol treatment services in four states (New South Wales, Queensland, Australian Capital Territory and South Australia). Sixteen sites received the organisational change intervention that included staff training, identification of site champions, smoke-free policy development, free NRT, and follow-up staff support. Client data was collected at baseline (n=896), 6 weeks (n=471; 53%), and 6 months (n=427; 48%). **RESULTS:** Complete case analysis (primary analysis) showed that the odds of having 7-day verified PPA were 2.1 times higher in the intervention group than the control group, however this was not significant (p=0.281). A higher odds of 7-day self-reported PPA was observed for intervention group at 6 months (OR 1.9, p=0.044); but not 6 weeks (OR 2.3, p=0.084). Significantly lower mean cigarettes per day were seen in the intervention group at both 6 weeks (IRR=0.73, p<0.001) and 6 months (IRR=0.85, p=0.033). The intervention group also reported higher rates of NRT use. No differences in quit attempts were shown. **CONCLUSIONS:** An organisational change intervention which aimed to build the capacity of drug and alcohol clinics in delivering smoking cessation care increased use of NRT, and greater reductions in cigarettes smoked by clients, but did not show evidence of improvement in client smoking cessation rates.

**FUNDING:** National Health and Medical Research Council Australia and Cancer Council New South Wales

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## PA13-5

### REFERRAL TO RANDOMIZED SMOKING REDUCTION AND CESSATION TREATMENTS IN PRIMARY CARE CLINICS: ELECTRONIC VS. FAX REFERRAL

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Primary care systems could connect many more patients who smoke with evidence-based care. Despite consistent documentation of tobacco use in primary care visits, rates of taking further evidence-based steps to address tobacco use are low. This project was implemented in two healthcare systems and compared an electronic health record (EHR)-enabled system of referral to a smoking treatment study with a quit line fax referral system (Fax To Quit; FTQ). In the EHR-assigned primary care clinics, patients who smoked were invited by rooming staff to learn about studies evaluating smoking cessation and reduction treatments. This analysis compared 17 clinics assigned to EHR (N=17780 smokers) with 9 clinics assigned to FTQ (N= 5079 smokers) in terms of referral and treatment enrollment rates across the healthcare systems. Referral rates were much higher in EHR clinics (42.8%) than in FTQ clinics (2.1%; chi-square=2716.39, p<.001). Although not all referrals resulted in enrollment, (some were not reached for screening, were ineligible, or declined to enroll), EHR clinics enrolled a higher proportion of smokers (12.2%) than did FTQ clinics (1%, chi-square=518.86, p<.001). The majority of enrollees from EHR clinics (75.7%) entered a cessation study but 24.3% were not ready to quit and entered a reduction study instead. The two healthcare systems implemented the EHR differently: System A used a hard-stop approach requiring a response from rooming staff, whereas in System B recording the invitation and the

patient's response was optional. This difference is reflected in the starkly different EHR-documented invitation rates in the two systems (mean 79.6% in System A, 28.6% in System B). Despite this, System B yielded slightly more referred patients (44.1%) than did System A (41.6%, chi-square=11.92, p<.001). **RESULTS:** indicate that EHR referral to experimental treatment greatly increased treatment enrollment, relative to quit line fax referral. However, even with the technology used, fewer than 50% of smokers were referred. Results suggest that the method of implementation (i.e., systems factors) may affect its yield.

**FUNDING:** Federal

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## PAPER SESSION 14: TRAJECTORIES OF MULTIPLE TOBACCO PRODUCT USE

### PA14-1

#### ADULT PERCEPTIONS OF THE RELATIVE HARMFULNESS OF TOBACCO PRODUCTS AND SUBSEQUENT TOBACCO PRODUCT USE: LONGITUDINAL FINDINGS FROM WAVES 1-2 OF THE PATH STUDY

Tara Elton-Marshall<sup>1</sup>, Pete Driezen<sup>2</sup>, Geoffrey Fong<sup>2</sup>, K. Michael Cummings<sup>3</sup>, Alexander Persoskie<sup>4</sup>, Olivia Wackowski<sup>5</sup>, Kelvin Choi<sup>6</sup>, Annette Kaufman<sup>7</sup>, David Strong<sup>8</sup>, Shannon Gravely<sup>2</sup>, Kristie Taylor<sup>9</sup>, Heather D'Angelo<sup>9</sup>, Jonathan Kwan<sup>4</sup>, Maansi Bansal-Travers<sup>10</sup>, Mark Travers<sup>10</sup>, Andrew Hyland<sup>10</sup>, <sup>1</sup>Centre for Addiction and Mental Health, ON, Canada, <sup>2</sup>University of Waterloo, ON, Canada, <sup>3</sup>Medical University of South Carolina, SC, USA, <sup>4</sup>Center for Tobacco Products, MD, USA, <sup>5</sup>Center for Tobacco Studies, NJ, USA, <sup>6</sup>National Institute on Minority Health and Health Disparities, MD, USA, <sup>7</sup>National Institutes of Health, MD, USA, <sup>8</sup>University of California, San Diego, CA, USA, <sup>9</sup>Westat, MD, USA, <sup>10</sup>Roswell Park Cancer Institute, NY, USA

**BACKGROUND:** This is the first longitudinal nationally representative U.S. study to examine how perceptions of harmfulness of seven non-cigarette tobacco products relate to subsequent tobacco product use among adults. Objectives were to examine: (1) How perceptions of harmfulness for seven non-cigarette tobacco products relative to cigarettes predict subsequent use (initiation, cessation, continued use/continued non-use); (2) How change in tobacco product use over time is associated with changes in perceptions of tobacco product harmfulness; (3) Whether sociodemographic variables moderate the association between lower harm perceptions and subsequent product use. **METHODS:** Data are from the adult sample (18 and older) of the Population Assessment of Tobacco and Health (PATH) Study, a nationally representative longitudinal cohort survey conducted Sept 2013-Dec 2014 (Wave 1 (W1) n=32,320) with a follow up Oct 2014-Oct 2015 (W2 n=28,362). **RESULTS:** W1 users and non-users of e-cigarettes (OR=1.97, 95% CI 1.74-2.22), filtered cigars (OR=1.61, 95% CI 1.15-2.25), cigarillos (OR=1.86, 95% CI 1.51-2.30), and pipes (OR=2.11, 95% CI 1.44-3.09), who perceived these products as less harmful had greater odds of using the product at W2. For the other products, there was an interaction between W1 perceived harm and W1 use status in predicting W2 product use: Low perceived harm was an especially strong predictor of W2 product use among W1 non-users for smokeless tobacco (F=4.67, p=0.03) and hookah (F=15.57, p<0.001), and among W1 users for traditional cigars (F=5.89, p=0.02). Perceptions of e-cigarettes changed substantially over time: At Wave 2, a smaller percentage of U.S. adults rated e-cigarettes as less harmful than cigarettes compared to Wave 1 (41% at Wave 1, 29% at Wave 2). No sociodemographic factors consistently modified the association between W1 harm perceptions and W2 use. **CONCLUSIONS:** Perceptions of the harmfulness of non-cigarette tobacco products predict subsequent tobacco product use. Therefore, strategies to prevent initiation and promote cessation of these products could address perceptions of these products.

**FUNDING:** Federal

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### PA14-2

#### YOUNG ADULT MULTIPLE PRODUCT USE DECLINES ACROSS TIME AND MAY CONSOLIDATE INTO CIGARETTE USE

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**SIGNIFICANCE:** Despite the increasing popularity of multi-tobacco product use, no studies have examined longitudinal changes in multi-product use across time. Thus, it is not known if multi-product users continue to use two or more tobacco/nicotine products across time, or if multi-product use consolidates into the use of a single product. The present study examined changes in young adult's multi-product use across a two-year period. Follow-up analyses examined changes in the use of five tobacco/nicotine products (cigarettes, e-cigarettes, hookah, cigars, smokeless) across the same time period. **METHOD:** Data were from a 5-wave 24-college study in Texas. Wave 1 data were collected in Nov 2014-Feb 2015 and every six months thereafter. Data from students who were current users of at least one tobacco/nicotine product during at least one wave were included in analyses

(N=2794). Students were 18-30 year olds at wave 1 ( $m=21.24$ ;  $sd=2.52$ ); 59.0% female; 38.1% non-Hispanic white, 33.0% Hispanic, and 28.9% another race/ethnicity. Growth curve models were fit to assess changes in multi- and single-product use by age (range=18-31.8 years old). One linear growth curve was estimated for multi-product use [scored from 0=current use of 0 products to 5=current use of all five products] and five logistic growth curves were estimated for each of the five tobacco/nicotine products (scored 0=non-use; 1=past 30-day/current use). **RESULTS:** There was a significant linear decline in multi-product use by age ( $p<.05$ ). At age 18, marginal means from the growth curve indicated that young adults used an average of 1.31 products (95% CI=[1.25, 1.36]) and by age 30, they used an average of 0.72 products (95% CI=[0.63, 0.81]). Regarding individual product use, e-cigarette, hookah, and cigar use declined across age ( $p<.05$ ), and smokeless use remained constant across age. In contrast, cigarette use significantly increased with age ( $p<.05$ ). **CONCLUSIONS:** Young adults may experiment with multi-product use, which appears to decline across time and may consolidate into cigarette use with increasing age. Sustained use and addiction may thus be more likely with cigarettes than other tobacco products.

**FUNDING:** Federal

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### PA14-3

#### TRANSITIONS BETWEEN COMBUSTIBLE, ENDS, AND DUAL USE IN YOUTH AND YOUNG ADULTS: RELATIONSHIPS WITH AGE AND OTHER DEMOGRAPHIC CHARACTERISTICS

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**SIGNIFICANCE:** Over the past decade, the rate of cigarette use has declined while the rates of use of alternative products like e-cigarettes and hookah has increased, as has the proportion of youth who use more than one product. The purpose of this study was to describe the dynamics of transitions between never use, non-current use, and past-30-day use of electronic nicotine delivery systems (ENDS), combustible tobacco products, and dual use of both kinds of products. **METHOD:** Using a nationally representative longitudinal data set of 15-21-year-olds (N=15,275), a multi-state Markov model was fit to observations collected every six months across 2.5 years to estimate the probability of transition between each state, the average time in state, and the effect of age, gender, race and parent's education on transitions. **RESULTS:** Respondents readily moved between types of tobacco products and between single and dual use. The estimated average time in state was significantly longer for cigarette use (0.52 y) and dual use (0.55 y) than ENDS-only use (0.27 y). Transitions into and out of using combustibles were especially variable across the covariate measures tested. Participants who were male, younger, and whose parent had more than a high school education were more likely to move from using combustibles to not using any tobacco products than those who were, respectively, female, older, and whose parent had no more than a high school education. Transitions into and out of dual-use, however, were influenced by age and not other individual characteristics. Younger participants were more likely than older participants to transition into dual use from non-current use and from combustible-only use and were less likely to transition from dual use to combustible-only use. **CONCLUSIONS:** These results are among the first to describe the dynamics of transitions between combustible tobacco products and ENDS in a population context of youth and young adults. Findings suggest that policy and prevention efforts must consider the frequent changes in product use patterns over time among young people, particularly adolescents.

**FUNDING:** Truth Initiative internal funding

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## PA14-4

### TRANSITIONS IN ELECTRONIC CIGARETTE USE AMONG ADULTS IN THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY, WAVES 1 AND 2

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**SIGNIFICANCE:** Prior cross-sectional analyses of the Population Assessment of Tobacco and Health (PATH) Study revealed the majority of adult e-cigarette users in the U.S. reported using less than daily and were also current cigarette smokers. This study assesses patterns of e-cigarette and cigarette use from Wave 1 (2013-2014) to Wave 2 (2014-2015) among adults who were e-cigarette users at Wave 1. **METHODS:** We examined changes in e-cigarette use frequency and product use status at Wave 2 among adult e-cigarette users at Wave 1 (unweighted  $n=2,835$ ). Adjusted prevalence ratios (aPR) were calculated using a predicted marginal probability approach to assess correlates of e-cigarette discontinuance and smoking abstinence at Wave 2. **RESULTS:** Among adult e-cigarette users at Wave 1, 49.5% discontinued their use of e-cigarettes at Wave 2. Among dual users of e-cigarettes and cigarettes at Wave 1, 44.3% maintained dual use, 43.5% discontinued e-cigarette use and maintained cigarette smoking, and 12.1% reported no cigarette smoking at Wave 2, either by discontinuing cigarette smoking (5.1%) or discontinuing both products (7.0%). Daily e-cigarette users at Wave 1 were less likely to discontinue their e-cigarette use compared to non-daily users (aPR=0.49, 95% CI=0.40-0.59) and more likely to report no cigarette smoking at Wave 2 compared to non-daily users (aPR=1.45, 95% CI=1.06, 1.96). Further, those who used customizable devices at Wave 1 were less likely to discontinue use of e-cigarettes at Wave 2 compared to those who used non-customizable devices (aPR=0.89, 95% CI=0.81, 0.99). **CONCLUSION** Findings from this study suggest e-cigarette use patterns are highly variable over a one-year period. Tracking these patterns of use over time may provide additional insight into the public health impact of e-cigarettes.

FUNDING: Federal

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## PA14-5

### HOW DOES SMOKING AND NICOTINE DEPENDENCE CHANGE AFTER ONSET OF VAPING? ANALYSIS OF DUAL USERS

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Electronic cigarette (ECIG) use has increased in the past 10 years. Although some smokers switched to exclusive use of ECIGs, many others are now dual users of combustible tobacco cigarettes and ECIGs. This dual use may increase nicotine dependence. Using baseline data from a smoking cessation trial for dual users ( $N=2896$ ), the aims of this study were to examine: 1) changes in smoking rates (i.e., cigarettes per day) and smoking-related nicotine dependence (Heaviness of Smoking Index [HSI-cig]) before and after initiating vaping; using self-report data along with their retrospective recall of pre-vaping smoking; 2) pre-to-post-vaping change in total nicotine frequency (number of vaping and smoking sessions per day), and combined nicotine dependence [HSI-nic]; and 3) examine predictors of total nicotine frequency and combined nicotine dependence. **RESULTS:** showed that participants significantly decreased ( $p<.001$ ) cigarettes/day from pre- ( $M=19.2$ ,  $SD=9.0$ ) to post-vaping ( $M=11.2$ ,  $SD=8.0$ ) and smoking-related nicotine dependence (HSI-cig; pre-vaping  $M=3.6$ ,  $SD=1.5$ ; post-vaping  $M=2.1$ ,  $SD=1.6$ ;  $p<.001$ ). Total nicotine frequency (sessions of nicotine consumption) significantly increased after initiating vaping ( $M=19.3$  vs.  $M=29.5$ ;  $p<.001$ ) as did combined nicotine dependence (HSI-nic;  $M=3.6$  vs.  $M=4.7$ ;  $p<.001$ ). Overall, 71% reported increased nicotine frequency and 65% reported increased nicotine dependence.

Hierarchical regression analysis revealed that variables associated with frequency of nicotine sessions and/or combined nicotine dependence included: male gender, younger age, lower education, higher income, higher nicotine dependence pre-vaping, more months using ECIGs, using ECIGs on more days/month, taking more puffs/vaping session, using ECIG before tobacco cigarettes in the morning, and using higher nicotine concentration in ECIG liquid. Overall, these findings provide support for dual use as a means to reduce the number of combustible cigarettes smoked. Conversely, they also suggest that a subset of dual users may have greater difficulty quitting smoking or achieving complete nicotine abstinence, due to increased nicotine intake and overall frequency of use.

FUNDING: Federal

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## PAPER SESSION 15: TOBACCO AND SUBSTANCE USE DISORDER COMORBIDITY

### PA15-1

#### ENHANCING SYSTEMS-LEVEL TOBACCO INTERVENTIONS IN OPIOID TREATMENT PROGRAMS

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**SIGNIFICANCE:** Despite the high prevalence and health burden of tobacco use among persons with opioid use disorder (OUD), few opioid treatment program (OTP) counselors address patients' tobacco use. **METHODS:** We conducted a serial cross sectional retrospective analysis of patient charts at each of three urban outpatient OTPs in the Bronx, NY. We conducted physician-led, 60-minute smoking cessation trainings at each clinical site, and universally incorporated forms documenting tobacco use behavior in OTP counselors' electronic medical records. We abstracted data from a random sample of 100 patient charts at each of three clinics during two different two-month periods, prior to and following the interventions. We ascertained patients' smoking status by reviewing their medical and counseling records over a two year period. We assessed OTP counselors' identification of patients' smoking status and provision of counseling over the two-month periods of review. **RESULTS:** Complete records were available for 596 patients, of whom 491 (82.4%) were current smokers, and 47 (7.9%) were former smokers. Patients were 35.1% female, 18.5% Black, and 70.3% Latinx. Over a two-month period, smokers had a mean of 4.4 (SD 5.9) visits with counselors pre- and 4.9 (SD 4.7) post-intervention. Among smokers with at least one counseling visit over the two-month period of review, tobacco use status was documented by counselors 17.7% pre- and 81.3% post-intervention ( $p<.001$ ). Counselors provided smoking cessation counseling to 1.7% and 24.8% of smokers ( $p<.001$ ) pre- and post-intervention respectively. **CONCLUSIONS:** With a low intensity health system level intervention, including brief provider trainings and EMR forms, both documentation of smoking status and provision of smoking cessation counseling increased. To our knowledge, this is the first study that has explored the impact of using EMRs to encourage OTP counselors to document patients' smoking status and provide smoking cessation counseling in an OTP setting. Further dissemination of these low intensity interventions has potential to increase tobacco treatment among persons with OUD.

**FUNDING:** Pharmaceutical Industry

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### PA15-2

#### SUBSTANCES USED IN ELECTRONIC VAPOR PRODUCTS AMONG ADULTS, UNITED STATES, 2017

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**SIGNIFICANCE:** Electronic vapor products (EVPs), including e-cigarettes, can be used to aerosolize a variety of substances. There are limited national data examining what substances are used in EVPs among U.S. adults. This study assessed past-year use of EVPs to deliver nicotine, cannabinoids, flavors, and other substances among U.S. adults. **METHODS:** Data were from the 2017 Styles Survey, a national, web-based panel survey of U.S. adults aged 18 years or older ( $N=4,107$ ). Respondents who had ever used EVPs were asked if they had used an EVP with any of the following substances in the past year: "Nicotine"; "Marijuana, THC, Hash oil, BHO, THC wax, or Dabs" (cannabinoids); "Flavor"; or "Something else". Respondents could select multiple response options. Weighted descriptive statistics for any, exclusive and combined EVP substance use were calculated among ever ( $n=593$ ) and current (past 30-day,  $n=123$ ) EVP users; those reporting using "something else" were not presented due to small sample sizes. **RESULTS:** Any past-year use of nicotine, cannabinoids, and flavors in EVPs was reported by 30.7%, 12.5%, and 23.6% of ever EVP users, respectively; and by 72.3%, 17.8%, and 54.6% of current EVP users. Among ever EVP users, nicotine only was the most commonly used substance in the past year (29.6%), followed by nicotine

plus flavor (27.2%), flavor only (16.4%), marijuana only (14.9%) and nicotine plus marijuana (7.8%). Among current EVP users, the most common substance use pattern was nicotine plus flavor (39.1%), followed by nicotine only (29.6%), flavor only (11.2%), nicotine plus marijuana (7.8%), and marijuana only (6.8%). **CONCLUSION:** Among U.S. adult EVPs users in 2017, nicotine is the most commonly reported substance used in the devices; more than 7 in 10 current EVP users reported using EVPs with nicotine in the past year. Additionally, more than 1 in 2 current EVP users report using the devices for flavors, and nearly 1 in 6 report use for cannabinoids. Further exploration of the frequency and patterns of using various substances with EVPs could help inform tobacco control surveillance and programmatic efforts.

**FUNDING:** None

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### PA15-3

#### IS CIGARETTE SMOKING STILL DECLINING IN THE UNITED STATES? THE IMPACT OF CANNABIS USE STATUS

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**INTRODUCTION:** Smoking is common among adults who use cannabis, and the prevalence of cannabis use has been increasing over the past decade. It is not known whether and to what degree the prevalence of cigarette smoking has changed differentially among those who do and do not use cannabis, and whether any such changes have differed based on frequency of cannabis use. The current study examined changes in the prevalence of daily and non-daily cigarette smoking among daily, non-daily, and non-cannabis users and examined time trends in cigarette smoking in daily, non-daily, and non-cannabis users from 2002-2015. **METHODS:** Data were drawn from the 2002-2015 National Survey on Drug Use and Health ( $n=782,156$ ). Linear time trends of daily and non-daily smoking were assessed using logistic regression with year as the predictor. **RESULTS:** In 2015, the prevalence of current (past 30-day) cigarette smoking was prevalent among over half of daily cannabis users (54.57%) and 40.17% of non-daily cannabis users, compared with 15.06% of those who do not use cannabis. Notably, the prevalence of non-daily cigarette smoking increased significantly among daily cannabis users from 2002 to 2015 (14.34% vs. 17.62%;  $p=0.014$ ) and declined among non-daily cannabis users (21.02% vs. 17.03%;  $p<0.001$ ) and those who did not use cannabis during this period (6.58% vs. 5.36%;  $p<0.001$ ). Daily cigarette smoking declined among both cannabis users and non-users. **CONCLUSIONS:** Despite ongoing declines in cigarette smoking among those who do not use cannabis in the U.S., non-daily cigarette smoking has been increasing among daily cannabis users, a growing percentage of the U.S. population. Tobacco control efforts do not seem to be equally successful with all segments of the population. Efforts to further tobacco control should consider novel co-use-oriented intervention strategies and outreach for the increasing proportion of the population who use cannabis.

**FUNDING:** Federal

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### PA15-4

#### EXPLORING ASSOCIATIONS BETWEEN THE USE OF PSYCHOACTIVE SUBSTANCES AND E-CIGARETTES IN A NATIONALLY REPRESENTATIVE SAMPLE OF YOUNG ADULTS

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**SIGNIFICANCE:** E-cigarette use is rising among young adults in the U.S., but it is not known whether psychoactive substance use is associated with e-cigarette use in patterns similar to those seen with cigarettes. We examined the relationships between ever use of prescription opioid drugs (painkillers, sedatives, and tranquilizers) and ever cocaine use with e-cigarette use. **METHODS:** A secondary data analysis of the 2013-2014 Population Assessment of Tobacco and Health (PATH) nationally representative sample of young adults (ages 18-24) was con-



ducted. Three logistic regression models examined the associations between the interaction of ever prescription opioid drug use and ever cocaine use with three e-cigarette use outcomes (past 30 days, former experimental, and never use). Adjusting covariates included: sex, race/ethnicity, education, household income, and total number of tobacco products ever used. Adjusted odds ratios (AOR) and 95% confidence intervals (CI) are reported. RESULTS: The interaction between ever use of prescription opioid drugs and ever cocaine use was significantly associated with former experimental use (AOR= 1.51; 95% CI= 1.18-1.93) and it was inversely associated with never e-cigarette use (AOR= 0.30; 95% CI= 0.21-0.41), but this interaction was not significantly associated with past 30-day e-cigarette use. However, prescription opioid drug use was significantly associated with past 30-day use of e-cigarettes (AOR= 1.21; 95% CI= 1.02-1.44). CONCLUSIONS: These findings indicate that among young adults (ages 18-24), the odds of using e-cigarettes is higher for those reporting ever use of both prescription opioid drugs and cocaine compared to individuals who did not report ever using these psychoactive substances in 2013-2014.

FUNDING: Federal

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## PA15-5

### DESIRE TO QUIT SMOKING AMONG INDIVIDUALS IN RESIDENTIAL SUBSTANCE ABUSE TREATMENT: PERCEIVED BARRIERS AND RISK

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SIGNIFICANCE: Individuals in treatment for a substance disorder other than nicotine dependence are disproportionately likely to smoke cigarettes compared to the general population. Although approximately 50% of those in residential drug and alcohol treatment meet criteria for nicotine dependence (SAMSHA, 2011), programs rarely integrate smoking cessation into treatment. Two complementary rationales often offered for failing to address nicotine dependence were explored: 1) there is little interest or desire to quit smoking among those in other-drug treatment and 2) smoking cessation may place individuals' other-drug sobriety at risk. Method: Ninety-four individuals (59% male;  $M$  age= 35) in residential substance abuse treatment (55% opiate users; 22% polydrug users) were anonymously surveyed by a treatment facility considering offering smoking cessation services. RESULTS: Current smoking rate was 15 cigs/day; preadmission smoking was 19 cig/day. Using a 7 point scale (1=strongly disagree), self-reported desire to quit was moderately high ( $M$  = 4.51,  $SD$  = 2.21) but intent to quit while in treatment was low ( $M$  = 2.55,  $SD$  = 1.95). The overall perceived risk of quitting smoking to other-drug sobriety was moderate ( $M$  = 3.75) but distinct subgroups emerged: 28% indicated no perceived risk; 21% rated the risk as moderate while 22 % saw the risk as extreme. Nine potential reasons for not quitting were assessed. Smoking as stress management emerged as most important ( $M$  = 5.60;  $SD$  = 1.45) and higher than all others ( $p$  < .001), followed by concerns about withdrawal and craving ( $M$  = 4.94;  $SD$  = 1.99), which was higher than the remaining concerns ( $p$  < .01). Risk to sobriety ranked 7<sup>th</sup> ( $M$  = 3.75). Regression analyses revealed two unique associations with desire to quit: enjoying smoking showed a robust negative relation ( $b$  = -.60,  $p$  < .000) and risk to sobriety showed a more modest negative relation ( $b$  = -.32,  $p$  = .011). CONCLUSIONS: Most individuals in other-drug treatment desire to quit smoking and do not see doing so as placing their sobriety at high risk. However, translating interest into an active quit attempt may require both stress management training and pharmacotherapy.

FUNDING: None

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## PA15-6

### CHANGES IN POLICY AND PRACTICE FOLLOWING AN ORGANISATIONAL CHANGE INTERVENTION FOR TOBACCO DEPENDENCE TREATMENT IN ALCOHOL AND OTHER DRUG SERVICES

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SIGNIFICANCE: Clinical practice guidelines recommend alcohol and other drug (AOD) services have comprehensive smoke-free policy, assess client's smoking status and offer evidence based smoking cessation care to all smokers. We aimed to assess written tobacco smoking policies and staff reported smoking cessation care practices six months before an organisational change intervention was implemented (August 2014) and 18 months after implementation (October 2016). METHODS: We conducted online surveys with AOD staff at each time point ( $n$ =362 and  $n$ =120) from 31 services from four states and territories of Australia. The current written tobacco smoking policy was requested at each time point. Survey items measured staff awareness of their service's smoking policy compared to the written document, perceived enforcement, how the decision to provide care is made, self-reported assessment and recording of client smoking status and provision of 9 types of smoking cessation care. RESULTS: The audit of written smoking policy revealed that the majority of services were regulated by a total ban (61% in 2014; 77% in 2016) and agreement between staff policy awareness and the written policy was moderate (Kappa 0.60) for a total ban. Perceived policy enforcement was sub-optimal. Assessment and recording of client smoking status increased from 62% in 2014 to 71% in 2016 ( $p$ <0.05). The decision to provide smoking care to all clients who smoked increased from 44% ( $n$ =112) to 68% in 2016 ( $p$ <0.05). From pre to post-intervention staff reported smoking cessation practices significantly increased for the provision of verbal advice to quit (33 vs 44%;  $p$ <0.05), offer of NRT (18% vs 42%;  $p$ <0.05) and follow-up to check on quit smoking progress (16% vs 26%;  $p$ <0.05). CONCLUSIONS: The organisational change intervention may offer a model that other AOD services may use to ensure tobacco smoking is treated. Further research on the potential to reduce smoking cessation prevalence is warranted.

FUNDING: Federal

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## PODIUM PRESENTATION 4

## PAPER SESSION 16: SOCIAL MEDIA EXPOSURE AND INTERVENTION RESEARCH

### PA16-1

#### LOW RISK OF BIAS IN BIOCHEMICAL VERIFICATION COMPLETION AMONG YOUNG ADULT SMOKERS PARTICIPATING IN A FACEBOOK INTERVENTION

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**SIGNIFICANCE:** Biochemical verification of smoking abstinence remains an important validity check for cessation trial outcomes. Digital health trials rarely establish in-person contacts between participants and intervention providers and opportunities to biochemically verify treatment outcomes. Here we describe a novel method of remotely determining smoking abstinence in clinical trial participants, and evaluate participant predictors of compliance. **METHODS:** Data came from a feasibility trial and randomized controlled trial of a Facebook smoking cessation intervention for young adults. In both trials (N=579), participants completed baseline as well as follow-up surveys at 3, 6, and 12 months. Participants indicating past 7-day point prevalence abstinence from smoking were mailed a saliva cotinine kit and instructed to send back two pictures – one of them giving a saliva sample and the other with test results. We investigated predictors of compliance with biochemical verification procedures (regardless of result) among participants that were mailed a kit at any follow-up point (N=130; Mean age = 21.3; 59.2% female) using logistic as well as multinomial regressions. **RESULTS:** A total of 189 kits were sent out, of which 97 were completed (51.3% completion rate). Kits sent per participant ranged from 1-3 with an average of 1.5 (SD=0.7). There were no significant baseline sociodemographic or smoking predictors of completing any vs. no kits using logistic regression. Similarly, there were no significant baseline predictors of extent of kit completion (none vs. some; none vs. all) using multinomial logistic regression and controlling for number of kits sent. **CONCLUSIONS:** We used a novel method of biochemical verification of smoking abstinence by saliva cotinine and pictures in two Facebook smoking cessation intervention trials. We did not find significant participant predictors of kit completion, which is encouraging, as it suggests low risk for bias of results.

**FUNDING:** Federal; State

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### PA16-2

#### TALKING ABOUT TOBACCO ON TWITTER: A RISK FACTOR FOR TOBACCO PRODUCT USE

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**SIGNIFICANCE:** Tobacco-related content is ubiquitous on social media such as Twitter. Previous studies have documented the presence of tobacco-related content on social media but have not demonstrated actual associations between engagement in tobacco-related social media and tobacco product use. Participation in conversations about tobacco products on social media could be a risk factor for experimentation with tobacco products and progression to nicotine addiction. Empirical evidence that tobacco-related social media can influence tobacco product use could advance the field. **METHODS:** Self-report data on tobacco product use were obtained from the Children's Health Study, a longitudinal study of tobacco product use among adolescents and young adults. Among the 1224 respondents in the cohort (mean age=20), 231 had active, public Twitter accounts. We obtained the tweets that those respondents posted on Twitter, searched the tweets for 42 tobacco-related keywords, and coded the tobacco-related statements as positive or negative/neutral. We conducted logistic regression analyses, controlling for demographic covariates, to determine whether posting about tobacco on Twitter was

associated with tobacco product use. **RESULTS:** Relative to respondents who did not post about tobacco, those who posted any positive messages about tobacco in the past 5 years were significantly more likely to be past-month users of e-cigarettes (OR=8.71, 95% CI=2.02,33.0) and any tobacco product (OR=4.37, 95% CI=1.62,11.8). **CONCLUSIONS:** This is the first study to establish an empirical link between adolescents' and young adults' tobacco-related Twitter activity and their tobacco product use. Findings indicate that youth who post even one positive tobacco-related tweet are at risk for becoming current tobacco users. Health communications about the risks of tobacco use could target this population.

**FUNDING:** Federal

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### PA16-3

#### PROMOTION OF TOBACCO PRODUCTS ON FACEBOOK: POLICY VERSUS PRACTICE

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**OBJECTIVE:** Facebook has a comprehensive set of policies intended to inhibit promotion and sales of tobacco products. Their effectiveness has yet to be studied. **Design:** Leading tobacco brands (388) were identified via Nielsen and Ranker databases and 28% (108) were found to maintain branded sponsored Facebook pages. Key indicators of alignment with Facebook policy were evaluated. **RESULTS:** Purchase links (eg. "buy now" button) on brand sponsored pages were found for hookah (41%), e-cigarettes (74%), smokeless (50%), and cigars (31%). Sales promotions (eg. discount coupons) were present in hookah (48%), e-cigarettes (76%), cigars (69%). While conventional cigarettes did not have brand sponsored pages, they were featured in 80% of online tobacco vendors' Facebook pages. The requirement for age gating, to exclude those < 18 from viewing tobacco promotion, was absent in hookah (78%), e-cigarettes (62%), and cigars (21%) brand sponsored pages and for 90% of online tobacco stores which promote leading cigarette brands (eg. Marlboro, Camel). Popularity of pages promoting tobacco was high with many having thousands of "likes." **CONCLUSIONS:** It is laudable that Facebook has policies intended to interdict tobacco promotion throughout its platform. Nevertheless, widespread tobacco promotion and sales were found at variance with the company's policies governing advertising, commerce, page content, and under age access. Vetting could be improved by automated screening in partnership with human reviewers.

**FUNDING:** None

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### PA16-4

#### DEVELOPMENT AND USABILITY TESTING OF THE SMOKING TOBACCO AND DRINKING (STAND) FACEBOOK INTERVENTION FOR YOUNG ADULTS

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**INTRODUCTION:** Intervention addressing smoking and heavy episodic drinking (HED) may result in better tobacco and alcohol outcomes for young adults who exhibit both behaviors. We conducted focus groups and usability testing to inform a Facebook intervention for smoking and HED. **METHODS:** Three 90-minute Facebook focus groups with 25 young adults aged 18-25 reporting past-month smoking and HED (5+ for men, 4+ for women) focused on contexts of smoking and drinking and receptivity to social media intervention. The Smoking Tobacco and Drinking (STAND) intervention was then developed based on U.S. Clinical Practice Guidelines for smoking cessation and the NIAAA Rethinking Drinking website, and usability tested for 30 days in a private Facebook group tailored to readiness to quit smoking ("Ready" in next 30 days/ "Not Ready"; N=29, Mean age = 20.8, 10% female, 72% non-Hispanic White). Comments on each post were tallied, coded for design and content feedback, and flagged as in need of change

(y/n). Engagement (comment frequency) and "change" status were examined by substance type (alcohol, tobacco, both). RESULTS: Focus groups showed participants were more receptive to quitting smoking than drinking and preferred to change one substance at a time; thus, alcohol and tobacco content was presented separately at the beginning of the intervention, and alcohol content focused on motivational enhancement and normative feedback throughout. Usability testing included 63(35%) alcohol posts, 78(43%) tobacco, and 40(22%) both substances. Mean comments per post were 5.34 ( $SD = 1.1$ ) in Ready groups and 11.67 ( $SD = 5.13$ ) in Not Ready; 94/180 (52.2%) posts were flagged for change. In both groups, neither engagement (Ready:  $p = .88$ ; Not Ready:  $p = .66$ ) nor change status (Ready:  $p = .27$ ; Not Ready:  $p = .11$ ) significantly differed for alcohol, tobacco, or combined posts. Overall STAND was rated by 91% participants as easy to understand, 83% providing sound advice, 87% would recommend the intervention to others, and 62% rated posts helpful. DISCUSSION/CONCLUSION: Conducting focus groups and usability testing through Facebook can improve content, supporting intervention engagement and impact.

FUNDING: Federal

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## PA16-5

### THE IMPACT OF CUMULATIVE EXPOSURE TO TOBACCO RELATED SOCIAL MEDIA CONTENT ON PAST 30 DAY TOBACCO USE IN TEXAS ADOLESCENTS

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SIGNIFICANCE: Social media is popular among adolescents and is an emerging method of tobacco marketing. It is crucial to understand the effect of tobacco-related social media on adolescent tobacco use. METHODS: The Texas Adolescent Tobacco and Marketing Surveillance System (TATAMS) surveyed students in five counties in Texas. Initial data collection occurred from October 2014 to June 2015, and three subsequent waves were collected in six month intervals thereafter. Weighted logistic regression examined the relationship between cumulative exposure to tobacco-related social media in the first three waves and tobacco use in wave four. Independent variables were the number of waves that students reported: (a) exposure to tobacco-related content on social media and (b) engaging with or posting tobacco-related content. Dependent variables were: past 30 day use of e-cigarettes ( $n=2,870$ ;  $N=458,985$ ), past 30 day use of a combustible product ( $n=2,866$ ;  $N=458,089$ ), and past 30 day use of both e-cigarettes and a combustible product ( $n=2,724$ ;  $N=433,804$ ). Estimates were adjusted for sex, grade, race and standard of living. RESULTS: Two-thirds of students (65%) were exposed to tobacco-related social media in one or more waves, and between 10-12% of students reported engaging with tobacco content. The adjusted odds of past-30 day use of e-cigarettes was almost 2 times higher ( $AOR=1.76$ , 95%CI: 1.38 – 2.23) for each unit increase in exposure to tobacco-related social media compared to unexposed students. This result was similar for past 30 day dual use of both e-cigarettes and any combustible product ( $AOR=1.85$ , 95%CI: 1.15 – 3.00). Similar estimates were found for the impact of posting or engaging with tobacco related content on past 30 day use of e-cigarettes ( $AOR=2.07$ , 95%CI: 1.60 – 2.69), and combustible products ( $AOR=1.57$ , 95%CI: 1.19 – 2.08). CONCLUSIONS: This study's strength is in estimating the prospective impact of tobacco-related social media on past 30 day use of exclusive and dual use of e-cigarettes and combustible tobacco products. Results suggest tobacco content on social media increases the risk of adolescent tobacco use, warranting future research and intervention.

FUNDING: Federal

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## PAPER SESSION 17: SMOKING AND MENTAL HEALTH: EPIDEMIOLOGY, PRECLINICAL, AND CLINICAL INSIGHTS

### PA17-1

#### INITIAL EVALUATION OF A POSITIVE ALLOSTERIC MODULATOR OF ALPHA-7 NICOTINIC RECEPTORS FOR EFFICACY IN AIDING CESSATION AMONG SMOKERS WITH OR WITHOUT SCHIZOPHRENIA

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Compounds acting at  $\alpha 7$  nicotinic receptors (nAChRs) can reduce nicotine self-administration in preclinical research, suggesting clinical utility of a positive allosteric modulator (PAM) of  $\alpha 7$  receptors for aiding smoking cessation. Moreover, individuals with schizophrenia, a vulnerable subpopulation with very high smoking prevalence, have reduced expression of  $\alpha 7$  nAChRs and may particularly benefit from this compound. In two parallel studies using an innovative and validated within-subject crossover design, 36 healthy smokers (Study 1) and 62 smokers with schizophrenia (Study 2), both high in quit interest, attempted to initiate quitting temporarily during each of two 3-week treatment periods. Treatments, administered double-blind and in counter-balanced order, were the  $\alpha 7$  nicotinic receptor PAM JNJ-39393406 (100 mg b.i.d.) or placebo. In each period, all subjects smoked ad lib with no drug on week 1, during dose run-up on week 2, and then tried to quit every day during week 3. Abstinence (confirmed by  $CO < 5$  ppm) was assessed daily (Mon-Fri) each quit week and compared between conditions. Secondary outcomes included abstinence symptoms (withdrawal, craving) and cognitive test responding (N-back; continuous performance task), compared in those smoking deprived to detect potential mechanisms of drug efficacy unconfounded by recent smoking. In both studies, compared with placebo, active JNJ-39393406 did not increase the number of abstinent days nor reduce total smoking exposure. We also found no significant improvements in craving, withdrawal, or cognitive function. In sum, results from both studies do not support further testing of this  $\alpha 7$  nAChR PAM compound for possible efficacy in smoking cessation, in smokers with or without schizophrenia. Yet, our findings could be specific to the brief drug duration, procedures used, and dose tested. Longer duration and a broader dose range of this or perhaps other  $\alpha 7$  nAChR PAMs may show efficacy for smoking cessation. Finally, Study 2 constitutes the first use in smokers with serious mental illness of our cross-over procedure to evaluate cessation efficacy in novel compounds vs. placebo, showing feasibility.

FUNDING: Federal

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### PA17-2

#### HOW DISTRESS TOLERANCE AND ANXIETY SENSITIVITY RELATE TO TOBACCO DEPENDENCE, WITHDRAWAL, AND SMOKING CESSATION

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SIGNIFICANCE: Leventhal and Zvolensky (2015) proposed that transdiagnostic emotional vulnerabilities can lead to difficulty quitting smoking. This study examines the relations of two such vulnerabilities—low distress tolerance (DT; difficulty tolerating aversive feelings) and anxiety sensitivity (AS; fear of anxious feelings)—with tobacco dependence, withdrawal, cessation, and response to treatment. METHODS: Participants in a cessation trial ( $N=1086$ ; 52% female; 29% African American) were randomized to 12 weeks of nicotine patch, nicotine patch + nicotine lozenge, or varenicline. Baseline questionnaires assessed DT, AS, tobacco dependence, negative affect on the Positive and Negative Affect Scale, and anxiety on the Wisconsin Smoking Withdrawal Scale. Withdrawal was assessed in Week 1 post-quit via ecological momentary assessment. RESULTS: DT was negatively correlated with baseline measures of dependence ( $r's = -.14$  to  $-.23$ ) and with post-quit mean and variability in negative affect and craving ( $r's = -.11$  to  $-.23$ ).





DT was positively related to CO-confirmed point-prevalence abstinence at Weeks 4, 12, 26, and 52 ( $p < .05$ ), even after controlling for baseline AS, negative affect, anxiety, or self-reported anxiety disorder history (although at Week 26 two  $p$ 's were  $< .10$ ). DT moderated treatment effects at Week 4; higher DT appeared to be related to higher abstinence rates among those receiving patch + lozenge, but DT did not appear to influence response to patch or varenicline. AS was positively correlated with baseline dependence ( $r = .16-.28$ ) and with post-quit mean and variability in negative affect and craving ( $r = .07$  to  $.22$ ). AS was negatively related to point-prevalence abstinence at Week 4 but not at later time points and not after controlling for baseline DT, negative affect, or anxiety. CONCLUSIONS: The vulnerabilities of low DT and high AS were associated with stronger tobacco dependence and withdrawal. However, only DT appeared consistently related to cessation such that lower DT was associated with lower quit rates over time. Further, DT moderated response to treatment at Week 4; smokers with higher DT appeared to do particularly well with patch + lozenge.

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## PA17-3

### INCREASING DISPARITIES IN CIGARETTE SMOKING IN DEPRESSION FROM 2005 TO 2015 IN THE UNITED STATES: EXAMINING THE ROLE OF SOCIOECONOMIC STATUS

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SIGNIFICANCE: Despite the substantial overlap in vulnerability to cigarette smoking associated with both poorer mental health and lower socioeconomic status (SES), no prior study to our knowledge has examined trends in smoking over the past decade by both depression and SES indicators such as income and education. It is possible that people with both depression and socioeconomic disadvantage may be even more vulnerable to cigarette smoking. The goal of this study was to estimate trends in the prevalence of cigarette smoking among persons with and without depression from 2005 to 2015 in the United States overall, and by income and education level. METHODS: Data were drawn from the National Household Survey on Drug Use (NSDUH), an annual cross-sectional study of persons age 12 and older (total study population  $N = 496,805$ ). The prevalence of past-month cigarette smoking was examined annually from 2005 to 2015 among those with and without past-year major depression, overall and by income/education, using linear trend analyses. RESULTS: Though smoking declined among those with depression (34.07% to 29.67%) from 2005 to 2015, as well as among those without depression, cigarette use remains nearly twice as common among those with, compared to without, depression overall (29.67% vs. 18.31%, respectively). Among people with depression in the lowest income and education groups, the prevalence of smoking (42.72% and 47.81%, respectively) was more than double that among people with depression in the highest income (20.28% and 21.20%, respectively) and education (21.20%) groups and over fourfold higher than those without depression in highest income (13.56%) and education (9.04%) groups. CONCLUSIONS: Disparities in smoking prevalence are striking when depression, income, and education are simultaneously considered. The prevalence of smoking among those with depression and lower socioeconomic status is more than twice the reported national average. Cigarette use remains common among nearly half the population of some groups with both mental health and socioeconomic disadvantage. Smokers with depression and lower socioeconomic status warrant additional public health attention.

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## PA17-4

### NICOTINE REINFORCEMENT IS NOT INCREASED IN THE MAM RODENT MODEL OF SCHIZOPHRENIA

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Despite progress in reducing smoking over the past several decades, up to 80% of individuals with schizophrenia (SCZ) continue to smoke. SCZ patients also smoke more intensely and with greater frequency, contributing to a disproportionately negative impact on health. However, no clear mechanistic connection between SCZ and smoking has been established. One hypothesis underlying the behavior is that SCZ brain pathophysiology confers an increased propensity to take nicotine (NIC), the primary psychoactive component of cigarette smoke. We sought to characterize NIC reinforcement, as measured through a self-administration paradigm, in a neurodevelopmental rat model of SCZ. Pregnant dams were treated with either methylazoxymethanol acetate (MAM; 1 mg/kg, i.p.) or saline (CTL) on gestational day 17. Adult male and female offspring were allowed to self-administer NIC across a range of doses (0 - 60 micrograms/kg/infusion, 7 days/dose) paired with neutral cue (CS) or reinforcing visual stimulus (VS) in daily 1 hr sessions. MAM and control rats did not differ in infusions + CS earned at any NIC dose (e.g. 15 microgram/kg/infusion dose, females; MAM,  $n = 22$ , mean =  $9.8 \pm 1.2$  infusions; CTL,  $n = 18$ , mean =  $9.9 \pm 0.9$  infusions). MAM rats earned fewer infusions of NIC paired with VS at all doses tested (e.g. 30 microgram/kg/infusion dose, males; MAM,  $n = 9$ , mean =  $17.2 \pm 1.4$  infusions; CTL,  $n = 10$ , mean =  $21.9 \pm 1.3$  infusions), but also responded less for VS alone. This suggests that VS may be less reinforcing to MAM animals, which may in turn reduce the relative magnitude of NIC enhancement of VS reinforcement. To capture patterns of responding across an extended period, rats in a separate experiment were allowed to self-administer NIC + CS for 23-hr sessions. No differences in NIC-taking between MAM and CTL rats were observed in 23-hr sessions. Overall, GD17 MAM did not produce an increase in NIC self-administration in male or female rats, which suggests that SCZ pathophysiology as modeled in these animals does not elevate NIC intake due to increased NIC reinforcement.

FUNDING: Federal

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## PA17-5

### THE EFFECTIVENESS OF A PROACTIVE OUTREACH SMOKING CESSATION INTERVENTION AMONG SOCIOECONOMICALLY DISADVANTAGED SMOKERS: THE ROLE OF SERIOUS MENTAL ILLNESS

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SIGNIFICANCE: Despite overall declines in smoking prevalence, significant socioeconomic and mental health disparities remain. The purpose of the present study was to examine whether a proactive outreach intervention that facilitated access to cessation treatments and addressed smokers' psychosocial needs was effective for promoting treatment utilization and prolonged abstinence among low-income smokers with serious mental illness (SMI). METHODS: Data were taken from OPTIN, an RCT that demonstrated the effectiveness of proactive outreach for promoting treatment utilization and prolonged abstinence in a sample of socioeconomically disadvantaged smokers enrolled in a publically-subsidized health care program in Minnesota. The intervention included mailings, telephone outreach, counseling, and access to free cessation treatments. ICD-9 codes indicating diagnoses of schizophrenia, psychotic disorder, bipolar disorders, and major depressive disorder were used to categorize participants in SMI ( $n = 1044$ ) or non-SMI ( $n = 1277$ ) groups. Logistic regressions tested for the presence of intervention x SMI interactions on all outcomes. Logistic regressions then modeled the effect of the intervention on cessation treatment utilization (medication, counseling, any form) and 6-month prolonged abstinence at 12-month follow-up in the SMI and non-SMI groups, respectively. RESULTS: There were no interactions between the intervention and SMI status on any of the outcomes tested. Relative to usual care, the intervention increased any form of treatment utilization in the SMI group (51.6% vs 38.1%,  $p < 0.001$ ) and the non-SMI group (38.6% vs 25.8%,  $p < 0.001$ ). The intervention also increased prolonged abstinence in the non-SMI group (18.1% vs 12.8%,  $p = 0.019$ ) and the SMI group (14.7% vs 10.8%,  $p = 0.070$ ). Discussion Results suggest that proactive outreach is a promising strategy for

boosting treatment utilization and abstinence rates among smokers enrolled in publically-subsidized state insurance programs. This is particularly important for smokers with SMI, who tend to engage in a greater number of quit attempts and utilize more treatments before achieving cessation.

FUNDING: Federal

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## PAPER SESSION 18: ELECTRONIC NICOTINE DELIVERY SYSTEMS: E-LIQUID CHARACTERISTICS AND VAPING BEHAVIOR

### PA18-1

#### THE EFFECT OF PUFF TOPOGRAPHY AND POWER SETTINGS ON ALDEHYDE AND CARBON MONOXIDE IN E-CIGARETTE AEROSOLS

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**INTRODUCTION:** E-cigarettes are a significantly less harmful alternative to traditional cigarette smoking. However, at least some e-cigarette devices, settings, or use patterns could result in unnecessarily high production of toxic compounds such as aldehydes. One of the problems facing the research community lies in wide variability of use patterns among e-cigarette users, such as puff topography (puff duration and flow rate). There is a critical need to understand how these parameters affect chemical composition, and thus safety, of e-cigarette aerosols. **METHODS:** We tested the effect of puff topography, e-cigarette orientation, e-cigarette power, and the effect of flavoring compounds on production of carbon monoxide and twelve aldehydes in e-cigarettes using a laboratory setup. **RESULTS:** E-cigarette orientation (horizontal vs. vertical) had no significant effect on emissions of the measured chemicals. Likewise, emissions per puff did not change when the air flow rate was varied between 0.37 L/min and 0.94 L/min. Carbon monoxide and aldehyde emissions increased linearly (beta ~1.7) with puff duration. CO emissions increased from 0.3 microgram per puff at 2 second to 3.1 microgram per puff at 6 s puff duration. Formaldehyde concentrations increased from 0.1 microgram per puff to 0.325 microgram per puff when the puff duration was increased from 2 seconds to 5 seconds (beta ~2.5). CO emissions of unflavored PG/VG liquid did not show any significant increase when coil temperature was varied between 235 C and 275 C. A watermelon liquid produced 2 to 4 times more CO per puff than the unflavored liquid of the same PG/VG composition. CO emissions from the flavored liquid increased linearly with coil temperature, demonstrating that flavoring compounds are not thermally stable under these conditions. **CONCLUSIONS:** Among the tested parameters, puff duration and, for the flavored liquid, e-cigarette power had a significant effect on the amount of aldehydes and carbon monoxide produced. Flavoring compounds in the tested watermelon liquid are thermally unstable and are responsible for at least two thirds of emitted carbon monoxide.

FUNDING: Academic Institution

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### PA18-2

#### DOES ELECTRONIC CIGARETTE PROPYLENE GLYCOL AND VEGETABLE GLYCERIN RATIO INFLUENCE NICOTINE DELIVERY, SUBJECTIVE EFFECTS, AND PUFF TOPOGRAPHY?

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**SIGNIFICANCE:** Electronic cigarettes (ECIGs) are a class of novel tobacco products that are growing in popularity, possibly due to their ability to deliver the dependence-producing drug nicotine to users. ECIG-associated nicotine delivery can be influenced by a variety of device, liquid, and human factors. However, the influence of ECIG liquid solvents propylene glycol (PG) and vegetable glycerin (VG) on ECIG acute effects is unknown. **METHODS:** Thirty ECIG-experienced ≥ 12-hour nicotine-abstinent participants used a 3.3 V "eGo" ECIG with a dual-coil cartridge (1.5 Ω) and 18 mg/ml nicotine liquid in four sessions differing only by liquid PG:VG ratio (2:98, 20:80, 55:45, 100:0). Blood was sampled and subjective effects were measured before and after 2, 10-puff ECIG-use bouts (30s inter-puff-interval). Puff topography was measured during each bout. **RESULTS:** After bout 2, mean (SD) plasma nicotine concentration, in ng/ml, was 8.6 (5.4) in the 2PG:98VG condition, 9.6 (8.0) in the 20:80 condition, 12.9 (10.7) in the 55:45 condition, and 13.4 (9.0) in the 100:0 condition. Nicotine delivery was significantly greater in the 100:0 and



55:45 conditions relative to the 20:80 and 2:98 conditions ( $p < .05$ ); significant differences were not detected across conditions after bout 1. Abstinence symptoms (e.g., "urge") were suppressed similarly across all PG:VG ratios but product-specific effects (e.g., "pleasant") were significantly lower in the 100 PG condition. Participants took significantly longer puffs in the 2:98 condition (5.58s) relative to all other conditions ( $ps < .05$ ). CONCLUSIONS: PG:VG ratio influenced nicotine delivery and user puff topography. ECIG-induced suppression of nicotine abstinence effects did not differ by PG:VG ratio but participants reported lower overall product satisfaction when using the 100 PG liquid. Regulatory efforts attempting to control the acute effects of ECIG use such as nicotine delivery should consider liquid PG:VG ratio along with other device and liquid factors known to influence these outcomes.

FUNDING: Federal

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## PA18-3

### 'REAL-WORLD' COMPENSATORY BEHAVIOR WITH LOW NICOTINE CONCENTRATION E-LIQUID: SUBJECTIVE EFFECTS AND NICOTINE, ACROLEIN, AND FORMALDEHYDE EXPOSURE

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SIGNIFICANCE: Use of lower nicotine strength e-liquid may not offer reduced health risk if compensatory behaviour occurs. This study aimed to document compensatory behaviour associated with using low vs high strength nicotine e-liquid in real-world settings and to explore associated subjective effects and nicotine and carbonyl exposure. METHODS: 20 experienced e-cigarette users vaped *ad libitum* using an eVic Supreme™ with a Nautilus tank over 4 weeks under conditions: i) low nicotine (6mg/mL), fixed power; ii) low nicotine, adjustable power; iii) high nicotine (18mg/mL), fixed power; iv) high nicotine, adjustable power (conditions counterbalanced). Puffing patterns (daily puff number, puff duration, inter-puff interval [IPI]), changes to power (where permitted), mL of e-liquid consumed, and subjective effects were measured in each condition. Nicotine intake was measured via salivary cotinine. 3-hydroxypropylmercapturic acid (3-HPMA), a metabolite of the toxicant acrolein, and formate, a metabolite of the carcinogen formaldehyde, were measured in urine. Nicotine and carbonyl levels were also measured in aerosol generated using a smoking machine operated to replicate the puffing behaviours of each participant in each condition. RESULTS: Participants increased their daily puff number and puff duration and consumed more liquid in the low versus high nicotine condition; effects were more pronounced when power was fixed. When changes to power were permitted, power was increased to a greater extent in the low nicotine condition. Despite this compensatory behaviour, nicotine exposure (measured both in salivary cotinine and aerosol) remained higher in the high nicotine condition. Urge to vape and nicotine withdrawal symptoms were higher in the low nicotine condition and positive subjective effects were lowest under 6mg/mL fixed. Whilst acrolein levels did not differ, formaldehyde exposure (measured via both biomarkers and aerosols) was higher in the low nicotine condition. CONCLUSION: These findings provide evidence of compensatory behaviour with lower nicotine concentration e-liquid resulting in reduced positive subjective effects and an increase in formaldehyde exposure.

FUNDING: Nonprofit grant funding entity

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## PA18-4

### BEHAVIORAL ECONOMIC DEMAND FOR ELECTRONIC CIGARETTES: EFFECTS OF FLAVOR AND NICOTINE CONCENTRATION

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SIGNIFICANCE: Electronic cigarette liquid (e-liquid) is currently available for purchase in the United States in a large variety of flavors and nicotine concentrations.

The US Food and Drug Administration has the ability to regulate the availability of e-liquid and has considered doing so. However, little is known about how regulations restricting e-liquid varieties will affect purchasing decisions and consumption by users. METHODS: Current smokers attended four to eight laboratory sessions after 12 hours of abstinence from nicotine products. In each session, participants were allowed to smoke a set amount of either an e-cigarette containing a double-blinded e-liquid flavor (menthol or tobacco) and nicotine concentration (0, 8, or 36 mg/mL) or one of two flavors of conventional cigarettes (menthol or tobacco). Cigarette evaluations and withdrawal ratings were collected throughout the one-hour sessions, and behavioral economic demand for the cigarette just consumed was collected shortly after the projected peak nicotine blood concentration. RESULTS: When plotted as a function of preferred versus non-preferred flavor, a large and statistically significant increase in demand emerged for the preferred e-cigarette flavor and preferred conventional cigarette flavor. This flavor preference effect was evident across nicotine concentrations and cigarette type for demand intensity (consumption unrestricted by price;  $ps < .05$ ), while demand elasticity (sensitivity to price) was unaffected by flavor preference. Within e-cigarettes, purchasing was also associated with blood nicotine levels across the blinded nicotine concentration conditions. CONCLUSIONS: Flavor of electronic cigarette liquid and absorbed nicotine both have effects on behavioral economic demand for electronic cigarettes. This research suggests that regulations to restrict one or both of these e-liquid characteristics could lead to a large reduction in e-liquid purchasing and consumption.

FUNDING: Federal

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## PA18-5

### IMPACT OF E-LIQUID FLAVORS ON VAPING BEHAVIOR

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SIGNIFICANCE: Flavorants, through different sensory effects, may influence vaping behavior and nicotine exposure. This pilot study describes the impact of e-liquid flavors on experienced users' vaping behavior. METHODS: 11 males and 3 females participated in a 3-day inpatient crossover study with strawberry, tobacco, and their usual e-liquid. Nicotine levels were nominally 18 mg/ml in the strawberry and tobacco e-liquids and ranged between 3-18 mg/ml in the usual brands. On each day, participants had access to the study e-cigarette (KangerTech mini Pro-Tank 3, 1.5 Ohms, 3.7 V) and the assigned e-liquid during a 90-minute videotaped *ad libitum* session. RESULTS: Participants took significantly more puffs with their usual e-liquid (104.2±17.8) (mean±SEM) compared to strawberry (74.2±10.3) and tobacco (71.1±14.5). Puff duration was longer and interpuff interval was shorter with their usual e-liquid (4.4±0.4 s and 72.0±11.8 s) compared to strawberry (3.1±0.3 s and 92.5±13.7 s) and tobacco (2.6±0.3 s and 109.1±17.4 s). The amount of e-liquid consumed was significantly higher for the usual e-liquid compared to strawberry and tobacco e-liquids while the amount of nicotine inhaled was significantly lower for the usual compared to strawberry e-liquids; the amount of e-liquid consumed and nicotine inhaled tended to be higher for the strawberry compared to tobacco e-liquid. Maximum plasma nicotine concentration ( $C_{max}$ ) was nonsignificantly lower with usual (11.5±1.7 ng/mL) and tobacco (11.5±2.3) e-liquids compared to the strawberry e-liquid (17.1±3.1 ng/mL). Overall, vaping behavior was not significantly correlated with systemic nicotine exposure. However, when analyzed by e-liquid, plasma nicotine  $C_{max}$  was significantly correlated with number of puffs ( $r=0.66$ ) and puff duration ( $r=0.53$ ) only for the tobacco e-liquid. CONCLUSION: E-liquid flavors as well as e-liquid nicotine content influence puffing behavior, which may contribute to differential systemic nicotine exposure and addictiveness of e-cigarettes. This study supports the regulation of e-liquid flavors to minimize e-cigarette abuse liability.

FUNDING: Federal

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## PODIUM PRESENTATION 5

## PAPER SESSION 19: ADDICTION/ABUSE LIABILITY OF TOBACCO PRODUCTS

### PA19-1

#### MENTHOL CIGARETTES ARE ASSOCIATED WITH NICOTINE DEPENDENCE RISK AMONG US ADOLESCENTS

Samantha Cwalina\*, Jennifer Unger, Mary Ann Pentz, University of Southern California Keck School of Medicine, CA, USA

**SIGNIFICANCE:** Menthol cigarettes appeal to adolescent smokers because they mask the harsh taste and sensation of tobacco smoke, potentially exposing menthol smokers to more nicotine than non-menthol smokers. Because adolescents are vulnerable to developing nicotine dependence, it is critical to prevent premature experimentation with menthol cigarettes. Several cities in the United States (U.S.) and the European Union have recently restricted menthol cigarette availability to prevent adolescent exposure; however, it is not yet clear whether these restrictions will effectively prevent smoking uptake and/or nicotine dependence. Understanding factors that influence dependence risk will facilitate future evaluations of existing restrictions and inform efficient tobacco control policies. **METHODS:** Using weighted data from Wave 2 of the Population Assessment of Tobacco and Health survey on U.S. adolescent past-month cigarette smokers ( $n=368$ ), linear regressions compared self-reported nicotine dependence and frequency of recent cigarette use between menthol ( $n=183$ ) and non-menthol ( $n=185$ ) users. Ratings of nicotine dependence were collected with responses to eight survey questions from existing dependence scales (i.e., FTND, WISDM, HONC; Cronbach's  $\alpha=0.82$ ). Frequency of recent use was the number of days within the past month that respondents smoked cigarettes (range=1-30). Menthol users were defined as those who reported "menthol/mint" flavored cigarette use within the past thirty days. **RESULTS:** Controlling for age, gender, and race, menthol users had higher average nicotine dependence scores ( $p<0.0001$ ) and smoked an average of 3.02 more days within the past thirty days ( $p<0.05$ ) compared to non-menthol users. As predicted, frequency of recent use was positively correlated with nicotine dependence ( $p<0.0001$ ). **CONCLUSIONS:** Adolescent menthol users appear to be at higher risk for developing nicotine dependence than their peers who smoke non-menthols, and this may be explained by an associated propensity to use cigarettes more frequently. These findings support tobacco control policies that restrict the availability of menthol cigarettes to youth.

**FUNDING:** Federal

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### PA19-2

#### COMPARISON OF CONVENTIONAL AND ELECTRONIC CIGARETTE REWARD VALUE MEASURED DURING A CUE- REACTIVITY TASK: AN EXTENSION OF THE CHOICE-BEHAVIOR- UNDER-CUED-CONDITIONS (CBUCC) PROCEDURE

Ashley Dowd\*, Stephen Tiffany, University at Buffalo, The State University of New York, NY, USA

**SIGNIFICANCE:** Up to 24% of e-cigarette users use both tobacco and e-cigarettes (dual users). Dual users provide an opportunity to assess key motivational processes supporting e-cigarette use, such as the reward value of e-cigarettes relative to tobacco cigarettes. The primary aim of this study was to use the Choice-Behavior-Under-Cued-Conditions (CBUCC) procedure to examine cue-specific reactions to e-cigarettes and tobacco cigarettes with a primary focus on evaluating the relative reward value of both forms of cigarettes. **METHODS:** Fifty-four users of both tobacco and e-cigarettes were presented with a lit tobacco cigarette, their own e-cigarette, or a cup of water across multiple trials. On each trial, participants rated their craving for both tobacco and e-cigarettes and indicated the amount of money they would spend to access the cue. The amount spent directly determined the probability that the cue could be accessed on each trial. Key measures included e-cigarette and tobacco cigarette craving, amount of money spent to access the cue, latency to access the cue, and amount of cue consumption (puff duration or

water consumption) on trials when the cue was available. **RESULTS:** Participants reported significantly higher craving and spent significantly more money on e-cigarette and tobacco cigarette trials than on water trials. Overall levels of craving were significantly higher for tobacco cigarettes than for e-cigarettes, and participants spent significantly more on tobacco than on e-cigarette trials. Additionally, craving for e-cigarettes was significantly lower in the presence of a tobacco cigarette than on water trials, suggesting that tobacco cigarette cues suppressed e-cigarette craving. **CONCLUSIONS:** This is the first study to demonstrate cue-specific reactivity to e-cigarettes and to examine the reward value of e-cigarettes relative to tobacco cigarettes. Overall, the data suggest that e-cigarettes are associated with lower overall craving and are valued less than tobacco cigarettes in a sample of dual users. The results provide strong support for the utility of CBUCC for examining a wide range of motivational processes supporting e-cigarette use.

**FUNDING:** None

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### PA19-3

#### POLYTOBACCO USE AND NICOTINE DEPENDENCE SYMPTOMS AMONG US ADULTS, 2012-2014

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**SIGNIFICANCE:** Due to the rapidly changing tobacco product landscape, the pattern of polytobacco use ( $\geq 2$  tobacco products) is likely changing. Little is known about the recent pattern of polytobacco use in the U.S and the relationship to nicotine dependence. This study examined the pattern and correlates of polytobacco use among U.S. adults, and the association between polytobacco use and nicotine dependence symptoms. **METHODS:** Using data from the 2012/13 and 2013/14 National Adult Tobacco Survey ( $N=135,425$  adults), we analyzed the prevalence and correlates of polytobacco use among current users of cigarettes, cigars, pipes, hookah, e-cigarettes, and smokeless tobacco (ST). The associations between polytobacco use and two nicotine dependence symptoms — craving and withdrawal symptoms — were analyzed among current users of cigarettes, cigars, e-cigarettes, and ST. **RESULTS:** During 2012-2014, 25.1% of adults in the U.S. were current users of any tobacco product. Among them, 32.5% were polytobacco users with the largest poly-use category being dual use of cigarettes and e-cigarettes (30.2%), followed by dual use of cigarettes and cigars (16.3%). Poly-use prevalence was 38.7% among current cigarette smokers, and 52.4%, 59.2%, 69.3%, 80.9%, and 86.2% among current ST, hookah, cigar, e-cigarette, and pipe users, respectively. Multivariate logistic regression results show that current cigarette smokers who concurrently used e-cigarettes only or e-cigarettes plus other tobacco products were more likely to report both craving and withdrawal symptoms than sole cigarette smokers. Among current e-cigarette users, those who concurrently used cigarettes were more likely to report craving and withdrawal symptoms than sole e-cigarette users; similar results were found among current cigar smokers and current ST users. **CONCLUSIONS:** Between 52% and 86% of noncigarette tobacco users and more than one-third of cigarette smokers engaged in polytobacco use. Poly-users showed evidence of greater nicotine dependence symptoms than sole-product tobacco users.

**FUNDING:** Federal

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## PA19-4

### MEASURING NICOTINE DEPENDENCE AMONG ADOLESCENT AND YOUNG ADULT CIGARILLO AND MULTIPLE TOBACCO PRODUCT USERS

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**OBJECTIVE:** Nicotine dependence (ND) is important for understanding smoking behavior and cessation, but existing measures of ND have been developed and validated for cigarette smokers only. We evaluate the psychometric properties of new and adapted items designed to assess ND among young adults who smoke cigarillos and multiple tobacco products. **METHODS:** Items were drawn from two sources. First, items from the PROMIS Nicotine Dependence Item Bank were adapted to be product neutral. Second, new items were developed based on findings from a qualitative study that assessed patterns of cigarillo smoking and experiences of smoking and addiction among 60 young adults and adolescents. A total of 42 ND items (5-point response format) were included in a web-based survey. Eligible were 14 to 28 year olds who smoked a minimum of 2 cigarillos per week. Item analysis included item factor analysis, item response theory analyses and reliability. **RESULTS:** Among the 334 participants, the mean age was 22 (std dev 3.0), 50% were male, 32% African American, 46% Caucasian and 22% other race. The median number of cigarillos smoked per week was 20; 63% of participants also smoked cigarettes. Thirty-eight items met the fit statistics criteria (infit and outfit between 0.5 and 1.5 and an item total correlation > 0.25) and are highly reliable 0.95. Eight of the 10 new items met the fit criteria. Total ND scores (mean=96.3, std dev=37.6) spanned the full range of scores (38-190) and were approximately normally distributed. The ND score is positively associated with the amount of cigarillo and cigarette use ( $p < .001$ ). **CONCLUSIONS:** This adapted measure of ND is psychometrically sound with items that are product neutral such that it is a suitable measure for assessing ND across tobacco products.

**FUNDING:** Federal

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## PA19-5

### SMOKERS AND DUAL USERS: DEPENDENCE AND CESSATION MOTIVATION

Megan Piper<sup>\*1</sup>, Timothy Baker<sup>1</sup>, Michael Fiore<sup>1</sup>, Stevens Smith<sup>1</sup>, Kate Kobinsky<sup>1</sup>, Neal Benowitz<sup>2</sup>, Douglas Jorenby<sup>1</sup>, <sup>1</sup>University of Wisconsin - Madison, WI, USA, <sup>2</sup>University of California, San Francisco, CA, USA

Electronic cigarettes (ECs) are widely used, often along with combustible cigarettes. The effects of such dual use are unknown, in part, because it is unclear how EC use affects concurrent combustible cigarette use and effects. Given the rapid increase in EC use, it is important to have a clear understanding of the risks and benefits posed by this novel nicotine delivery system. We recruited 166 smokers (5 cigarettes/day for 6 months and no EC use in 3 months) and 256 dual users (daily smoker for 3 months and EC use at least once/week for the past month) from the Madison and Milwaukee, WI area via TV ads, and social media advertisements to participate in a 2-year longitudinal observational study. Participants (47% women) completed baseline assessments of demographics and dependence and provided a breath sample for carbon monoxide (CO) assay and a urine sample for cotinine and NNAL (a biomarker of carcinogen exposure) assay. Compared to smokers, dual users were significantly younger (39.0 vs. 42.6 years old), more likely to be white (71.2 vs. 53.0%), more likely to live with a spouse/partner who vapes (18.9 vs. 1.2%), and more likely to have more than a high school education (65.7 vs. 49.7%). With respect to dependence, compared to smokers, dual users smoked fewer cigarettes/day (12.5 vs. 15.8 cigarettes), had lower FTND scores (4.2 vs. 4.8), were less likely to smoke within 30 minutes of waking (67.3% vs. 79.4%), and were somewhat more motivated to quit smoking (3.7 vs. 3.3). There were no differences in CO or cotinine levels. We will also examine group differences in NNAL levels. Most smokers and dual users had no plans to quit within the next year (78.9% and 73.7%, respectively) and 91% of dual users planned to continue using ECs for at least the next year. These findings suggest that in this community sample dual users are supplementing their smoking with EC use and while they might be smoking fewer cigarettes per day and delaying their first cigarette, it does not appear to influence their carbon monoxide nor their plans to quit smoking.

**FUNDING:** Federal

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## PA19-6

### HOW DO ELECTRONIC CIGARETTES AFFECT CRAVINGS TO SMOKE OR VAPE? PARSING THE INFLUENCES OF NICOTINE AND EXPECTANCIES USING THE BALANCED-PLACEBO DESIGN

Amanda Palmer<sup>\*1</sup>, Thomas Brandon<sup>2</sup>, <sup>1</sup>University of South Florida, FL, USA, <sup>2</sup>Moffitt Cancer Center, FL, USA

**SIGNIFICANCE:** E-cigarettes are becoming an increasingly popular option as a smoking cessation method, despite limited empirical support. In fact, the first two clinical trials testing this showed smoking reductions similar to that of approved medications (e.g. patch), with no observed differences between nicotine and non-nicotine devices (Bullen et al., 2013; Caponnetto et al, 2013). This suggests that non-nicotine factors may be influencing vaping behaviors, including transition from cigarettes. The present study investigated one such factor, cognitive outcome expectancies, in its separate and combined effects with nicotine delivery. **METHODS:** Utilizing a balanced-placebo design, drug dosage (contains nicotine or does not contain nicotine) was crossed with instructional set (told nicotine or told non-nicotine) during an ad-lib e-cigarette use session with 128 current e-cigarette users (52 identifying as current smokers, or "dual users"). **RESULTS:** It was hypothesized that reduction in craving for both cigarettes and e-cigarettes following e-cigarette administration would be driven primarily by the instructional set manipulation, reflecting the influence of outcome expectancies. **RESULTS:** supported this hypothesis: Among dual users, a main effect of instructional set emerged on cravings to smoke in that individuals told that they received nicotine reported a greater reduction in craving ( $p < .05$ ). **RESULTS:** with the full sample revealed an interaction between drug dose and instructional set on cravings for e-cigarettes, with the greatest reduction among participants who were told and received nicotine ( $p < .05$ ). Other outcome variables were assessed and interaction effects were found. **CONCLUSIONS:** These findings suggest that cognitive expectancies contribute to reductions in nicotine cravings observed following e-cigarette use, perhaps beyond the effects of nicotine itself. These observations can inform the potential of e-cigarettes as smoking cessation aids.

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## PAPER SESSION 20: TOBACCO USE AMONG LGBT

### PA20-1

#### SINGLE AND MULTI-PRODUCT TOBACCO USE AMONG YOUNG ADULT LGBT NON-DAILY CIGARETTE SMOKERS

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**SIGNIFICANCE:** Trends in the general adult population demonstrate that cigarettes are often used in combination with other tobacco products (OTPs). While LGBT persons are known to be at higher risk for smoking cigarettes, less is known about OTP use and poly use within this population. This study explores patterns of multi-product tobacco use among a diverse sample of non-daily LGBT young adult cigarette smokers. **METHODS:** In 2015, 1,061 LGBT 18-24 year olds were recruited via social media ads, an online panel, and at LGBT social venues to complete an online survey as part of the development of a tobacco education campaign targeting LGBT non-daily young adult cigarette smokers. Inclusion criteria included smoking cigarettes on 1-29 of the past 30 days and LGBT self-identification. Eligible participants were asked about past 30-day use of cigars/cigarillos, e-cigarettes, hookah, and smokeless tobacco. Multi-product cigarette smokers were defined as those who used cigarettes on 1-29 days of the past 30 days plus one or more OTPs in the past 30 days. **RESULTS:** Participants had a mean age of 21 and reported smoking cigarettes on an average of 9 of the past 30 days. Among LGBT non-daily cigarette smokers, 39% reported using only cigarettes. Thus, the majority of participants (61%) reported using cigarettes plus at least one OTP in the past 30 days. Most multi-product users reported using cigarettes & one OTP (62%), followed by cigarettes & two OTPs (27%). Use of cigarettes plus three or four products (11% and <1%, respectively) was less common. Among multi-product cigarette smokers, the most common product combinations were cigarettes & e-cigarettes (32%), cigarettes & cigars/cigarillos (19%), and cigarettes, cigars/cigarillos & hookah (11%). **CONCLUSIONS:** The majority of LGBT non-daily cigarette smokers in this sample also used other forms of tobacco. Multi-product use may perpetuate social norms about tobacco product use by enhancing perceptions about acceptability and may undermine cessation efforts. These findings underscore the importance of targeted public health education efforts that take into account usage of multiple product types.

**FUNDING:** Federal

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### PA20-2

#### TOBACCO USE AMONG LGBTQ INDIVIDUALS: 2016 SURVEY AND FOCUS GROUP RESULTS

Aida Giachello<sup>\*1</sup>, Thanh-Huyen Vu<sup>1</sup>, Thomas Payne<sup>3</sup>, Rose Robertson<sup>2</sup>, Allison Groom<sup>2</sup>, Joy Hart<sup>4</sup>, Kandi Walker<sup>4</sup>, Robyn Landry<sup>2</sup>, Anshula Kesh<sup>2</sup>, <sup>1</sup>Northwestern University, IL, USA, <sup>2</sup>American Heart Association, TX, USA, <sup>3</sup>University of Mississippi Medical Center, MS, USA, <sup>4</sup>University of Louisville, KY, USA

**BACKGROUND:** High rates of tobacco use, particularly cigarette smoking, are reported among lesbian, gay, bisexual, transgender and queer (LGBTQ) individuals. However, in-depth studies of perceptions, knowledge, and behaviors, as well as risk and protective factors associated with tobacco use, are limited. **METHODS:** Focus groups (n=27) and surveys (n=143) were conducted among Hispanics/ Latinos, Whites, and African Americans aged 18-74 in LGBTQ communities in Chicago and New York City. Separate focus groups were conducted with LGBTQ who were either current smokers or formal/non-smokers. They all responded to tobacco use questions. Data were analyzed using SAS, v.9.4 and ATLAS.TI v7. **RESULTS:** Current smokers were more likely to be older (26+ years), African Americans, living with children, and with annual household income of \$≤20,000; the mean age was 40 years. Among current/formal smokers, 62% smoked 100+ cigarettes during their lifetime; Among smokers, 52% smoked everyday (64%) or some days (36%); Among all smokers, 27% reported daily, weekly or occasional use of e-cigarettes, e-hookah and/or other ENDS. Further, 72% began smoking between 9-17 years of age. Focus group discussions revealed that using tobacco is a way of "fitting in," "expressing yourself," and relieving stress. Heavy marketing by the tobacco industry and stress associated with social discrimination, family and friend re-

jections (including others within the LGBTQ community), and, limited income were also factors that participants associated with tobacco use. These findings were particularly true among gay/bisexual men or women. **CONCLUSIONS:** Tobacco use was high among these LGBTQ participants. Most participants began smoking prior to turning 17, and more than one-fourth use ENDS. Social stressors (family, community conflicts and discrimination) due to sexual orientation combined with heavy marketing of the tobacco industry in the gay communities, and appear to be a strong contributing factor to smoking behavior and the use of ENDS.

**FUNDING:** Federal

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### PA20-3

#### TOBACCO-FREE POLICIES AND TOBACCO CESSATION SYSTEMS AT LESBIAN, GAY, BISEXUAL, AND TRANSGENDER SERVING COMMUNITY HEALTH CENTERS

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**SIGNIFICANCE:** Lesbian, gay, bisexual, and transgender (LGBT) populations have higher rates of tobacco use than the general population. LGBT-serving community health centers are an important source of care, but no research has assessed their implementation of systems-level tobacco dependence treatment recommendations. **METHODS:** Using systematic searching, directories, and expert review, we identified 16 LGBT-serving health centers that provide primary care. We conducted phone-based, semi-structured interviews with medical directors or clinic managers (n=11) about implementation of the Clinical Practice Guideline, Treating Tobacco Use and Dependence: 2008 Update. Interviews from September 2016 to March 2017 solicited information about implementation of the systems-level recommendations in the Guideline, tobacco-free policies, and barriers to addressing tobacco use. Two authors confirmed saturation. One author conducted deductive and inductive thematic coding with NVivo 11. Themes were discussed and confirmed with a second author. **RESULTS:** We identified nine themes, including clear evidence of systems-level procedures being in place for asking, advising, and assessing tobacco use. Interviewees viewed tobacco use as important given existing disparities. However, the themes that emerged suggested room for improvement in four areas: (1) Education for staff on tobacco dependence treatment was ad hoc and not formalized; (2) materials and resources available in the clinic varied widely and changed when a staff champion left; (3) designated tobacco dependence coordination is not being assigned to a point person; and, (4) assessment of tobacco use as a vital sign is not consistent—some centers meet meaningful use quality metrics (e.g., once or more in past 24 months) instead of the Guideline recommendation (every visit). **CONCLUSIONS:** LGBT-serving community health centers viewed tobacco dependence as an important issue and had in place systems for promoting quitting. However, there was also room for improvement in implementation of Guideline recommended systems. Targeted outreach to LGBT-serving health centers is warranted to improve standardization of implementation.

**FUNDING:** None

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### PA20-4

#### TOBACCO POLICIES AT LESBIAN, GAY, BISEXUAL, AND TRANSGENDER PRIDE FESTIVALS: 100 MOST POPULOUS CITIES, USA, 2017

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**SIGNIFICANCE:** Substantial disparities in smoking exist for lesbian, gay, bisexual, and transgender (LGBT) populations. Causes of these disparities include permissive norms toward tobacco in community spaces. One such community space that can promote norms is the pride parade and festival. Pride events have played an important role in LGBT efforts to gain recognition and acceptance, and in 2016 there were over 900 such events globally. Yet, no study has examined coverage of smoke and tobacco-free policies at pride festivals in the USA. **METHODS:** We identified 104 pride events in the 100 most populous cities in the U.S. using sys-

tematic searching and directories of pride festivals. Of these 101 showed web updates in the last year and were included in the study. Using a quantitative content analysis approach, we coded each pride event's web pages for smoke-free policies and tobacco-free policies. If necessary, we contacted pride staff for information. Two independent coders established inter-rater reliability following a written coding protocol. Data were collected from February to April 2017. RESULTS: Of the 101 identified active pride events, only 8 pride events had a smoke-free grounds policy, and 3 pride events had a tobacco-free grounds policy. Smoke- and tobacco-free park policies were responsible for many of these protections. CONCLUSIONS: Festivalgoers at pride events across the country are rarely protected from involuntary smoking. The few protections from involuntary smoking are largely due to municipal smoke- or tobacco-free park ordinances. Engagement with pride event organizers is warranted to increase coverage of policies that promote health. Municipal tobacco-free park ordinances may have unanticipated benefits for promoting tobacco-free policies at pride events.

FUNDING: None

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## PA20-5

### SOCIAL OR SOLO? SOCIAL INFLUENCES AND NON-DAILY SMOKING IN LGBT YOUNG ADULTS

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SIGNIFICANCE: Research shows that LGBT young adult culture is heavily embedded in the nightlife scene (Leibel et al., 2011), thereby impacting identity formation and behavior. While LGBT young adults have disproportionately high tobacco use rates (Corliss et al., 2013), less is known about occasional smoking and social factors that impact use. The current study explores LGBT cultural engagement, friend smoking, and frequency of past month cigarette smoking among a sample of LGBT non-daily smokers. METHODS: 1,061 LGBT 18-24 year olds were recruited in person and online to complete a survey informing a LGBT tobacco education campaign. For inclusion, participants reported smoking cigarettes on 1-29 of the past 30 days, self-identified as LGBT, and had a positive response to 1 of 3 LGBT cultural engagement items (LGBT nightlife, social media influencers, websites). Days smoked were recoded into 1-5, 6-19, and 20-29 days. Cultural engagement and close friend smoking were coded dichotomously. Chi-squared tests included days smoked and 1) LGBT cultural engagement and 2) close friend smoking. RESULTS: The majority of participants smoked 1-5 days (54%) and participated in LGBT nightlife (80%) in the past 30 days. LGBT website visits (80%) and following LGBT influencers (95%) were also high. Those who participated in LGBT nightlife and those with at least 1 close friend who smokes, were more likely to report smoking 20-29 of the past 30 days than those who did not report nightlife participation or friend smoking ( $p < .05$ ). There were no significant differences in smoking, on <20 days for either item, or for any level of smoking for social media and website visits. CONCLUSIONS: LGBT young adult non-daily smokers who participate in LGBT nightlife or have close friends who smoke cigarettes have increased patterns of use approaching daily use. To address smoking disparities in the LGBT community, attention should be paid to occasional smoking and the social environments that likely perpetuate use. Practitioners may wish to address normative beliefs among LGBT young adults, particularly within the nightlife setting. Further research on non-daily smoking is needed.

FUNDING: Federal

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## PAPER SESSION 21: GLOBAL TOBACCO CONTROL POLICY INTERVENTIONS

### PA21-1

#### EFFECTS OF TOBACCO 21 ON UNDERAGE SALES VIOLATION IN CALIFORNIA: 2015-2017

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SIGNIFICANCE: Retailer compliance inspection is an important strategy to reduce youth access to tobacco products. Tobacco 21 is gaining momentum across the national and California became the second state to raise age of tobacco purchase from 18 to 21 on June 9, 2016. Little is known about how this policy change would impact the tobacco retail compliance for underage sales. METHODS: We collected inspection data on tobacco retailers in 2015, 2016 and 2017 from the Food and Drug Administration (FDA) compliance check database. We constructed a quasi-experiment with control period from June 9, 2015 to June 8, 2016 and test period from June 9, 2016 to June 8, 2017. Difference-in-difference approach was used to examine the changes in Retailer violation rate for minors (RVRm) in California and in other states of U.S. before and after the California implementation of Tobacco 21 on June 9, 2016. Multi-level logistic regression model was performed where retail compliance at each inspection (violation vs. no violation) served as the dependent variable, time period and Tobacco 21 (CA vs. other states that had not implemented statewide Tobacco 21 by June 9, 2016) served as the predictors, and state tobacco control policies, state youth smoking rates, and census tract socio-economic status (SES) served as other covariates. RESULTS: A total of 264,224 compliance checks involving minors conducted by the FDA from June 8, 2015 to June 8, 2017 were analyzed. The RVRm decreased from 6.3% to 4.2% in California after Tobacco 21 while it changed from 13.79 to 13.44% in other states of U.S. In the multivariable analysis, the significant interaction between time period and Tobacco 21 ( $p = 0.0007$ ) suggests that the implementation of Tobacco 21 in California was associated with a 34% lower odds of RVRm (AOR=0.66, CI [0.52-0.84]) as compared with the change in RVRm in other states of U.S. CONCLUSIONS: Statewide implementation of Tobacco 21 was associated a lower tobacco retail violation rate of sale to minors, and thus might have stronger effects to restrict youth access to tobacco products. This study supports further promote Tobacco 21 to more states.

FUNDING: None

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### PA21-2

#### COMPLIANCE OF HEALTH WARNING LABELS ON SMOKELESS TOBACCO PRODUCTS IN INDIA

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India is the 2nd largest producer and 3rd largest consumer of tobacco in the world. The burden of tobacco use is especially high due to consumption of smokeless tobacco (SLT). One in five Indian adults (21%) uses SLT, more than double the proportion of Indians who smoke tobacco only (9%). Also unique to the Indian population is that the gender gap for SLT (24% of males, 17% of females) is narrower compared to smoked tobacco (15% of males, 1% of females). Each year SLT causes nearly 185,000 deaths in India. To reduce SLT use, India has a strong packaging and labeling policy in place for SLT products. As per the law, the health warning label (HWL) must cover 85% on both sides of the SLT packaging, be located at the top edge of the pack, contain HWL elements (full color graphic and text in a contrasting background color), and have the warning message in the same language as used on the pack. This study examines the level of compliance of HWLs on SLT products with the Indian law. In 2016, a systematic protocol was used to collect unique SLT packages from 4 cities in India: Mumbai, Delhi, Chennai and Bengaluru. To assess compliance, we used 4 indicator variables: warning size, location, label elements, and language. Packs were double coded and the analysis was done using STATA. 54 unique SLT packs were purchased. Compliance with India's HWL requirements was extremely low. Only 1/54 packs (2%) complied with all four indicators. Though 67% (36/54) of packs had the HWL in the correct location, only 1/36 packs met the coverage requirement of 85%. We observed huge variation in how the HWLs appeared on packs: split HWL, multiple HWLs on one side, and HWL with a graphic but no text warning. There were also issues with the



printing quality and magnification of the graphics. Though most of the packs had a full color graphic, the images were either blurry, faded or had heavy tint, making the HWL appear unclear. Findings from the study suggest that SLT manufacturers are not complying with HWL laws for SLT. Although the Indian law aligns well with the WHO-FCTC guidelines, this deficit in implementation diminishes the potential health benefits of warning label on tobacco users.

FUNDING: Nonprofit grant funding entity

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## PA21-3 COMPLIANCE WITH THE CITY OF CHICAGO'S PARTIAL MENTHOL CIGARETTE SALES BAN IN TOBACCO RETAIL STORES WITHIN 500 FEET OF HIGH SCHOOLS

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Menthol cigarettes are associated with initiation, progression to established smoking, and decreased likelihood of cessation, particularly for low income and non-White populations. Local ordinances to restrict menthol cigarette sales are an emergent tobacco control policy option. In February 2017, Chicago was the first major US city to implement a ban on menthol cigarette sales in stores within 500 feet of high schools. The current study assessed compliance with Chicago's partial ban in June 2017. Using stratified sampling, we randomly selected 100 of the 154 stores within 500 feet of a high school. 89 stores were included in the analysis, excluding stores that were out of business or did not sell tobacco prior to the ban. Compliance was determined by whether a menthol cigarette pack was purchased. Multivariate logistic regression modeled compliance by store type, menthol cigarette ads, geographic region, and neighborhood factors (poverty level, proportion of non-White residents). We also conducted a content analysis of clerk response to the request for menthol cigarettes. Compliance rate was 56% (n=50). Stores with menthol cigarette ads (OR=0.22, 95% CI:0.06-0.77) and stores located in the North (OR=0.26, 95% CI:0.07-0.91) and West (OR=0.20, 95% CI:0.06-0.68) region of the city were less likely to be compliant. Store type and neighborhood factors were not associated. Most non-compliant stores sold menthol cigarettes without hesitation and packs were highly visible. In compliant stores, most clerks expressed limited knowledge of the ban and some referred data collectors to another store to purchase a pack. Menthol cigarette ads were present in several compliant stores. Compliance with Chicago's partial ban was moderate. Compliance did not vary significantly by neighborhood characteristics, which suggests stores follow the partial ban similarly across communities of different racial and income composition. Optimizing local resources to target enforcement efforts in certain regions of the city could improve compliance. Further, an ordinance that also restricts ads as well as sales could enhance potential ban impact by reducing exposure to product and promotions.

FUNDING: Academic Institution; Federal

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## PA21-4 EFFECT OF STATE MEDICAID COVERAGE OF TOBACCO DEPENDENCE TREATMENT ON SMOKING CESSATION AMONG ADULT MEDICAID BENEFICIARIES, UNITED STATES, 2008-2014

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SIGNIFICANCE: Cigarette smoking and smoking-related disease and death disproportionately affect low-income populations. Medicaid is the largest insurance provider for low-income persons in the United States. Traditional state Medicaid programs have increased coverage of smoking cessation treatments over the past decade, although coverage can vary widely across and within states, between the fee-for-service and managed care plans, and among different managed care plans. METHODS: Using individual-level data on low-income cigarette smokers from the 2009-2014 National Health Interview Survey (NHIS), we assessed the association between Medicaid coverage of smoking cessation treatments and past-year quitting (quitting smoking within the past year and not smoking for at

least 30 days prior to survey) among adults Medicaid beneficiaries. State-level data on Medicaid coverage of cessation treatments during 2008-2013 were obtained from the American Lung Association and merged with the NHIS data using restricted state identifiers provided by the National Center for Health Statistics. A difference-in-differences specification that used changes in Medicaid cessation coverage policies across states, and comparison to within-state counterfactual groups of low-income adults not covered by Medicaid, was employed. A four-level categorical factor for coverage was constructed at the state-year level: 1) no coverage; 2) medications-only coverage; 3) counseling-only coverage; and 4) combined medication and counseling coverage. RESULTS: Combined medication and counseling coverage in state Medicaid programs was associated with a 3.8 percentage point increase in quitting. Relative to the average past-year quit rate among Medicaid beneficiaries of 8.1%, this finding represents about 47% relative increase in past-year quit rates. Past-year quitting was also positively associated with Hispanic ethnicity, being married, or being more educated, and was negatively associated with younger age. CONCLUSION: This study provides evidence that combined coverage of both smoking cessation counseling and medication by state Medicaid programs could reduce cigarette smoking among Medicaid beneficiaries.

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## PA21-5 DIFFERENCES IN NORMS TOWARDS E-CIGARETTES ACROSS CANADA, THE US, ENGLAND AND AUSTRALIA: CROSS SECTIONAL FINDINGS FROM THE 2016 ITC FOUR COUNTRY SURVEY

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SIGNIFICANCE: This study compares descriptive and injunctive norms toward e-cigarettes (EC) across four countries, two with more restrictive policies regarding the retail sale and marketing of e-cigarettes (Australia [AU] and Canada [CA]) and two with less restrictive policies (United States [US] and England [EN]) at the time of surveying. METHODS: Data come from the ITC 4CE 2016 Survey, from CA (n=3,592), the US (n=2,638), EN (n=4,097) and AU (n=1,999). Primary outcomes were self-reported descriptive and injunctive norms. Descriptive norms included frequency of exposure to e-cigs in public, e-cig use amongst friend(s) and partner e-cig use. Injunctive norms included perceived societal approval of EC and perceived approval of e-cigs by people important to them. Each norm was analysed using binary or multinomial logistic regressions adjusting for demographics, smoking and vaping status. RESULTS: Compared to participants in CA (63%), those in EN (82%) [3.16 (2.81-3.54)] were more likely, while those in the US (57%) [0.80(0.71-0.90)] and in AU (32%) [0.21(0.18-0.25)] were less likely, to report frequent EC exposure in public in the last 30 days. Participants in EN (7%) [1.39(1.14-1.69)] and in the US (11%) [1.52(1.24-1.86)] were more likely to have a partner that uses EC than those in CA, with no difference found between CA (6%) and AU (7%). Compared to CA (22%), participants in the US (28%) [1.38(1.22-1.57)] and EN (29%) [1.53(1.37-1.71)] were more likely, while those in AU (16%) [0.82(0.70-0.97)] were less likely, to perceive society as approving of EC use. Participants in AU (37%) [2.08(1.79-2.41)], US (29%) [1.20(1.05-1.37)] and EN (30%) [1.20(1.05-1.37)] were all more likely to report perceiving those important to them as approving of EC than participants in CA (22%). CONCLUSION: Overall, countries with less restrictive EC regulations (US and EN), tend to have descriptive and injunctive norms that are more favourable towards EC than countries with more restrictive EC regulations (CA and AU).

FUNDING: Academic Institution

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## PA21-6

### COURT-ORDERED CORRECTIONS OF TOBACCO COMPANY RACKETEERING: AWARENESS, ATTITUDES, AND IMPLICATIONS FOR TOBACCO CONTROL POLICY

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**SIGNIFICANCE:** Internal tobacco industry documents show tobacco companies have heavily influenced public policy for more than 50 years. In 2006, a U.S. District Court ruled that Philip Morris, R.J. Reynolds and other tobacco companies had violated the Racketeer Influenced and Corrupt Organizations Act (RICO) and ordered the companies to publish corrective statements to help address their conspiracy to commit fraud. Though delayed by extensive legal appeals, the statements may soon appear in major media outlets and on cigarette package inserts. However, little is known as to how the statements and related court findings could affect attitudes towards policies or tobacco company influences in policymaking. **METHODS:** A cross-sectional survey of 2,010 U.S. adults was conducted in May 2017 to assess awareness of the corrective statements and court findings. Additionally, attitudes towards policies, tobacco company influences, and lawmakers' trust in tobacco companies were assessed. Half of the participants were exposed to the statements and findings before answering the attitude questions and half were exposed after. **RESULTS:** Only 23.1% of respondents reported they were aware that the companies had violated RICO and only 37.0% were aware of the court finding that the companies are likely to continue to commit fraud. Those exposed to the statements and findings prior to answering the attitude questions were significantly less likely to think lawmakers should trust tobacco companies as much as other companies ( $p < .001$ ) and less likely to think tobacco company lobbyists should be trusted to provide accurate information ( $p < .05$ ). Those exposed to the statements and findings first were also more in favor of requiring graphic warning labels ( $p < .05$ ), requiring tobacco retailers to post a quitline sign ( $p < .05$ ), and were marginally more in favor of raising the minimum age to buy cigarettes to 21 years ( $p = .07$ ) and prohibiting menthol in cigarettes ( $p = .07$ ). **CONCLUSIONS:** These results could inform remedial local, state, and national policy initiatives and aid in the development and evaluation of public education efforts to enhance and amplify the court-ordered statements.

**FUNDING:** State

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## PAPER SESSION 22: PRECLINICAL STUDIES TO INFORM TOBACCO USE TREATMENT

## PA22-1

### EFFECTS OF OPIOID BLOCKADE ON STRESS RESPONSE DURING ACUTE SMOKING WITHDRAWAL

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**SIGNIFICANCE:** Chronic smoking is associated with altered central stress regulatory mechanisms including the hypothalamic-pituitary-adrenal (HPA) axis and endogenous opioid system. Whether nicotine deprivation modifies this relationship is largely unknown. **METHODS:** Using a double-blind design, this study examined effects of acute smoking withdrawal and opioid blockade on stress response. Participants were scheduled for two laboratory sessions (placebo and 50 mg of naltrexone) with each lasted for about 4 hours. The two sessions took place 10 days apart. Smokers assigned to the withdrawal condition ( $n=62$ ) were required to refrain from any tobacco product for at least 24 hours before the lab session. Smokers assigned to the ad libitum condition ( $n=39$ ) were asked to smoke a cigarette immediately before stress tasks to minimize withdrawal. Forty-two non-smoking controls completed the same protocol except smoking procedure. Participants were tested individually. Blood and saliva samples were collected multiple times during the session for the measurement of the adrenocorticotrophic hormone (ACTH) and cortisol. All laboratory sessions started at approximately noon to control for diurnal changes in hormones. **RESULTS:** Multivariate regression analysis revealed a smoking  $\times$  drug  $\times$  time interaction in salivary cortisol, indicating a blunted stress response among abstinent (withdrawal) smokers in naltrexone session. A similar pattern of changes were found in plasma cortisol. ACTH showed a greater stress response in naltrexone session than placebo session as indicated by a drug  $\times$  time interaction. **CONCLUSIONS:** Results collectively show that effects of opioid blockade on cortisol stress response was reduced in smokers who were under acute nicotine withdrawal while the effects were enhanced in smokers who were not deprived from smoking. These findings suggest a role for nicotine in normalizing HPA and endogenous opioid regulatory functions associated with stress.

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## PA22-2

### INDIVIDUAL DIFFERENCES IN RESPONDING TO BUPROPION OR VARENICLINE IN A PRECLINICAL MODEL OF NICOTINE SELF-ADMINISTRATION VARY ACCORDING TO INDIVIDUAL DEMAND FOR NICOTINE REINFORCEMENT

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Bupropion and varenicline are the only two non-nicotine pharmacological agents in the first-line of approved therapies for smoking cessation. Even with the help of these treatments the cessation rates remain marginally low. The effects of these drugs are primarily investigated using grouped subject designs. Current understanding of the effects of these drugs on an individual level is virtually unexplored. To start filling this gap, we began investigating individual differences in responding to bupropion or varenicline using preclinical animal model of drug self-administration. First, we used behavioral economics approach to derive individual demand for nicotine (0.03 mg/kg/inf). In subsequent phases, we assessed whether response to bupropion or varenicline varied according to this individual demand. Following acquisition of the demand for nicotine, we tested the effects of bupropion (0, 10, 30 and 60 mg/kg) or varenicline (0, 0.1, 1.0 and 3.0 mg/kg) on responding for nicotine on a progressive ratio of reinforcement. In the next phase of experiment, responding for nicotine was extinguished and rats were subjected to 3 reinstatement tests with nicotine (0, 1.0 or 3.0 mg/kg) or non-contingent cue presentation as triggers; each series of reinstatement tests were separated by additional extinction sessions. Finally, because both varenicline and bupropion share stimulus effects with nicotine, rats were also subjected to reinstatement with bupropion or varenicline. We found that both bupropion and varenicline decreased responding for nicotine





and that this responding varied according to individual demand for nicotine. Specifically, rats with higher demand for nicotine showed greater decrease in responding for nicotine following pretreatment with bupropion or varenicline. Furthermore, rats with higher demand for nicotine showed higher magnitude of initial reinstatement triggered by nicotine and final reinstatement triggered by bupropion. Our results suggest that responding to pharmacological cessation treatments may differ from individual to individual and that understanding these effects may be critical for the development of more efficacious treatment strategies.

FUNDING: None

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## PA22-3

### IMPACT OF EARLY LIFE ADVERSITY ON THE STRESS BIOBEHAVIORAL RESPONSE DURING TOBACCO WITHDRAWAL

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**SIGNIFICANCE:** Accumulating evidence demonstrates an association between exposure to early life adversity (ELA) with subsequent risk for tobacco addiction and relapse. Stress and reward-related biobehavioral mechanisms may mediate this risk. We combined here these two areas of investigation to examine changes in psychobiological responses to stress in dependent smokers and nonsmoking control. A short-term abstinence protocol was included to assess how history of early adversity may exacerbate acute changes during withdrawal. **METHODS:** Participants attended a laboratory session during which they were exposed to acute stressful challenges. Smokers were randomly assigned to one of two conditions; 24 hr abstinence (66 smokers; 26 women) from smoking and all nicotine-containing products or smoking ad libitum (46 smokers; 23 women) prior to the lab session, and 44 non-smokers (23 women) were also included in this study. The laboratory session included a baseline (20 min), rest (40 min), stress (30 min), and recovery (80 min). Plasma and saliva samples for the measurement stress hormones, cardiovascular measures, and self-report mood measures were collected multiple times during the session. **RESULTS:** Multivariate regression analysis indicated that all groups showed stress-related increase in negative mood, cardiovascular measures, and stress hormones. Smokers in the withdrawal condition reported greater levels of negative mood than other two groups. Individuals with high ELA showed greater adrenocorticotrophic hormone (ACTH), but lower plasma and salivary cortisol levels than those with low ELA. High ELA group also had higher ACTH/cortisol ratio than low ELA. Cortisol differences were abolished during tobacco withdrawal. **CONCLUSIONS:** These findings indicate consistent effects of withdrawal on stress-related biobehavioral changes, dysregulation of the hormonal axis associated with the stress response in individual with history of high ELA, and that acute withdrawal disrupts the hormonal-ELA association reflecting differential impact of acute stress under withdrawal in this vulnerable group of smokers.

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## PA22-4

### EFFECT OF NICOTINE LOZENGE USE PRIOR TO SMOKING CUE PRESENTATION ON CRAVING AND WITHDRAWAL SYMPTOM SEVERITY

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**SIGNIFICANCE:** Nicotine lozenge is often used as needed with smokers told to use this product when craving or withdrawal symptoms occur. Due to the delay between when the lozenge is used and when substantial nicotine concentrations are reached, this delay may be too long to prevent relapse. The purpose of this study was to determine if nicotine lozenge use prior to smoking cue exposure can decrease craving and withdrawal symptom severity observed subsequent to cues. **METHODS:** Each subject completed three laboratory sessions randomly assessing three lozenge options in which they proceeded through 4 rooms in a virtual reality (VR) environment. The first and last rooms contained neutral cues and the middle two rooms contained smoking cues. At one session, a 4 mg nicotine lozenge was given after cue exposure (to approximate current use – i.e., after craving

and withdrawal symptoms occur). During the other two sessions either a nicotine lozenge or placebo lozenge was used 15 minutes prior to cue exposure. Craving and withdrawal symptoms were measured outside the VR environment via the Minnesota Nicotine Withdrawal Scale and the Questionnaire of Smoking Urges. Additionally, two questions embedded within each VR room asked about craving and the extent to which subjects thought about smoking. **RESULTS:** 56 subjects were randomized; 40 completed all 3 labs. Both placebo and active lozenge when given prior to cue presentation significantly lowered post cue measures of craving and withdrawal symptom intensity (all p-values <0.05). There were however no differences among the three groups in the magnitude of symptom severity increase that occurred between the first neutral room and the smoking cue rooms. **CONCLUSIONS:** Active or placebo lozenge used 15 minutes prior to smoking cues reduced craving and withdrawal symptom severity but did not attenuate cue-induced increases. Taking a lozenge prior to anticipated cue exposure may therefore provide a way for smokers to minimize cue induced symptoms but at 15 minutes prior to cues, the decrease is not different than placebo. Research is needed to determine if another time-frame relative to cue exposure would have been more effective.

FUNDING: Federal; Pharmaceutical Industry

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## PA22-5

### VARENICLINE TREATMENT EFFICACY FOR NICOTINE SELF-ADMINISTRATION ON A SECOND-ORDER SCHEDULE DIFFERS BY SEX

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**SIGNIFICANCE:** Varenicline is a commonly prescribed smoking cessation aid (Chantix) and is the most effective pharmacotherapy available. In human treatment, medication use starts in advance of a quit date for smoking. However, most basic research to date in rodents has studied varenicline during extinction or as relapse prevention. Studies that have tested repeated treatment during self-administration have only used male rats. Notably, in human smokers, women, but not men, benefit from extended varenicline treatment in advance of smoking cessation. These effects suggest that short-term pre-quit treatment may be effective for males to reduce nicotine self-administration, however, females are likely to require prolonged exposure for any direct therapeutic effects of varenicline to develop. **METHODS:** Male and female Sprague-Dawley rats were trained to self-administer nicotine (0.03 mg/kg/infusion) in daily 2-h sessions. The initial reinforcement schedule of FR1 (fixed ratio 1) was gradually shifted to a FI5(FR2:S) (fixed interval 5; fixed ratio 2:stimulus) second-order schedule. Thus, active lever pressing could be separated from number of drug infusions received. Following stabilization, half of each sex began chronic varenicline treatment (1 mg/kg, SC) 30 min before each nicotine self-administration sessions; the remaining rats received pretreatment with saline. **RESULTS:** Female rats initially showed higher levels of active lever presses on FR1 than male rats. As the schedule progressed to FI5(FR2:S), however, males began to show higher levels of nicotine intake than females. Varenicline treatment more rapidly reduced nicotine self-administration in males than females. **CONCLUSIONS:** Females required longer varenicline treatment during self-administration compared to males, suggesting differential sensitivity to direct pharmacological manipulation of the nicotine action. This corroborates findings that women benefit from extended varenicline treatment in advance of an attempt to quit, and indicates that clinical practice may be improved by incorporating different treatment protocols for women versus men.

FUNDING: Federal

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## PAPER SESSION 23: TOXICOLOGY OF ALTERNATIVE NICOTINE DELIVERY SYSTEMS

### PA23-1

#### THE EFFECT OF ELECTRONIC CIGARETTE AEROSOLS ON PULMONARY INFLAMMATION

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**SIGNIFICANCE:** The detrimental impact of tobacco on human health including cancer, chronic lung and vascular diseases is clearly established. Over the last 10 years electronic cigarettes (EC) that deliver flavored nicotine containing aerosol have gained considerable popularity especially among youth. ECs were designed to deliver nicotine without burning tobacco. These novel devices are *assumed* to be safer than tobacco cigarettes since they do not produce carcinogenic tar; however recent studies have shown that vapor generated from ECs actually does contain some toxic compounds. Although safety of these flavorings has been evaluated for food and cosmetics products, little is known about their safety when inhaled. Since there is a critical knowledge gap in the potential impact of ECs on pulmonary inflammation and immune responses to infection and vaccination, we examined the potential adverse effects of the *components* of aerosol emitted by ECs. **METHODS:** Our experiments were designed to study the impact of acute inhalation exposure to nicotine-containing and nicotine-free ECs and ECs containing different flavoring and measured immune cell infiltration in lung tissue and spleen. **RESULTS:** We have observed that there is a hierarchy in the inflammatory response as characterized by the numbers of CD4<sup>+</sup>, CD8<sup>+</sup>, IL-17<sup>+</sup> T cells, B cells, macrophages and neutrophils in lung and spleen following exposure to ECs with different flavoring. Additionally, we have found that flavored EC aerosols containing 24mg/ml nicotine can induce significantly enhanced lung inflammatory response compared to ECs without nicotine. Finally, we have observed that host sex influences the outcome; male and female mice showed significantly different lung inflammatory levels in response to EC aerosols. We also measured albumin leak in the broncho-alveolar lavage as a surrogate of epithelial cell damage and found differences in the extent of leak caused by the different aerosols. **CONCLUSIONS:** Our studies reveal, for the first time, important insights into the contribution of nicotine and flavoring inhalation to increased inflammatory pathology and injury.

**FUNDING:** Academic Institution

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### PA23-2

#### CELLULAR TOXICITY AND REACTIVE OXYGEN SPECIES PRODUCTION BY COMMONLY USED FLAVORING AGENTS IN E-CIGARETTE LIQUIDS

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**SIGNIFICANCE:** E-cigarettes are gaining popularity among American youth mainly due to the availability of over 7,700 uniquely flavored e-juices. These flavoring agents are often generally recognized as safe (GRAS) classification when used in foods. However, the health effects of repeated inhalation exposure to these flavoring chemicals are not well understood. We focused our study on the immuno-toxicological and the oxidative stress effects by these e-cigarette flavoring agents on two types of monocytic cell lines, mono-mac6 and U937 cells. The potential to cause oxidative stress by these flavoring agents was assessed by measuring the production of reactive oxygen species (ROS). We hypothesized that the flavoring agents used in e-juices induce an inflammatory response, cellular toxicity, and ROS production. **METHODS:** Mono-mac6 and U937 cells were exposed to two commonly used flavoring chemical compounds, diacetyl and cinnamaldehyde at different doses, 10  $\mu$ M to 1000  $\mu$ M. Cell viability and the concentrations of the secreted inflammatory cytokines, interleukin 8 (IL-8) and interleukin 6 (IL-6) were measured in cell supernatants. Cell-free ROS levels produced by commonly used flavoring chemical compounds, diacetyl and cinnamaldehyde were measured using 2',7'-dichlorofluorescein diacetate probe. These DCF fluorescence data were expressed as hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) equivalents. **RESULTS:** Treatment of the

cells caused varying cellular toxicity. The exposed cell groups also induced IL-8 and IL-6 cytokines in a dose-dependent manner compared to the unexposed cell groups depicting a biologically significant inflammatory response. The measurement of cell free-ROS by the flavoring agents, diacetyl and cinnamaldehyde (diacetyl>cinnamaldehyde), showed significant increased levels of H<sub>2</sub>O<sub>2</sub> equivalent in a dose-dependent manner versus control reagents. **CONCLUSIONS:** Our data suggest that the flavorings used in e-juices can trigger an inflammatory response in lung tissue, mediated by ROS production, providing insights into potential pulmonary toxicity and tissue damage in e-cigarette users.

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### PA23-3

#### CYTOTOXIC EFFECTS OF A TOBACCO HEAT-NOT-BURN SYSTEM ON HUMAN BRONCHIAL EPITHELIAL CELLS

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**BACKGROUND:** Heat-not-Burn (HnB) tobacco products are an emerging class of modified risk tobacco products. These new products, similar to e-cigarettes, purport to reduce exposure to toxicants compared with combustible nicotine products such as cigarettes by avoiding burning tobacco and instead heating tobacco sticks to below 300°C, producing an inhalable aerosol. This pilot study examined the potential cytotoxic effect of a novel HnB system in comparison to the electronic and tobacco cigarettes. **METHODS:** E-cigarettes (Markten brand; tobacco flavored), HnB system (IQOS; tobacco flavor) and tobacco cigarettes (Marlboro Red) were purchased from convenient stores in Buffalo, NY and Florence, Italy. Human bronchial epithelial cells were plated on permeable supports and placed in an air liquid interface for experimentation. A Borgwaldt LX-1 smoking machine was used to generate aerosols from each tested product. Each product was puffed using the Health Canada Intense protocol (55ml puff volume, 2 sec duration, 30 sec interval). Cells were exposed to 55 (Markten), 12 (IQOS) and 12 (Marlboro) puffs to ensure similar nicotine delivery to the cells across products. Cell viability (Trypan Blue) and metabolic activity (Neutral Red) assays were performed to compare the cytotoxic effect of these three products in addition to an air control. **RESULTS:** The tobacco cigarette was found to be significantly more toxic than Markten and IQOS products for both the cell viability and metabolic activity assays. Cytotoxic effects of IQOS and Markten products were not significantly different from the air control. **CONCLUSION:** Using limited cytotoxic measures, the IQOS system showed significantly reduced cytotoxicity as compared to combustible tobacco cigarettes. While more comprehensive testing is needed to determine long term effects of inhaling aerosol from HnB products, this new product may be a potential harm reduction tool for smokers unwilling to quit smoking or smokers not interested in switching to e-cigarettes.

**FUNDING:** Federal

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### PA23-4

#### ELECTRONIC CIGARETTE AEROSOLS INDUCE DNA DAMAGE AND DECREASE DNA REPAIR

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**SIGNIFICANCE:** E-cigarettes (ECs) are battery-operated devices that deliver nicotine through inhaled aerosols. The use of ECs has increased sharply since 2003, reaching more than 13% of high school students and 10 % of adults in U.S. Limited data suggest that EC is a less harmful alternative to tobacco cigarettes and a promising smoking cessation aid. Nonetheless, EC aerosols contain unique toxicants, as well as carcinogens and reactive oxygen species (ROS) that are also present in tobacco smoke. Moreover, we have previously reported that EC aerosols can cause DNA damage. Here we aim to determine the sensitivity of

diverse methods to detect DNA damage induced by EC aerosols and to investigate the mechanisms by which EC use can contribute to DNA damage. **METHODS:** Extracts were prepared from two distinct EC brands and a reference combustible cigarette. Nicotine was quantified by gas chromatography mass spectroscopy. Cells were exposed for 10 min, 1 h, or 2 weeks to diverse doses of EC aerosol or tobacco smoke extracts. DNA damage was quantified using the primer anchored DNA damage detection assay (q-PADDA), the comet assay, and an ELISA kit that detects only 8-oxo-7,8-dihydroguanine (8-oxoG). Levels of ROS and total antioxidant capacity (TAC) were evaluated using standard kits. mRNA and protein expression were evaluated by RT-PCR and western blot, respectively. Data were analyzed by Student's *t*-test. **RESULTS:** Exposure to EC aerosol caused a significant increase in ROS and in DNA damage detectable by q-PADDA and comet assays. We also observed a significant increase in 8-oxoG, one of the most mutagenic DNA lesions caused by ROS. Exposure to EC aerosol caused a dose-dependent increase in DNA damage detectable only by q-PADDA. Exposure to EC extracts reduced the cellular antioxidant capacity and the expression of proteins essential for DNA damage repair. **CONCLUSION:** EC aerosols can cause significant DNA damage, including lesions that are highly mutagenic, possibly by decreasing the cellular antioxidant and DNA damage repair capability. Our data emphasize the urgent need to further evaluate EC safety to ensure evidence-based public health policies and regulations.

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

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## PA23-5

### DIFFERENTIAL RESPIRATORY TOXICITY INDUCED BY E-CIGARETTE AEROSOL FLAVORINGS IN COMBINATION WITH NICOTINE

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**SIGNIFICANCE:** There is a significant need for data on respiratory effects of chemical constituents including flavorings in e-cigarettes (EC) aerosols in relation to nicotine to inform the regulatory science and communicate with the public about EC safety. **METHODS:** Cytotoxicity of human airway epithelial cells in a submerged culture was measured by MTT assay at 18 hours post-exposure to EC aerosols collected in a impinger. Aerosols were generated from a EC using 1.8-ohm coil and 4-volt mod setting using a program-controlled, customized smoking system following CRM No.81 and ISO puffing regimes. Four differently flavored e-liquids (i.e., non-flavor, menthol, sweet, tobacco) of 50:50 propylene glycol and vegetable glycerin with two nicotine concentrations (0% and 1.8%) for each flavor were tested in dose-response manner using 2, 15, 47, 80 puffs. The Kentucky 3R4F cigarette was compared with EC. **RESULTS:** We found differential cytotoxicity associated with flavorings. The menthol-flavored aerosols induced cytotoxicity in dose-response manner with 40% cytotoxicity at the highest dose as compared to the other two flavorings that showed 15% or less. This effect was more pronounced with the high nicotine aerosols, suggesting potentially synergistic toxicity between nicotine and menthol flavorings. Non-flavored aerosols showed little cytotoxicity that did not vary by dose and nicotine level, suggesting the vehicle and additives other than flavorings have little cytotoxicity for the condition we used to generate aerosols. Very low nicotine dose slightly improved cell viability, agreeing with previous reports in the literature. The CC of lowest dose induced higher cytotoxicity than the most toxic menthol EC aerosols, confirming previous studies. **CONCLUSIONS:** EC flavorings have a significant impact on the degree and variability of respiratory toxicity. Certain flavoring such as menthol together with nicotine could synergistically increase harmful effects in user's lung. More efforts to investigate the link between flavorings chemical composition in association with nicotine and respiratory effects are needed to support regulation of harmful constituents in the EC products.

**FUNDING:** Academic Institution

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## PODIUM PRESENTATION 6

## PAPER SESSION 24: IMPACT OF POINT-OF-SALE EXPOSURE

## PA24-1

## THE INFLUENCE OF ELECTRONIC NICOTINE DELIVERY SYSTEMS (ENDS) POINT-OF-SALE MARKETING EXPOSURE ON PERCEPTIONS, SUSCEPTIBILITY, AND USE OF MARIJUANA IN ENDs AMONG COLLEGE STUDENTS

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**INTRODUCTION:** Electronic Nicotine Delivery Systems (ENDS) point-of-sale (POS) marketing may influence use of marijuana in ENDs through changing perceptions and susceptibility toward ENDs use. The purpose of this study was to examine if the relationship between ENDs POS marketing exposure and use of marijuana in ENDs a year later was mediated by perceptions of harmfulness, social acceptability, and susceptibility to ENDs use among college students. **METHODS:** Data were from waves 4 (spring 2016), 5 (fall 2016), and 6 (spring 2017) of the Marketing and Promotions Across Colleges in Texas study (M-PACT). Exposure to ENDs POS marketing was assessed by multiplying observed counts of marketing within a mile of the student's college/university by self-reported frequency of store visits per week, both measured at wave 4. Wave 5 susceptibility, perceived harmfulness, and social acceptability were included as mediating variables between wave 4 marketing exposure and use of marijuana in ENDs at wave 6, while controlling for reported use of marijuana in ENDs at wave 4, using Mplus 7.4. **RESULTS:** 3,764 students (64% female, 38% white, and  $m_{age}=20$ ) had complete data (wave 4) and were used in the mediation model. Average ENDs POS marketing exposure was 30.4 (sd=47.6) signs per week; and 381 (10.5%) students reported use of marijuana in ENDs at wave 6. The model had good fit and there was a statistically significant association between wave 4 ENDs POS marketing exposure and wave 5 susceptibility ( $\beta=.09$ ,  $SE=.02$ ,  $p<.00$ ), harmfulness ( $\beta=.03$ ,  $SE=.02$ ,  $p<.05$ ), and social acceptability ( $\beta=.05$ ,  $SE=.02$ ,  $p<.00$ ), while only susceptibility was statistically significantly associated with past 6-month use of marijuana in ENDs at wave six ( $\beta=.36$ ,  $SE=.04$ ,  $p<.00$ ). There was a significant indirect effect of marketing exposure on marijuana use in ENDs at wave six through susceptibility ( $\beta=.03$ ,  $SE=.01$ ,  $p<.00$ ) indicating full mediation. **DISCUSSION:** Our findings suggest regulation targeting ENDs marketing at the POS may decrease favorable perspectives of ENDs and particularly susceptibility to ENDs use and prevent both ENDs use as intended (with nicotine) and with marijuana among college students.

**FUNDING:** Federal

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## PA24-2

## POINT-OF-SALE PROMOTION OF NON-CIGARETTE TOBACCO PRODUCTS IN MANHATTAN, NYC

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**SIGNIFICANCE:** Non-cigarette tobacco products (NCTPs) are commonly advertised at the point-of-sale, but it is unclear how product promotion varies across communities. This study examines the relationship between neighborhood demographic characteristics and the prevalence of NCTP advertising and availability in Manhattan, NYC. **METHODS:** Ten percent of licensed tobacco retailers were selected via stratified, random sampling from 28 neighborhood tabulation areas ( $n=213$  retailers). In July-August 2017, researchers collected data on the presence of exterior advertising and the availability of cigars, smokeless tobacco, and electronic nicotine delivery systems (ENDs). Using U.S. Census data, neighborhoods were grouped into 3 levels (ie, low, mid, high) for the following measures: median household income, percent Black (non-Hispanic), percent Hispanic, and percent

under 18 years old. Cochran-Armitage trend tests assessed linear associations between demographic variables and product advertising/availability. **RESULTS:** Cigar advertising was significantly associated with neighborhood demographics. For example, 20.4% of retailers in the lowest income neighborhoods had exterior cigar ads compared to 6.9% and 4.4% of retailers in mid and high income neighborhoods, respectively ( $p=0.005$ ). Moreover, as the percentage of Black, Hispanic, and youth residents increased, so did the prevalence of cigar advertising. Smokeless tobacco and ENDs availability were significantly lower in neighborhoods with high proportions of Black and Hispanic residents ( $p<.001$ ), whereas cigar availability was positively correlated with these measures ( $p<.05$ ). Notably, 99-cent cigars were sold in 75.8% of retailers in largely Black neighborhoods versus 12.8% in neighborhoods with few Black residents ( $p<.0001$ ). **CONCLUSIONS:** In Manhattan, NYC, non-combusted NCTPs (ie, smokeless tobacco, ENDs) are more accessible in neighborhoods with higher income levels and fewer minority residents, while inexpensive cigar promotions saturate predominantly Black, Hispanic, and low income neighborhoods. Given the risk differences between combusted and non-combusted NCTPs, these patterns may widen existing health disparities.

**FUNDING:** Federal

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## PA24-3

## EXPOSURE TO RETAIL TOBACCO OUTLET ADVERTISING AND USE OF AND SUSCEPTIBILITY TO CIGARETTES AND E-CIGARETTES AMONG TEXAS 8TH AND 10TH GRADE STUDENTS

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**OBJECTIVE:** This study examined the relationship between directly observed retail tobacco outlet (RTO) cigarette and e-cigarette advertisement exposure and ever use, past 30-day use, and susceptibility to use cigarettes and e-cigarettes among adolescents. **METHODS:** Participants included 1,494 8<sup>th</sup> and 10<sup>th</sup> grade students ( $N=252,742$ ), who completed a survey from Wave 2 of the Texas Adolescent Tobacco and Marketing Surveillance Study (TATAMS). Trained data collectors audited 172 RTOs (i.e. gas stations, grocery stores, convenience stores) within one half mile around the schools with participating TATAMS students approximately one week to two months before students attending those schools completed the survey. All outdoor and indoor tobacco advertising was documented. Advertisement exposure was calculated by multiplying the number of times students self-reported visiting RTOs close to their school by the total number of cigarette and e-cigarette ads observed in these RTOs. Separate multivariable weighted logistic regression models were used to examine the association between exposure to cigarette and e-cigarette ads and ever use, past 30-day use, and susceptibility to use cigarettes and e-cigarettes, controlling for age, sex, grade in school, race/ethnicity, and family standard of living. **RESULTS:** Almost 60% of students were exposed weekly to cigarette and e-cigarette advertisements in RTOs. Approximately 3% of students had used cigarettes in the past 30 days while 6.1% used e-cigarettes in the past 30 days. Exposure to any cigarettes ads was associated with greater odds of reporting past 30-day use of cigarettes as compared to students who were not exposed to cigarettes ads (Adjusted Odds Ratio=2.65, 95% CI: 1.08-6.52). There was no association between exposure to cigarettes ads and ever use of or susceptibility to use cigarettes. Exposure to POS e-cigarette advertisements was not related to use or susceptibility to use. **DISCUSSION:** Findings from this study support previous studies linking RTO cigarette advertisement exposure to use, however, this association was not found for e-cigarettes.

**FUNDING:** Federal

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## PA24-4

### GRAPHIC HEALTH WARNING POSTERS AT RETAIL POINT-OF-SALE INCREASE SOME ADOLESCENTS' FUTURE SMOKING RISK: AN EXPERIMENTAL INVESTIGATION

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**SIGNIFICANCE:** The point-of-sale (POS) retail environment is a potent source of tobacco advertising. Colorful branded posters litter POS stores and the tobacco power wall is prominently located behind the cashier. Adolescents are particularly susceptible to the effects of POS tobacco advertising. As such, regulatory efforts have sought to diminish the influence of the POS retail environment on adolescent tobacco use. Introducing anti-tobacco posters at POS has been advocated as one way to reduce the potency of the POS environment but research documenting the efficacy of this regulatory action on adolescents is rare. This experiment tested whether introducing graphic health warning posters at POS had any effect on adolescents' susceptibility to future cigarette smoking and whether these effects were moderated by adolescents' baseline risk of cigarette smoking. **METHODS:** The study was conducted in the RAND StoreLab (RSL), a life-sized replica of a convenience store that was developed to experimentally evaluate how changing aspects of tobacco advertising at POS influences tobacco use risk during simulated shopping experiences. A total of 441 adolescents (*M* age=13; 50% female; 70% Caucasian) were randomized to one of four conditions in a 2 (*graphic health warning poster placed near the tobacco power wall*: no, yes) x 2 (*graphic health warning poster placed near the cash register*: no, yes). Participants shopped under their assigned condition in the RSL and once they exited the store, completed a measure of their future susceptibility to smoking. **RESULTS:** Results revealed that the addition of graphic health warning posters at POS led to a significant increase in future smoking susceptibility among those adolescents who already were at high risk for smoking in the future ( $p < .045$ ). The introduction of graphic health warning posters had no impact on never smokers; their susceptibility to future smoking was uniformly low across experimental conditions. **CONCLUSIONS:** Based on these results, it is difficult to recommend the display of anti-smoking posters at POS.

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TPW at POS may help to reduce youth susceptibility to initiating nicotine products, including e-cigarettes.

**FUNDING:** Federal; R01CA175209

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## PA24-5

### EXPOSURE TO THE TOBACCO POWER WALL INCREASES INTENTIONS TO USE E-CIGARETTES IN THE FUTURE

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**SIGNIFICANCE:** Adolescents' e-cigarette use is now more prevalent than their combustible cigarette use. Though likely less harmful than combustible cigarettes, e-cigarettes are not without harm and may increase likelihood of future cigarette use. Thus, there is a need to understand factors that contribute to adolescent e-cigarette use. Youth are exposed to massive levels of advertising at retail point-of-sale locations (POS), especially via the tobacco power wall (TPW), but no data is available on whether exposure to the TPW at POS influences e-cigarette use risk. This study examined the effect of exposure to a TPW that prominently displays e-cigarettes on future intentions to use e-cigarettes among adolescents. **METHODS:** The study was conducted in the RAND StoreLab (RSL), a life-sized replica of a convenience store developed to experimentally evaluate how tobacco advertising at POS influences tobacco use risk and behavior under simulated shopping conditions. In a between-subjects experiment, 158 adolescents (*M* age=13.7; 58% female, 58% White) were randomized to shop in the RSL under one of two conditions: 1) TPW located in its usual position behind the cashier, with myriad tobacco products visible, including e-cigarettes ( $n=80$ ); or 2) TPW hidden behind an opaque wall ( $n=78$ ). Youth shopped under their assigned condition and, upon exiting, rated their intentions to use e-cigarettes ("If one of your best friends were to offer you an e-cigarette, would you try it?"; 1=Definitely not, 10=Definitely yes). **RESULTS:** At baseline ever use of e-cigarettes was 5.1%; ever use of cigarettes was 8.1%; ever use of both e-cigarettes and cigarettes was 3.8%. There were no differences between the TPW conditions on these or other baseline variables (e.g., age, gender). Analyses revealed that exposure to the visible TPW increased intentions to use e-cigarettes in the future ( $B=.31, p<.001$ ). **RESULTS:** were unchanged when controlling for gender, race/ethnicity, age, and ever-use of cigarettes and e-cigarettes. **CONCLUSIONS:** Efforts to regulate the visibility of the





## PAPER SESSION 25: ADDRESSING TOBACCO-RELATED RISKS IN INDIGENOUS POPULATION

### PA25-1

#### SECONDHAND SMOKE EXPOSURE INTERVENTION IN LAKOTA FAMILY HOUSEHOLDS

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**SIGNIFICANCE:** Nonsmokers from the Lakota tribes in South Dakota disproportionately share the burden of secondhand smoke exposure (SHS), especially in their homes. A novel approach to encourage the adoption of home smoking restrictions is to provide parents with objective, biomarker feedback documenting child exposure to tobacco toxins. **METHODS:** From 2013-2015 we recruited American Indian smokers with potty-trained children ages 2 to 8 residing in their homes into a two-arm randomized clinical trial (N=110). We randomized eligible participants to the intervention arm (n=56), consisting of biomarker feedback and counseling on their child's exposure to NNAL and cotinine. The control group (n=54) received a brochure on SHS. Child urine cotinine and air nicotine were collected at both time points. Primary outcome was badge-verified (air nicotine) complete home smoking restrictions at 3-months post-randomization. **RESULTS:** All enrolled participants were American Indian, 81% female and average age 34 year (interquartile range: 29-44). Average cigarettes smoked/day was 7 (IQR= 4-11). Median child cotinine level was 7 ng/mL (IRQ: 3-22). At week 12, a t-test comparison indicated that the intervention and control groups had a similar reduction in air nicotine (change score in intervention = -0.42, 95% CI (-1.0, 1.55); change score in control = -0.31, 95% CI (-1.68, 0.10), with no changes in child urine cotinine. However, at week 12, more participants assigned to biomarker feedback than the control group self-reported implementing complete home smoking restrictions (41% vs. 21%, p=0.05). **CONCLUSION:** Biomarker feedback was marginally significant for self-reported complete in-home smoking restrictions and quit attempts.

FUNDING: Federal

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### PA25-2

#### SMOKING AND QUITTING IN SOCIAL NETWORKS AMONG INDIGENOUS AND NON-INDIGENOUS SMOKERS: FINDINGS FROM THE ITC NEW ZEALAND SURVEY

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**SIGNIFICANCE:** In New Zealand (NZ), Māori have much higher smoking rates than non-Māori. On current trends NZ's goal of being smoke-free by 2025 will be missed by a wide margin for Māori. High levels of smoking in Māori smokers' social networks may reinforce smoking and contribute to high Māori smoking prevalence. We compared the social networks and patterns of smoking within Māori and non-Māori smokers. **METHODS:** Data came from the Wave 1 ITC NZ Survey (Aug 2016-Apr 2017), a phone cohort survey of 1,023 smokers and 138 ex-smokers. 358 participants identified as Māori and 803 as non-Māori. We measured the extent of social networks, smoking in the participants' social networks, gifting and sharing of cigarettes, and the degree of exposure to other people smoking and frequency of smoking with other people. Analyses presented in the abstract uses preliminary weighting procedures. **RESULTS:** Māori had larger social networks. For example, 36.8% of Māori and 26.3% of non-Māori had regular contact with ≥ 4 out of 8 possible groups of people (different family members, house/flatmates, work colleagues). 11.7% of Māori and 2.8% of non-Māori smokers reported having smokers among ≥ 4 groups of people in their social network. The proportion of smokers with ≥ 3 smokers among their closest friends was 67.1% among Māori and 51.6% among non-Māori. Māori smokers (52.9%) were more likely to report daily exposure to other people's tobacco smoke (non-Māori 33.1%), and to report giving or receiving tobacco products in the last 6 months (49.1% vs 34.6%) or sharing cigarettes whilst smoking (74.8% vs 63.7%). **CONCLUSIONS:** Smoking

and exposure to smoking was greater among Māori smokers' social networks. Role modelling and exposure to smoking may both encourage smoking uptake and reduce the motivation and ability to quit smoking. The findings suggest that high smoking prevalence in the Māori population may be partially maintained by the high prevalence of smoking around Māori smokers. The findings should inform the design and delivery of interventions to discourage smoking uptake and promote and support cessation among Māori.

FUNDING: State; Federal

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### PA25-3

#### DEVELOPING HEALTH COMMUNICATION MESSAGING FOR A SOCIAL MARKETING CAMPAIGN TO REDUCE TOBACCO USE IN PREGNANCY AMONG ALASKA NATIVE WOMEN

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**SIGNIFICANCE:** Despite the high prevalence of tobacco use during pregnancy among Alaska Native and American Indian (AI/AN) women - a tobacco use disparity group, few efforts have focused on developing tobacco cessation interventions for this group. This study developed a community wide social media campaign to reduce tobacco use in pregnancy among AN women as part of a multi-component intervention. **METHODS:** Mixed methods with two rounds of assessments obtained feedback on preferences for message appeals; Round 1: qualitative focus groups and individual interviews (N=60), and Round 2: quantitative survey interviews (N=52). Each round purposively sampled adult AN pregnant women, family/friends and Elders in Western Alaska; and included tobacco users and non-users. Round 1 also assessed reasons for tobacco use in pregnancy. **RESULTS:** Qualitative findings converged with quantitative results to indicate that participants preferred factual, loss-framed, visual concepts on how maternal tobacco use harms the fetus, newborn and child, in contrast to spiritual or emotional appeals, or gain-framed messaging. Stress was indicated as a major reason for tobacco use in pregnancy. **CONCLUSIONS:** Results suggest campaign messages should include factual messaging for being tobacco-free and focus on reducing stress and other healthy pregnancy targets. A large randomized trial is underway evaluating the efficacy of such an intervention.

FUNDING: Federal

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### PA25-4

#### URBAN INDIGENOUS COMMERCIAL TOBACCO USE IN CANADA: OUR HEALTH COUNTS TORONTO

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**BACKGROUND:** In Canada, there is a poor understanding of commercial (non-traditional) tobacco use and effective tobacco reduction strategies among the Indigenous population. This is predominately due to data collection systems that misclassify and/or exclude Indigenous peoples as well as weak Indigenous health service and program evaluation systems. The most recent statistics are outdated (2006) and underestimate the prevalence of Indigenous tobacco use. This research generated a unique primary dataset in a major urban area in one of Canada's largest Indigenous communities. **Design/Methods:** Our Health Counts Toronto uses Indigenous community driven processes to generate a comprehensive health information platform to understand and address gaps in Indigenous health and tobacco use. Trained local interviewers implemented a survey using Respondent Driven Sampling among Indigenous adults in Toronto to generate population-level prevalence estimates, including information on tobacco use. Statistical analysis was used to characterize and describe the results, determining tobacco use prevalence by age, sex, education and household income. **RESULTS:** This research recruited a sample of 935 Indigenous adults. Preliminary analysis indicated the



prevalence of current daily smoking among Indigenous adults in Toronto was 62.3% (95%CI:55.0,69.6). Of current smokers, 42.7% (95%CI:33.1,52.3) smoked 11 sticks or more per day, and 53.1% (95%CI:44.1,62.1) of all Indigenous smokers tried to quit in the last 12 months. CONCLUSIONS: Canada is a signatory to the Framework Convention on Tobacco Control (FCTC) which recognizes the harm caused by tobacco use. Further, the FCTC highlights the urgent need to engage with Indigenous peoples in planning, delivery, and evaluation of tobacco reduction programs and policies. However, the Indigenous population in Toronto continues to experience smoking rates nearly four times greater than the general population. This research highlights the need for recent and accurate population health data to inform tobacco reduction programs and policies; reducing a completely preventable cause of morbidity and mortality.

FUNDING: Federal

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## PA25-5

### HARDENING AMONG INDIGENOUS AND NON-INDIGENOUS SMOKERS: FINDINGS FROM THE ITC NEW ZEALAND SURVEY

Richard Edwards<sup>\*1</sup>, James Stanley<sup>1</sup>, Andrew Waa<sup>1</sup>, Susan Kaai<sup>2</sup>, Anne Quah<sup>2</sup>, Geoffrey Fong<sup>2</sup>, <sup>1</sup>University of Otago - Wellington, New Zealand, <sup>2</sup>University of Waterloo - Waterloo, ON, Canada

SIGNIFICANCE: The hardening hypothesis states that as smoking prevalence reduces remaining smokers are increasingly 'hardened', i.e. less likely to quit because they are less motivated to quit, more heavily addicted, or more disadvantaged. In New Zealand (NZ), smoking rates are much higher among Māori. We compared multiple measures of hardening among Māori and non-Māori smokers. METHODS: Data came from the Wave 1 ITC NZ Survey (Aug 2016-Apr 2017), a phone cohort survey of 1,023 smokers and 138 ex-smokers. 358 participants identified as Māori and 803 as non-Māori. We assessed hardening using measures of: quit motivation, quit attempt history, addiction or heaviness of smoking, socio-economic disadvantage, mental health, and quit rates. Analyses presented in the abstract uses preliminary weighting procedures. RESULTS: The proportion of smokers who had never tried or had not tried to quit in the last year was 11.5% and 46.8% respectively among Māori and 17.7% and 60.7% among non-Māori while 12.5% of Māori and 13.7% of non-Māori had no desire to quit. Among daily smokers, 22.1% of Māori and 20.4% of non-Māori smoked at least 20 per day. 65.3% of Māori and 58.4% of non-Māori had their first cigarette < 30 minutes after waking. The proportion of smokers with a household income <NZ\$30,000 per year or who reported financial stress in the last 30 days was 26.6% and 15.4% respectively among Māori and 22.0% and 12.6% among non-Māori. 10.7% of Māori and 4.9% of non-Māori had high levels of psychological distress (K6 score 13-24). 14.9% of Māori and 19.1% of non-Māori smokers had quit in the last year. CONCLUSIONS: Māori smokers were more 'hardened' in being more likely to be heavily addicted, have a low household income, report financial stress, and have high psychological distress scores. They were also less 'hardened' in being less likely to not have tried quitting ever or in the last year. However, Māori quit rates were lower. The findings suggest that Māori are highly motivated to quit, but are succeeding less. Individual and population-based interventions should support Māori smokers to quit and be appropriate for and reach Māori smokers and communities.

FUNDING: State; Federal

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## PAPER SESSION 26: TOBACCO-CONTROL CAMPAIGNS: RESEARCH TO EVALUATION

### PA26-1

#### COST-EFFECTIVENESS ANALYSIS OF THE REAL COST CAMPAIGN'S EFFECT ON SMOKING PREVENTION

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INTRODUCTION: A previous study found that FDA's *The Real Cost* national tobacco education campaign was associated with preventing approximately 350,000 U.S. youths from initiating smoking between 2014 and 2016. OBJECTIVE: We conducted an analysis to determine the cost-effectiveness of the campaign. METHODS: We assessed the cost-effectiveness of *The Real Cost* by measuring efficiency in two ways. First, we used a standard approach for assessing the cost-utility of public health interventions by estimating the cost per quality-adjusted life-year (QALY). Then, we calculated the total monetary return on investment (ROI) by comparing the cost savings associated with the campaign to campaign expenditures. RESULTS: We estimate that *The Real Cost* averted 175,941 youth from becoming established smokers between 2014 and 2016. Campaign expenditures totaled \$246,915,233. The cost per QALY of the campaign was less than \$1,500. When considering the costs of smoking, the averted established smokers represent over \$30 billion in cost savings. The overall ROI of the campaign was more than \$100 in cost-savings for every \$1 spent on the campaign. Our conclusions were robust to a number of sensitivity analyses surrounding the parameters. CONCLUSIONS: Our findings indicate that expenditures on the campaign were cost-efficient. The cost-savings resulting from *The Real Cost* represent a large reduction in the financial burden of tobacco to individuals, their families, and society.

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### PA26-2

#### IMPACT OF EMOTIONAL RESPONSE TO ADS ON TOBACCO-RELATED ATTITUDES AMONG US YOUTH AND YOUNG ADULTS

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The body of literature devoted to emotional responses to health messages has not focused on the effect that both type and intensity of emotion have on changes in attitudes. The purpose of this study was to examine how positive vs negative emotion and/or intensity of emotion predict attitudes toward smoking among youth and young adults. Online surveys of 11,440 (200-300/ad) youth/young adults ages 15-21 captured emotion and attitudes towards 41 truth campaign anti-tobacco advertisements. Respondents viewed one ad and were asked "how much does this ad make you feel..." Emotions were dichotomized as positive (Powerful, Inspired, Hopeful, Happy, Confident, Motivated) or negative (Sad, Angry, Irritated, Afraid). Intensity was measured on a scale of 1 to 5, with 1, "not at all" and 5 indicating "a great deal". Any emotion (positive or negative) scoring 5 out of 5 was considered high intensity and any emotion scoring 1 out of 5 was low intensity. Linear regressions were performed to indicate whether positive vs negative or intensity of emotion had a bigger impact on the attitude "this ad gave me good reasons not to smoke" on a scale from 1=strongly disagree to 5=strongly agree. Having any emotion (positive or negative) is related to "...good reasons not to smoke," while positive emotions had a stronger effect than negative emotions ( $\beta=.56$  vs  $.02$ ). Regardless of the emotion being positive or negative, the higher the intensity the more likely respondents were to report the ad "gives me good reasons not to smoke" versus low intensity ( $\beta=.83$  vs  $-.04$ ). Negative low intensity ads did not significantly change this attitude ( $\beta=.03$ ) but negative high intensity ( $\beta=.27$ ), positive high intensity ( $\beta=.70$ ) and positive low intensity ( $\beta=-.46$ ) did. Eliciting emotion is an important role of anti-tobacco advertisements to change viewer attitudes. Any emotion, positive or negative, is related to giving more reasons not to smoke. Making the viewers feel high intensity emotions had a bigger impact on attitudes than low intensity. Anti-tobacco advertising aimed at giving reasons not to smoke should consider intensity of emotions in the creative execution.



FUNDING: Truth Initiative internal funding

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## PA26-3

### TRACKING THE CONVERSION: ENSURING DIGITAL OUTREACH EFFORTS RESULT IN ADOPTION OF CESSATION RESOURCES

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**SIGNIFICANCE:** Digital channels are often viewed as a cost-effective way to reach smokers with cessation resources, but evaluation of the uptake of these resources is often not done. Conversation tracking can be used to assess whether digital communication leads to uptake of cessation resources. The National Cancer Institute's Smokefree.gov initiative, a digital cessation intervention, implemented conversation tracking to examine which digital communication efforts resulted in users accessing evidence-based cessation resources. **METHODS:** Conversion tracking assesses whether individuals identified from a specific outreach strategy (e.g., social media) complete a behavior of interest (e.g., sign up for a text messaging program). Conversions are typically measured as the ratio of users who completed an intended behavior to the number of total users on a platform. Google Analytics was used to assess conversion tracking for 17 text messaging programs (Goal= Program Opt-In) and an interactive quit plan generator on the Smokefree.gov website (Goal= Quit Plan created). **RESULTS:** Although the majority of sign-ups for the SmokefreeTXT Adult text messaging program come from Google Organic Search (7,342 opt-ins), users that arrived from the CDC's TIPS website (10.53% conversion rate; 2,480 overall opt-ins), the FDA's This Free Life website (2.21% conversion rate; 120 opt-ins), or Facebook (1.09% conversion rate; 185 opt-ins) had higher conversion rates. For Smokefree.gov's Quit Plan, Google Organic Search led to the highest number of quit plans completed (3,810), but users that arrived from Facebook (9.61% conversion rate; 500 completed quit plans), the Tweet2Quit research study (12.84% conversion rate; 274 completed quit plans), or the Chantix website (5.56% conversion rate; 22 completed quit plans) had higher conversion rates. **CONCLUSIONS:** The use of conversion tracking provides valuable information on the optimal outreach strategies for driving Smokefree product usage/downloads and the entry pages most likely to result in a conversion. This has informed adjustments to the outreach strategy for SmokefreeTXT program and Quit Plan, leading to an increase in opt-ins.

FUNDING: Federal

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## PA26-4

### DOES BRIEF EXPOSURE TO E-CIGARETTE VAPOR CUES IN PUBLIC SERVICE ANNOUNCEMENTS INFLUENCE SMOKING AND VAPING-RELATED URGES AND USE INTENTIONS?

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**SIGNIFICANCE:** Cross-cue reactivity research on electronic nicotine delivery systems (ENDS) product advertising suggests that exposure to visual depictions of vapor might elicit nicotine-related appetitive responses among smokers. One explanation is ENDS vapor is functionally similar to depictions of smoking and is associated with nicotine reward. While anti-vaping public service announcements (PSAs) are intended to discourage vaping or use of ENDS, depictions of vapor within PSAs may serve as smoking cues and may inadvertently influence smoking behaviors or attitudes. The objective of this study is to determine the effect of smokers' exposure to vapor cues within PSAs on smoking and vaping urges and behavioral intentions. **METHODS:** A between-subjects experiment was conducted among young adult cigarette smokers and dual-users of cigarettes and ENDS (ages 21-30; N=293) who were randomly assigned to view four PSAs in one of the following conditions: 1) anti-vaping PSAs with vapor; 2) anti-vaping PSAs without vapor; 3) physical activity PSAs, or 4) anti-smoking PSAs with smoking cues. Outcomes were change in smoking and vaping urges, post-test smoking and vaping intentions within the next hour, and post-test intention to purchase cigarettes or ENDS. **RESULTS:** Exposure to PSAs with vapor was associated with a smaller reduction in vaping urge and greater intention to purchase cigarettes compared to viewing PSAs without vapor. Exposure to anti-vaping PSAs with or without vapor

was associated with lower intention to purchase ENDS compared with PSAs unrelated to vaping (physical activity or anti-smoking ads). There was no significant difference in smoking and vaping intentions across conditions. Conclusion Including vaping portrayals within PSAs exhaling emissions may not be beneficial for overall message effectiveness and may risk diminishing the desirable effect of reducing vaping urge while increasing intentions to purchase cigarettes. These findings may have broader implications on regulating the presence of vapor in tobacco marketing and anti-tobacco messages.

FUNDING: Federal

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## PA26-5

### ADOLESCENT NEURAL RESPONSES TO ANTI-SMOKING MESSAGES, PERCEIVED AD EFFECTIVENESS, AND SHARING INTENTION AND ELABORATION

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**SIGNIFICANCE:** Anti-smoking campaigns can substantially influence adolescent behavior, and the effects of campaign ads are amplified through interpersonal sharing. However, the underlying psychological and neurocognitive mechanisms that influence ad effectiveness and sharing are not well understood, especially among teens. Based on adult research, we hypothesized that ad-induced self-related processing, social cognition and valuation, as indexed in the brain, would relate to greater perceived ad effectiveness and measures of sharing. **METHODS:** Forty adolescents (aged 14-17) viewed twelve ads from "The Real Cost" campaign during an fMRI scan. Participants rated sharing intention and perceived effectiveness (PE) for each ad and verbally described each ad, as if talking to a friend. We computed percent signal change in brain regions implicated in self-relevance, social processing, and valuation for each participant and ad, then conducted multilevel mixed effects models in which each measure (PE, sharing intention, and verbal sharing elaboration) was separately regressed on neural response in each set of brain regions (self-relevance, social processing, and valuation), controlling for clustering at the participant and ad levels. **RESULTS:** Mean PE was positively associated with neural activity in social processing regions ( $\beta=.119$ ,  $p=.019$ ) and marginally associated with neural activity in self-relevance regions ( $\beta=.097$ ,  $p=.060$ ). PE was not associated with neural response in valuation regions. Though sharing intention was not associated with neural activity in these regions, verbal sharing elaboration was positively associated with neural activity in self-relevance ( $\beta=.213$ ,  $p<.001$ ), social processing ( $\beta=.179$ ,  $p=.001$ ), and value regions ( $\beta=.186$ ,  $p=.001$ ). **CONCLUSIONS:** Findings suggest that the mental processes responsive to effective messages in adolescents are more focused on social processing systems than self-related and value systems, whereas sharing elaboration reflects social, self-relevance and value processing. We discuss implications for the design of effective and shareworthy youth-targeted campaign messages and compare to related findings in adults.

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## PAPER SESSION 27: DEVELOPMENTS IN TOBACCO USE EXPOSURE ASSESSMENT WITH BIOMARKERS

### PA27-1

#### THE INFLUENCE OF RACE AND UGT2B10 ACTIVITY ON GLUCURONIDATION OF ANATABINE, A MINOR TOBACCO ALKALOID AND URINARY BIOMARKER OF TOBACCO USE

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Anatabine has been used as a biomarker of tobacco use during smoking cessation and more recently, to biochemically verify compliance with the use of very low nicotine (and anatabine) content (VLNC) cigarettes during concurrent transdermal nicotine or e-cigarette use. However, little is known about anatabine metabolism or how differences in metabolism influence the concentration of anatabine excreted by smokers. In a prior study of predominantly Whites, glucuronides accounted for 39% of the total anatabine excreted. We have tentatively identified an N-glucuronide of anatabine, analogous to cotinine and nicotine N-glucuronides. The extent of nicotine and cotinine N-glucuronidation by Blacks is significantly less than by Whites due to the prevalence of non-functional UGT2B10 variants. Here we investigated the role of race and UGT2B10 activity on urinary anatabine levels. **METHODS:** Baseline urine from smokers participating in a randomized trial of VLNC cigarettes was analyzed for total nicotine equivalents (TNE), anatabine (free and total; "total" refers to the sum of anatabine and its glucuronide), and the ratio of free to total cotinine (a measure of UGT2B10 activity). DNA was collected for UGT2B10 genotype. In vitro, the rate of UGT2B10 and UGT1A4-catalyzed anatabine N-glucuronidation was determined. **RESULTS:** TNE did not differ between Black (n=175) and White smokers (n=358). However, the urinary concentration of free cotinine (as reported previously) and free anatabine were significantly higher in Blacks compared to Whites (p<0.01). Among Blacks the mean percent of anatabine glucuronidation by smokers with no cotinine glucuronidation (UGT2B10 null, n=22) was lower than for smokers with active UGT2B10 (n=140), 28% ± 19% vs 37% ± 21% (p=0.067). But, in contrast to cotinine, all but 3 UGT2B10 null smokers excreted anatabine glucuronide. In vitro, both UGT2B10 and UGT1A4 catalyzed anatabine glucuronidation. **Conclusion:** A significant proportion of the anatabine excreted by smokers is glucuronidated, and Blacks excrete more unconjugated anatabine than Whites. UGT2B10 is one catalyst of anatabine glucuronidation. Total anatabine may be a better biomarker of tobacco use.

FUNDING: Federal

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### PA27-2

#### AN INTERNATIONAL COLLABORATIVE STUDY OF THE MEASUREMENT OF NICOTINE, ITS METABOLITES, AND TOTAL NICOTINE EQUIVALENTS IN HUMAN URINE POOLS AS AN INDEX OF EXPOSURE TO TOBACCO PRODUCTS

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Reliable and comparable biomarker assays in people are essential for evaluating their exposure and responses to tobacco and related nicotine sources. Measurement of nicotine and its metabolites in people is perhaps the most fundamental approach available for assessing tobacco exposure. The best index of recent nicotine intake is believed to be the molar sum of nicotine and its major metabolites measured in urine samples and referred to as the Total Nicotine Equivalents (TNE). Most commonly, TNE has referred to a sum based on the measurement of the three primary urinary metabolites: total nicotine, cotinine, and *trans*-3'-hydroxycotinine where the term "total" refers to the inclusion of both the "free" and glucuronide forms of each of these analytes. In this study, laboratories active in urinary nicotine biomarker assays (determined primarily from their publication activity) including academic, government and commercial laboratories were invited to participate in a round robin study coordinated by the US Centers for Disease Control and Prevention (CDC) and investigators from the University of California,

San Francisco (UCSF). Eleven laboratories participated in this study and agreed to analyze replicate aliquots of 7 human urine pools including 5 blended pools prepared from smokers and nonsmokers at various concentration levels of nicotine and its associated metabolites, and additional two pools from a confirmed non-exposed, non-tobacco user pool fortified with known amounts of high-purity nicotine, cotinine and hydroxycotinine salts. The number of separate analytes measured by the participating laboratories ranged from 1 (free cotinine only) to a maximum of 18, including 9 metabolites and their corresponding glucuronides in the latter case. All laboratories in this study used some form of liquid chromatography coupled to tandem mass spectrometry. The results of this trial demonstrated generally excellent inter-laboratory agreement overall, and indicate that current measurements of urinary nicotine metabolic profiles can be reliable and should provide valid and comparable results when conducted by laboratories with similar expertise and experience.

FUNDING: Federal

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### PA27-3

#### NICOTINE EXPOSURE ASSESSMENT IN US POPULATION, PATH WAVE 1

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The Population Assessment of Tobacco and Health (PATH) Study is a nationally representative, longitudinal cohort study of tobacco use and health in the civilian non-institutionalized population of the United States. As part of the PATH Study, this study measured the concentrations of nicotine and six of its main metabolites (cotinine, *trans*-3'-hydroxycotinine, cotinine-N-oxide, nicotine-N-oxide, norcotinine, and norcotinine) in urine samples collected from tobacco users and nonusers age 18 years and older in Wave 1 of the PATH Study (September 2013 to December 2014). Here, nicotine exposure, as measured by TNE2 (total nicotine equivalents, the molar sum of the two most prevalent nicotine metabolites: cotinine and *trans*-3'-hydroxycotinine) and TNE7 (the molar sum of urinary nicotine and all six metabolites), were characterized for the US population by their tobacco use patterns (product type, exclusiveness, and frequency) and demographic characteristics (sex, age, race/ethnicity, and education level). Our data showed that the geometric mean (GM) of urinary nicotine levels in tobacco users are approximately 1,000-fold higher than those in non-users. Users of smokeless tobacco only (loose snus, pouches, chewing tobacco, dip, snuff, spit, and/or dissolvables), had the highest urinary nicotine levels, followed by users of combusted tobacco products only (cigarettes, all cigars, pipe, and hookah) and then by users of e-cigarettes only. Nicotine metabolite profiles for non-Hispanic Black participants are distinctly different from other racial/ethnic groups; however, they are similar among daily users of different tobacco products. We demonstrated that TNE2 are highly correlated to TNE7 (correlation coefficient of 0.99), and therefore can be used as biomarkers of nicotine exposure when not all nicotine metabolites are measured in urine samples. The PATH Wave 1 data for urinary nicotine, its most prevalent metabolites, and total nicotine equivalents can provide a reference to compare PATH Study results to those of other studies and enable longitudinal analysis of trends in nicotine and HPHC exposure from tobacco product use.

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## PA27-4

### URINARY CONCENTRATION OF TOBACCO-SPECIFIC NITROSAMINES (TSNAs) IN THE US POPULATION FROM THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY

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Population Assessment of Tobacco and Health (PATH) Study was launched to generate longitudinal epidemiologic data on tobacco use behaviors, including patterns of use, attitudes, beliefs, exposures, and health among the U.S. population to inform, and to monitor the impact of FDA's regulatory actions under the Federal Food, Drug and Cosmetic Act to reduce tobacco-related death and disease. Certain *N*-nitrosamines associated with tobacco (tobacco-specific nitrosamines; TSNAs) through its cultivation and subsequent processing into commercial products are known carcinogens. Prevalent TSNAs include 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK), *N*'-nitrosonornicotine (NNN), *N*'-nitrosoanabasine (NAB), and *N*'-nitrosoanatabine (NAT). Urinary concentrations of TSNAs serve as biomarkers of human exposure to tobacco products and smoke, and 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanol (NNAL) serves as a specific biomarker of NNK. In Wave 1 of the PATH Study (September 2013 to December 2014), we measured total NNAL, NNN, NAT and NAB in spot urine samples from 11,880 tobacco users and nonusers age 18 years and older. Among all tobacco users, the detection rate for NNAL, NNN, NAT, and NAB was 96, 68, 74, and 72 percent, respectively. For all non users, NNAL detection rate is 62 percent, the other TSNAs detection rates are less than 10%. TSNA concentrations were associated with tobacco product and frequency of use. Among established daily tobacco product users, the geometric mean of urinary NNAL was highest for exclusive smokeless users (1021.8 ng/g creatinine), followed by combusted users (295.5 ng/g creatinine), multi-product users (279.8 ng/g creatinine), and exclusive e-cigarette users (6.3 ng/g creatinine). TSNAs were higher in daily users than intermittent users. Among users of a single product, exposure to the TSNAs differed by sex, age, race/ethnicity, and education. Urinary TSNAs and nicotine biomarkers were also highly correlated. se data provide baseline information on TSNA exposures among different tobacco users in the U.S. population and provide valuable information for FDA regulatory decisions.

FUNDING: Federal

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## PA27-5

### EXAMINING BIOMARKERS OF FOUR HARMFUL TOBACCO-SPECIFIC NITROSAMINES IN SMOKERS' URINE AND ORAL FLUID

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**SIGNIFICANCE:** Tobacco-specific nitrosamines (TSNAs), including known human carcinogens *N*'-nitrosonornicotine (NNN) and 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK), and other TSNAs *N*'-nitrosoanatabine (NAT) and *N*'-nitrosoanabasine (NAB) are harmful compounds formed primarily in tobacco during tobacco curing. NNN and NNK elevate cancer risk associated with tobacco use, especially for oral cancer among smokeless tobacco users. Compared to other TSNAs, urinary NNN is limited as a biomarker of exposure to this important carcinogen by its relatively low concentration in urine of tobacco users despite higher relative NNN content in many tobacco products. NNN has been reported to be higher in saliva compared with urine, and thus salivary NNN may be a useful exposure biomarker. We investigated salivary NNN and three other TSNAs as biomarkers of exposure to these harmful chemicals in oral fluid collected from cigarette smokers. **METHODS:** In the oral fluid of 30 self-described daily cigarette smokers we measured NNN, 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanol (NNAL, a specific biomarker of NNK), NAT, and NAB using solid-phase extraction (SPE) coupled to

isotope-dilution liquid chromatography-tandem mass spectrometry (LC-MS/MS). These were compared to matched urine samples collected at the same time and measured by an automated multi-step SPE method and the same LC-MS/MS protocol. **RESULTS:** The NNAL, NNN, NAT, and NAB detection rate in urine samples was 100 percent. The NNAL, NNN, NAT, and NAB detection rate in saliva samples was 93, 37, 13, and 7 percent, respectively. Urinary concentrations of all four TSNAs were consistent with measurements of smokers in more representative studies. TSNAs in saliva were consistently lower than urinary TSNAs. The average concentration of NNAL measured in urine was approximately 30 times the average measured in saliva. Urinary NNN was approximately 2 times higher than salivary NNN. **CONCLUSION:** In this small and temporally-limited study of cigarette smokers we find salivary TSNA levels to be lower than matched urinary TSNA levels. Further research is needed to characterize the utility of salivary TSNAs.

FUNDING: Federal

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## PAPER SESSION 28: PREGNANCY: TRANSLATIONAL RESEARCH

### PA28-1

#### SMOKING DURING PREGNANCY AS A RISK FACTOR FOR NEONATAL ABSTINENCE SYNDROME SEVERITY AMONG NEWBORNS PRENATALLY EXPOSED TO MEDICATION ASSISTED THERAPY FOR OPIOID ADDICTION TREATMENT

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**SIGNIFICANCE:** A frequent outcome of opioid use during pregnancy, or use of treatment drugs (MAT) to reduce opioid withdrawal/further opioid abuse, is neonatal abstinence syndrome (NAS). Decreasing the severity of NAS has been a recent focus of research and medical care recommendations, but much is unknown about which newborns will be most affected. The goal of the current study was to examine other prenatal substance exposure, including pregnancy tobacco use, as possible risk factors for increased NAS severity. **METHODS:** Participants were 129 newborns diagnosed with NAS whose mothers received MAT during pregnancy. Data were obtained through review of delivery medical charts and included demographic and medical variables. Length of newborn hospital stay represented NAS severity, and drug exposure variables were constructed from self-report and biochemical testing results. **RESULTS:** Rates of other pregnancy substance use were high in this population including tobacco (93% at any point during pregnancy, 85% in the final month), benzodiazepines (31%, 9%), marijuana (22%, 12%) and alcohol (8%). Marijuana and alcohol exposure were not significantly related to newborn length of stay. However, both tobacco and benzodiazepine exposure predicted significantly ( $p < .05$ ) longer hospital stays, with the longest hospital stays for those infants whose exposure occurred in the final 1 to 3 months of gestation. After consideration of potential demographic and medical confounders, infants exposed to both tobacco and benzodiazepines in the final months of pregnancy stayed in the hospital more than 11 days longer than those without such exposure ( $t = 2.98$ ,  $p < .01$ ). **CONCLUSIONS:** Efforts to reduce NAS severity among those using MAT during pregnancy should focus not just on known, contraindicated prescription medications like benzodiazepines, but also on addressing pregnancy smoking, which appears to have both independent and synergistic effects. Women receiving MAT during pregnancy should be aware that eliminating tobacco use during pregnancy can lessen the severity of NAS in their newborns, and their providers should offer appropriate advice and assistance to encourage smoking cessation.

**FUNDING:** Junior League of Johnson City

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### PA28-2

#### PROSPECTIVELY COLLECTED RESEARCH DATA VS. DATA EXTRACTED FROM THE ELECTRONIC MEDICAL RECORD TO DETERMINE SMOKING BEHAVIOR DURING PREGNANCY

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**SIGNIFICANCE:** As electronic medical records (EMR) become ubiquitous and large-scale research funding dwindles, studies increasingly rely on data extracted from EMRs. Little is known about completeness and accuracy of EMR data when used for research. The study goal was to compare information on smoking behavior during pregnancy from research interviews (RI) with parallel information from the prenatal EMR. **METHODS:** 1063 women participating in a study of pregnancy health behaviors were included. An RI at entry to prenatal care used ACOG-recommended questions for smoking status, amount, and second hand smoke (SHS) exposure. These same questions were used by the medical providers at the initial prenatal visit with responses recorded in the EMR, and manually extracted for this study. **RESULTS:** RI data were 100% complete for smoking status, but missing from the EMR for 20% of participants, who differed from those with data on several key demographics. Where data from both sources existed, rates of smoking were similar (RI=40%, EMR=38%) and 96% agreement occurred, with 3% who denied smoking in the EMR admitting smoking during the RI, and 5% who denied smoking in the RI admitting to smoking in the EMR. Similarly, SHS status for the RI was 99% complete, but missing in the EMR for 21% of women. However, only

76% agreement occurred. Finally, amount of smoking from the RI was significantly higher ( $M = 7.9$  cig/day, range 1-70) than reported in the EMR ( $M = 3.9$ , range 1-40,  $p < .01$ ), with the two sources only moderately correlated ( $r = .58$ ). **CONCLUSIONS:** Even when using the same questions (likely representing the best case scenario for agreement), EMR data was incomplete and differences in responses and/or what was recorded occurred, especially for amount of smoking and SHS exposure. While rates of disclosure of smoking and SHS exposure may not be higher in a research interview, and characteristics of women, providers, and interviewers may play a role, pregnant women may be more willing to accurately report how much they are smoking in a research context. Use of EMR data alone to describe smoking behavior in pregnant women may not always be complete, representative, or accurate.

**FUNDING:** State

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### PA28-3

#### EFFECT OF LOW AND HIGH FINANCIAL INCENTIVES ON BIRTH WEIGHT OF NEWBORNS TO PREGNANT SMOKERS ENROLLED IN A CONTINGENCY MANAGEMENT INTERVENTION TRIAL

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**SIGNIFICANCE:** Smoking during pregnancy is an important risk factor for fetal outcomes, with long term consequences on health. Smoking cessation interventions targeting pregnant women have shown mixed effects on newborn outcomes. One intervention that has showed promise is contingency management, which provides financial incentives to women for abstaining from smoking during pregnancy. This study assessed the effect of different sizes of financial incentives on birth weight. **METHODS:** Women who reported current cigarette smoking or recent quitting at enrollment in prenatal care were assigned by clinic to two incentive groups and a control group without any financial incentive for quitting. Women in the high level financial incentive group received a \$50 gift card when they reported abstinence from smoking at each prenatal care visit. Women in the low level financial incentive received a \$25 reward for reported abstinence. Urine cotinine tests were conducted by clinic staff at all visits. We performed a multivariate regression to estimate the effect of financial rewards on birth weight. **RESULTS:** Out of 286 pregnant women who completed the study, 103 (36%) were in the high level financial incentive group, 93 (33%) in the low level financial incentive group, and 90 (31%) in the control group. After controlling for gestational age, gender, Apgar values, method of delivery, and mother's age and socioeconomic characteristics, the study found no effect of low level financial incentives on birthweight. However, newborns to women in the high level financial incentive group were 113.1 gr. ( $p = 0.04$ ) heavier than newborns in the control group. **CONCLUSIONS:** This study found that the size of financial incentives had a differentiated effect on birth weight. A low incentive of \$25 per prenatal visit was not enough to produce effects on birth weight. However, doubling the incentive to \$50 produced a large birth weight gain equivalent to almost half the negative effect of smoking on birth weight reported in the literature.

**FUNDING:** State

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### PA28-4

#### A 'REAL-WORLD' EVALUATION OF FINANCIAL INCENTIVES TO HELP PREGNANT WOMEN STOP SMOKING

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**SIGNIFICANCE:** Helping pregnant women who smoke to quit is a priority. Although many women manage to stop smoking during pregnancy, a significant number cannot. Trials have demonstrated the effectiveness of financial incentives in helping pregnant women quit smoking. Counties Manukau District Health Board, which serves a high-needs population, introduced an incentives scheme in its stop smoking service in August 2013. Women who quit (validated by a carbon monox-



ide (CO) reading < 5 ppm), are provided with shopping vouchers to the value of NZ\$50, \$100, \$100, and \$50 at 1, 4, 8 and 12 weeks after their target quit date (TQD). METHODS: Data from all cases referred between January 2012 and June 2017 were extracted from the service database. Cases completed before August 2013 were without financial incentives and did not have self-reported smoking status CO validated. We used pre-post comparisons (chi-squared test) on the following variables: numbers of referrals, attendance, setting a TQD, demographics, tobacco dependence, and 12-week quit rates (self-reported pre-incentives vs. CO-validated with-incentives). Logistic regression was used to adjust for any variables that differed between the periods. RESULTS: Annual referrals approximately doubled after the introduction of incentives (138 vs. 279 per annum; 1384 referrals in total). Incentives increased the proportion of women who attended for assessment (60% vs. 68%,  $p=0.026$ ) and set a TQD (33% vs. 49%,  $p<0.001$ ). Incentives also attracted proportionally more Māori (48% vs. 59%,  $p=0.008$ ) and women < 30 years of age (35% vs. 69%,  $p<0.001$ ). There was no significant difference in the proportion of women who smoked within the first 30 minutes of waking (57% vs. 58%). Quit rates at 12-weeks were 11% vs. 46% ( $p<0.001$ ) at a cost of \$449 per 12-week quitter. The benefit of incentives remained after adjusting for ethnicity and age (OR=4.99, 95% CI: 2.20-11.33,  $p<0.001$ ). CONCLUSIONS: Financial incentives implemented within a stop smoking service can have a positive impact on priority groups, such as pregnant women who smoke.

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## PA28-5

### SMOKING AND QUITTING SMOKING DURING PREGNANCY: A QUALITATIVE EXPLORATION OF THE SOCIO-CULTURAL CONTEXT FOR THE DEVELOPMENT OF A COUPLE-BASED SMOKING CESSATION INTERVENTION IN ROMANIA

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SIGNIFICANCE: Smoking during pregnancy has significant negative effects on the mother and the unborn infant. Barriers and facilitators to smoking cessation during pregnancy are context-dependent and multifaceted. This qualitative research was conducted to explore pregnant women's experience with smoking and cessation in Romania, and inform the development of the Quit Together program, a couple-focused smoking cessation intervention. METHODS: We conducted semi-structured, in-depth interviews via telephone, with 15 pregnant women who smoked during pregnancy (8) or had quit smoking upon learning about the pregnancy or shortly before (7). Pregnant women were considered eligible if they were 18 years of age or older, were current smokers or had quit smoking in the past 6 months, were married or were living with a partner. A hybrid inductive-deductive approach to thematic analysis was used, to identify patterns in the data and explore women's narratives, in relation to smoking and smoking cessation. RESULTS: Three main themes emerged from the data, which shaped the socio-cultural adaptation of the intervention to the local context: (1) Access to and mixed messages from the healthcare system: describes the lack of a coherent discourse from the healthcare system regarding smoking during pregnancy, with some physicians not emphasizing the need for cessation; (2) Cessation as individual or team effort: variations in partner dynamics and difficulty in quitting being have important roles in perceptions about team efforts; and (3) Transition to motherhood and motivation to quit: even if most women were strongly motivated to quit for the health of the pregnancy and the infant, in isolated cases, women felt less connected with the pregnancy and these motivators. DISCUSSION: Pregnant women in Romania face systemic, interpersonal, and individual-level barriers which can be responsively integrated in smoking cessation interventions, through culturally adapting them to the local context.

FUNDING: Federal

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## POSTER SESSION 1

### POS1-1

#### EFFECT OF SWITCHING TO LOW OXIDANT CIGARETTES ON OXIDATIVE STRESS BIOMARKERS

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**SIGNIFICANCE:** Oxidants, including free radicals and carbonyls, are a major class of toxicant in cigarette smoke. Oxidant-induced stress/damage plays critical roles in the development and progression of tobacco-related diseases including COPD, cancer and CVD through their widespread impact on many cellular pathways including cell proliferation, survival and inflammation. Free radical delivery in cigarette smoke is high, with highly reactive radicals reaching ~14 nmol/cigarette in the gas phase. Likewise, overall delivery of carbonyls, including reactive aldehydes such as acrolein, acetaldehyde and crotonaldehyde, is high, reaching ~15 µmol/cigarette. In laboratory studies where different popular US cigarette brands were machine-smoked, we found large variation in the delivery of both free radicals (>12-fold) and carbonyls (3-6-fold). Levels of radicals were highly correlated with carbonyls, indicating that overall oxidant delivery was highly dependent on brand. The present goal was to translate these findings to determine the impact of switching from high to low oxidant products on biomarkers of oxidative stress/damage in smokers. **METHODS:** We conducted a pilot switching study in healthy adult smokers who switched from typical high oxidant to low oxidant cigarettes based on our data from the laboratory. In this randomized study, a total 14 subjects switched from their usual cigarette to a reduced oxidant cigarette for 2 weeks and smoking topography, and biomarkers of exposure (plasma cotinine) and oxidative stress/damage, including 8-hydroxydeoxyguanosine (8-OHdG, oxidative DNA damage) and 8-isoprostane (8-IsoP, lipid peroxidation) and oxidized/reduced glutathione (GSSG:GSH ratio, redox status) were analyzed before and after switching. **CONCLUSIONS:** A decline in all 3 biomarkers of oxidative stress was observed after 2 wk, with 8-OHdG decreasing by 20% ( $P < 0.05$ ), GSSG:GSH by 21% ( $P < 0.05$ ) and 8-IsoP by 29% ( $P = 0.06$ ). Switching had no effect on smoking behavior (topography) or exposure (cotinine). Altogether, these findings support the hypothesis that switching to lower oxidant delivery products results in a reduction in oxidant exposure and harm.

**FUNDING:** Federal

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### POS1-2

#### POSITIVE MODULATION OF ADENOSINE A<sub>2A</sub> RECEPTORS REDUCES NICOTINE SELF-ADMINISTRATION IN THE NEONATAL QUINPIROLE MODEL OF SCHIZOPHRENIA

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Adenosine A<sub>2A</sub> receptors (A<sub>2A</sub>Rs) form a heteromeric complex with dopamine D<sub>2</sub> receptors (D<sub>2</sub>Rs), primarily in the striatum, and A<sub>2A</sub>R agonists allosterically decrease D<sub>2</sub>R affinity. Nicotine self-administration (NSA) activates D<sub>2</sub>Rs by quantal release of dopamine in the ventral striatum and NSA increases expression of high affinity D<sub>2</sub>Rs in the ventral striatum. We hypothesized that increasing adenosine A<sub>2A</sub>R activity with an agonist CGS 21680 (CGS) or an adenosine kinase inhibitor ABT-702 (ABT), would reduce nicotine self-administration. We also hypothesized that rats with hypersensitized dopamine D<sub>2</sub> receptors from neonatal quinpirole (NQ) exposure would be more sensitive to the effects of positive A<sub>2A</sub>R modulation. On Postnatal Day 1 rats were assigned to one of 3 groups: Control (no neonatal injections), NQ, or neonatal saline (NS) injections. NQ and NS rats received 1 mg/kg quinpirole or 1 ml/kg saline from post-natal days (P) 1-21. On approximately P60 all rats were instrumented for intravenous nicotine self-administration and allowed to self-administer nicotine (30, 60, or 90 µg/kg/infusion, base) under an FR 5 schedule of reinforcement. After responding stabilized, we began pretreatment tests with ABT (15-180 µg/kg, IP, 60 min before testing) and CGS (30-180 µg/kg, IP, 15 min before testing). There was no evidence of a change in baseline between drug pretreatment tests. The lowest doses of ABT (15 µg/kg) and CGS (30 µg/kg) significantly and selectively reduced responding for nicotine; spontaneous behavior (inactive lever responding) was not altered by these doses. Higher doses of both compounds non-selectively suppressed behavior. NQ, NS, and control rats

had similar sensitivity to the A<sub>2A</sub>R modulators. There were no interactions between A<sub>2A</sub>R modulators and sex or nicotine dose. Our findings confirm that increasing the activity of A<sub>2A</sub>Rs reduces nicotine self-administration. The findings suggest that the A<sub>2A</sub>-D<sub>2</sub> heteromer may play a role in nicotine reinforcement and may relate to increased tobacco use in psychiatric disorders with a pathophysiology that includes increased sensitivity of D<sub>2</sub>Rs (e.g., psychosis).

**FUNDING:** Federal; Academic Institution

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### POS1-3

#### TABACCO SMOKE EXPOSURE INCREASES THE REWARDING EFFECTS OF NICOTINE IN FEMALE RATS

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**SIGNIFICANCE:** The rewarding effects of nicotine play a role in the onset of smoking and withdrawal symptoms and craving maintain smoking. Smoking often starts with experimenting with cigarettes, which then develops into more regular smoking. It is currently not known if experimenting with cigarettes can have a delayed effect on the rewarding effects of nicotine. Therefore, we investigated if passive exposure to tobacco smoke affects the rewarding effects of nicotine in males and females at a later time point. **METHODS:** To investigate the effects of tobacco smoke and nicotine on brain reward function, rats were prepared with electrodes in the medial forebrain bundle and trained on the intracranial self-stimulation (ICSS) procedure. This procedure allows us to investigate the rewarding and aversive properties of nicotine. The rats were exposed to smoke for 7 days and the effect of this on the rewarding effects of nicotine was investigated 3 weeks later. **RESULTS:** Exposure to tobacco smoke did not change the ICSS thresholds and thus did not affect the state of the brain reward system. The nicotine receptor antagonist mecamylamine did not elevate the brain reward thresholds after the rats had been exposed to tobacco smoke. This indicates that exposure to smoke did not lead to the development of dependence. Three weeks later, it was investigated if prior exposure to smoke affects the rewarding effects of nicotine. The administration of nicotine led to a decrease in brain reward thresholds, which indicates that nicotine potentiates brain reward function. The statistical analysis revealed that there was an effect of sex on the response to nicotine. Nicotine induced a larger decrease in ICSS thresholds in female compared to male rats. However, this effect was only observed in the females that has been exposed to tobacco smoke. **CONCLUSION:** In females, exposure to smoke may enhance the rewarding effects of nicotine at a later time point. This suggests that in particular in females, experimenting with cigarettes might increase the risk for developing an addiction by increasing the rewarding properties of nicotine.

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### POS1-4

#### EXPLORING THE INTEROCEPTIVE STIMULUS EFFECTS OF VARENICLINE

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**SIGNIFICANCE:** Despite many failed quit attempts, around 17% of adults in the US still smoke. Future behavioral and pharmacological treatment could benefit from studies on basic science and learning processes to increase their effectiveness. Thus, we studied for the first time the interoceptive conditioning processes with varenicline as the training stimulus. Varenicline, an agonist at alpha-7 and a partial agonist at alpha-4 beta-2 nicotine acetylcholine receptor (nAChR) subunits, is prescribed in the US as the smoking cessation aid Chantix. **METHODS:** Rats were trained to discriminate a varenicline (1 mg/kg) interoceptive stimulus from a baseline non-pharmacological stimulus (saline) in a drug discriminated goal-tracking task. In acquisition, rats were given an injection of varenicline before the start of a 20-min session in which intermittent access to 26% sucrose was available. On interspersed saline days, sucrose was withheld. Following acquisition were dose-effect generalization and substitution tests with varenicline, nicotine, saze-

dine-A (saz-A), and bupropion. RESULTS: An increase in head entries in the dipper receptacle was seen before the first sucrose delivery (i.e., goal-tracking) on varenicline but not on saline sessions. This outcome indicates that the varenicline stimulus can acquire control over appetitive goal-tracking behavior; an effect we have reported with nicotine (0.05 to 0.6 mg/kg). All test compounds except bupropion dose-dependently evoked goal-tracking to a level controlled by the 1 mg/kg varenicline stimulus. Specifically, moderate doses of varenicline (0.1 to 3 mg/kg), nicotine (0.05 to 0.4 mg/kg), and saz-A (0.3 and 1 mg/kg) fully substituted for the training stimulus. The highest dose of varenicline (3 mg/kg) and lowest dose of nicotine (0.025 mg/kg) partially substituted for the varenicline training stimulus. Bupropion (10 to 30 mg/kg) and saz-A at 3 mg/kg did not differ from saline-evoked responding. CONCLUSIONS: These findings suggest that compounds with nAChR agonist actions substitute for varenicline in this task. Future studies should address which nAChR subunits are involved in the substitution patterns described in this study.

FUNDING: Federal

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## POS1-5

### CARBONYL COMPOUNDS IN EXHALED E-CIGARETTE AEROSOLS

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INTRODUCTION: In recent years, use of e-cigarettes has increased at a rapid rate. Several studies showed the presence of toxic aldehydes (i.e., formaldehyde, acrolein) in direct emissions of some e-cigarettes. For this reason, concerns have been raised regarding their potential toxicity. The purpose of this research was to measure levels of carbonyls in exhaled breath of e-cigarette users during "vaping" sessions and estimate the respiratory tract (RT) uptake of aldehydes, such as formaldehyde and acetaldehyde. METHODS: We measured concentrations of 12 carbonyls in e-cigarette aerosols produced directly by e-cigarettes and in exhaled breath of 18 subjects who used their own e-cigarette devices. A subset of subjects was also offered a different e-cigarette (the same for all subjects in this subgroup). Carbonyls were sampled on 2,4-dinitrophenylhydrazine (DNPH) cartridges and analyzed with High Performance Liquid Chromatography (HPLC) coupled with UV-Vis photodiode detector. RESULTS: We found that in most cases levels of carbonyls were significantly higher (2 - 125 times) in exhaled e-cigarette aerosols than in pre-exposed breath. Next, we examined the retention of formaldehyde and acetaldehyde in volunteers' RT. The mean value of formaldehyde RT retention was found to be 99.3±0.8% for all volunteers, while in the case of acetaldehyde it was 84±15%. The high uptake of aldehydes was expected, since these compounds are water soluble and well retained by RT hydrophilic surface. When subjects used an unfamiliar e-cigarette, the RT retention of formaldehyde was lower than during sessions with a familiar device. This could be due to changes in puff topography or other factors that need to be investigated further. CONCLUSIONS: Within the limitations of a small number of volunteers, results show that there is a statistically significant increase of breath carbonyls during e-cigarette use sessions. The high RT retention of formaldehyde and acetaldehyde stresses the importance of future studies on e-cigarette emissions, their health effects, and ways to reduce aldehyde formation in e-cigarette vapors.

FUNDING: Academic Institution

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## POS1-6

### CIGARETTE DEMAND AND DELAY DISCOUNTING AMONG SMOKERS MOTIVATED TO QUIT

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BACKGROUND: Cigarette demand (i.e., relative reinforcing value of cigarettes) and delay discounting (DD; i.e., preference for smaller immediate rewards over large delayed rewards) are frequently used to explore decision making among cigarette smokers. Several studies have demonstrated that higher demand for cig-

arettes and greater DD is associated with higher levels of nicotine dependence, heavier smoking, and poorer cessation outcomes. To date, however, there are few studies that have compared both measures and their relationship with smoking-related measures and treatment outcomes. The aims of this study were to examine (1) the relationship between demand indices and DD, (2) their association with craving, nicotine dependence, and heaviness of smoking, as well as (3) the association of demand indices and DD with treatment outcomes. METHODS: Participants were 30 cigarette smokers interested in quitting who enrolled in a controlled trial aimed at assessing the efficacy of a minimal intervention to reduce cigarette smoking. Cigarette demand and DD were assessed using the cigarette purchase task and the 5-trial adjusting delay task, respectively. Participants also completed the brief questionnaire on smoking urges and a smoking history questionnaire. RESULTS: Breakpoint was the only index associated with DD ( $p = 0.015$ ). Intensity and elasticity were significantly associated with craving ( $p = 0.016$  and  $p = 0.034$ ), nicotine dependence ( $p = 0.021$  and  $p = 0.014$ ), and cigarettes smoked per day ( $p = 0.028$  and  $p = 0.05$ ). DD was positively associated with craving ( $p < 0.001$ ) and nicotine dependence ( $p = 0.003$ ). Higher elasticity was associated with a greater reduction on both cigarettes smoked per day ( $p = 0.027$ ) and nicotine dependence ( $p = 0.029$ ). CONCLUSIONS: These findings provide evidence of the relevant association between smoking-related measures and both cigarette demand indices and DD. Additionally, this study further confirms that cigarette demand indices are valid predictors of treatment outcome. Future studies should explore whether these results may be extended in vulnerable subpopulations of smokers.

FUNDING: Federal

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## POS1-7

### SUBSTITUTABILITY OF NICOTINE ALONE AND AN ELECTRONIC CIGARETTE LIQUID USING A CONCURRENT CHOICE ASSAY IN RATS: A BEHAVIORAL ECONOMIC ANALYSIS

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BACKGROUND: Understanding the contribution of non-nicotine tobacco constituents to the abuse liability of tobacco is fundamental to the Food and Drug Administration's mandate to maintain a list of Harmful and Potentially Harmful Constituents to regulate tobacco products. Our lab has found that electronic cigarette refill liquids (EC liquids), which contain such constituents, have a similar abuse liability (i.e., demand elasticity) to an equivalent dose of nicotine (Nic) alone. These results suggest that these constituents do not contribute to the abuse liability of EC liquids. However, unlike a nicotine marketplace, these formulations were only available in isolation. Concurrent availability may reveal differences in abuse liability. METHODS: The present study measured differences in demand elasticity for Nic alone and an EC liquid when only one formulation was available (alone-price demand) and when both formulations were concurrently available (own-price demand), allowing an assessment of the degree to which each formulation served as a substitute (cross-price demand) when available at a low fixed-price. RESULTS: For both formulations, own-price demand was significantly more elastic compared to alone-price demand, indicating that availability of an alternative reinforcer increased demand elasticity. During concurrent access, consumption of the fixed-price formulation increased as the unit-price of the other formulation increased. The rate of increase was similar between formulations, indicating that they served as symmetrical substitutes. CONCLUSION: Demand elasticity was similar between formulations regardless of whether they were available alone or concurrently, suggesting that levels of non-nicotine tobacco constituents in the EC liquid did not contribute to its abuse liability.

FUNDING: Federal

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**POS1-8****NICOTINE ENHANCES THE DEMAND FOR SUCROSE, ETHANOL, AND SUCROSE-SWEETENED ETHANOL IN MALE AND FEMALE WISTAR RATS**

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Nicotine and alcohol dependence are highly correlated: up to 80% of alcohol-dependent persons in the US smoke regularly, and risk of alcohol dependence is four times higher among people who are nicotine dependent. A growing body of research demonstrates that nicotine enhances behavior maintained by appetitive and sensory reinforcement, and this effect is a significant contributor to overall nicotine reward. Previous work has shown that nicotine enhances the reinforcement value of appetitive rewards, such as liquid sucrose or food pellets. Recently, we demonstrated that nicotine dose-dependently enhanced consumption of a 15% ethanol solution in Wistar rats, and that this effect is sensitive to response cost (i.e. FR schedule). A notable feature of most alcoholic drinks typically consumed by humans is that they include a mixture of ethanol and other carbohydrates, including sucrose. Given that nicotine enhances both sucrose and ethanol separately, interesting questions arise regarding the nature of nicotine enhancement on reinforcement consisting of a combination of the two. In the present study, we assessed the effects of nicotine (0, 0.1 and 0.4 mg/kg) on the self-administration and consumption of 2% sucrose, 12% ethanol, or 2% sucrose + 12% ethanol solution in male and female Wistar rats. All rats were trained to self-administer 12% ethanol solution before being assigned to the Sucrose Only, Ethanol Only, or sucrose + ethanol Blend groups. Self-administration was assessed over a range of FR schedules, and reinforcer consumption as a function of unit response cost was evaluated. A reinforcer demand model (Hurst, 2014) was applied to evaluate the effects of nicotine on reinforcement value between solution conditions. Nicotine enhanced the value of both ethanol and sucrose alone, as well as the combined solution of the two. Reinforcement value and its enhancement by nicotine in the Blend group differed from the simple summation of its components. These findings suggest that the effects of nicotine on ethanol seeking and consumption differ between conditions when ethanol is available alone or in combination with other appetitive rewards.

FUNDING: Federal

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**POS1-10****NICOTINE DIFFERENTIALLY IMPACTS FEAR EXTINCTION AND SPONTANEOUS RECOVERY IN ADOLESCENT AND ADULT MICE**

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**SIGNIFICANCE:** Adolescence is a period of high risk for the initiation of nicotine product usage and exposure to traumatic events. In parallel, nicotine exposure has been found to age-dependently modulate acquisition of contextual fear memories; however, it is unknown if adolescent nicotine exposure alters extinction of fear related memories. Age-related differences in sensitivity to the effects of nicotine on fear extinction could increase or decrease susceptibility to anxiety disorders. In this study, we examined the effects of acute nicotine administration on extinction and spontaneous recovery of contextual fear memories in pre-adolescent, late adolescent, and adult mice. **METHODS:** Pre-adolescent (PND 23), late adolescent (PND 38), and adult (PND 53) C57BL/6J mice were trained in a background contextual fear conditioning paradigm and given an intraperitoneal injection of one of four doses of nicotine (0.045, 0.09, 0.18, or 0.36 mg/kg, freebase) prior to subsequent extinction or spontaneous recovery sessions. **RESULTS:** All acute nicotine doses impaired extinction of contextual fear in adult mice. However, late adolescent mice only exhibited impaired contextual fear extinction following higher doses of acute nicotine, and contextual fear extinction was unaffected by acute nicotine exposure in early adolescent mice. Additionally, acute nicotine exposure enhanced spontaneous recovery of fear memory only in adult mice. **CONCLUSIONS:** Overall, our results suggest that younger mice were less sensitive to nicotine's impairing effects on extinction of contextual fear and to nicotine's enhancing effects on spontaneous recovery of contextual fear memories.

FUNDING: Federal; Academic Institution

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**POS1-11****PROMOTER HYPERMETHYLATION OF P53 AND PAR2 GENES IN BLOOD LYMPHOCYTES AND ORAL EPITHELIAL CELLS IS ASSOCIATED WITH WATERPIPE SMOKING**

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**SIGNIFICANCE:** Cigarette tobacco use has been shown to cause cancer through different mechanisms that include epigenetic modulation of tumor-suppressor genes. In the present study, the association between *p53* and *PAR4* gene promoter methylation and waterpipe tobacco smoking was investigated. **METHODS:** Blood lymphocytes and oral epithelium were sampled from 150 pure waterpipe smokers and 150 non-smokers from Jordan. Methylation assessment was performed using the methylation specific PCR technique. **RESULTS:** Results showed significant increases in *p53* and *PAR4* gene promoter methylation among waterpipe smokers compared to non-smokers ( $P < 0.01$ ). Moreover, the magnitude of DNA methylation was higher in older waterpipe subjects (age > 30 years) compared to young ones (age 18-29) ( $P < 0.01$ ). Finally, methylation of the promoters of examined genes was prominent in both oral epithelium and blood lymphocytes. **CONCLUSIONS:** Collectively, the results indicate that waterpipe tobacco use is associated with epigenetic changes that might predispose users to lung and blood cancers. The results highlighted the need for actions against waterpipe smoking and can be used in cessation interventions that target this type of smoking.

FUNDING: Federal

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**POS1-12****THE EFFECT OF BRIEF MINDFULNESS TRAINING ON BRAIN ACTIVITY ASSOCIATED WITH FOOD IMAGES DURING NICOTINE WITHDRAWAL**

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**BACKGROUND:** On average, people who quit smoking gain 10 pounds, and roughly one third of people gain over 20 pounds. Mindfulness training has been established as an effective treatment for tobacco dependence, but has yet to be studied for its effect on post-cessation weight gain. Design: This pilot study (N=5) was conducted to address whether or not brief mindfulness training with 1 week of daily practice affects brain activity associated with hedonic eating, assessed via functional magnetic resonance imaging (fMRI). Participants received 60 minutes of training in mindfulness meditation and mindfulness of eating, and were instructed to practice 15 minutes of meditation per day and practice mindfulness during meals. fMRI scans tracked cue-induced responses to salient food images and matched control images in a block paradigm. Two fMRI scans were conducted on each participant – the first was prior to initial mindfulness training and the second was after 1 week of mindfulness practice. Scans were conducted during nicotine withdrawal induced by 12-hour smoking abstinence. Baseline variables of nicotine dependence, food craving, mindfulness, and perceived stress were measured. **RESULTS:** The sample included five adult smokers with a history of smoking 10 or more cigarettes per day and weight gain following previous cessation attempts. Baseline measures of nicotine dependence and food craving were correlated,  $R=0.8$ ,  $p<0.1$ . Mindfulness training and practice was found to be significantly associated with reduced brain activity in dorsomedial prefrontal cortex (dMPFC), visual areas, and somatosensory cortex when comparing responses to all food images vs. control images. These statistic images were thresholded using clusters with  $Z>2.3$  and a corrected cluster significance threshold of  $P=0.05$ . There were no significant pre-post intervention changes on self-reported measures. **DISCUSSION:** This was a small trial, but results could have interesting implications because observed changes in neural reactivity could be attributed to downregulating sensory processing of food images as a result of mindfulness training on food craving.

FUNDING: Federal

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**POS1-13****A TALE OF TWO MICROBES: BACTERIAL AND VIRAL INTERACTIONS WITHIN THE ORAL CAVITY OF TOBACCO USERS**

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**SIGNIFICANCE:** The human oral cavity is home to a complex microbial ecosystem dominated by bacteria and bacteriophages, *i.e.* bacteria-infecting viruses. Phage-bacteria interactions are key in shaping microbial community structure, yet little is known about how tobacco use affects their dynamics. Here, we aimed to identify the dominant bacterial taxa present in the human oral cavity, and characterize their expressed adaptive immune system CRISPR/Cas (Clustered Regularly Interspaced Short Palindromic Repeats / CRISPR-associated system). The short DNA sequences (spacers) contained in CRISPR arrays represent a form of acquired immunity against "infection" by foreign DNA (e.g. viruses), and can be used to trace infection history between bacteria and bacteriophages. **METHODS:** Nine participants were recruited, completed demographic/tobacco-use questionnaires, and provided saliva samples once a month for four months. To characterize bacterial constituents, total DNA was extracted from each sample, PCR-amplified for the V3/V4 hypervariable region of the 16S rRNA gene, and sequenced. Furthermore, to characterize the expression of CRISPR/cas, total RNA was extracted from each sample, and shotgun sequenced using RNASeq. **RESULTS:** The 16S rRNA gene data revealed communities dominated by typical oral genera, such as *Streptococcus*, *Prevotella*, and *Veillonella*, regardless of tobacco use status (e.g. non-user, cigarette user and smokeless user). However, tobacco users had a larger and more diverse set of core operational taxonomic units (OTUs that occurred in 100% of samples), than non-users. In addition, over 20,000 unique CRISPR spacers were identified and nearly 4,000 unique repeats, with a portion homologous to the dominant bacterial genera. However, non-users were found to harbor a greater number of CRISPR spacers than tobacco users, which may allow for broader protection against bacteriophage predation. **CONCLUSIONS:** These results provide a more holistic understanding of the structure of microbial communities in the oral cavity, and some clues about how external exposures may govern their assembly and lead to disease states.

**FUNDING:** Federal

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**POS1-14****SECONDHAND SMOKE EXPOSURE INCREASES CISPLATIN RESISTANCE IN ORAL CANCER CELLS**

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**SIGNIFICANCE:** About 58 million Americans are exposed to secondhand (SH) smoke, and about 41,000 deaths in non-smoking adults and 900 deaths in infants yearly have been associated with SH smoke exposure. With 40.6% of children and almost half of non-smokers estimated to be exposed to SH smoke, there remains a pressing need to study the short and long term effects of SH smoke exposure. Both active and passive (SH) smoking have been associated with head and neck squamous cell carcinoma and other adult and childhood cancers. Moreover, continued smoking after cancer diagnosis increases drug resistance and reduces overall survival rate by about 50%. Yet, the effects of SH smoke on drug resistance are unknown. Here, we examined the effects of SH smoke exposure on cisplatin resistance in oral epithelial cancer cells. **METHODS:** To assess cisplatin resistance, oral cancer epithelial cell lines were exposed to 10 puffs or 100 puffs/5L of mainstream (MS) and sidestream (SS) smoke extracts for 48 h followed by exposure to both cisplatin (0.1-100  $\mu$ M) and extracts for 48 hours. Cell viability was assessed by the MTT assay. Cell survival after cisplatin treatment was evaluated by the clonogenic assay. Apoptosis and necrosis was evaluated using Annexin V/PI staining. Gene expression was assessed by quantitative PCR. **RESULTS:** After cisplatin treatment, cells exposed to SS smoke extract showed a significant increase in cell viability and IC50 values. Similarly, after cisplatin treatment, cells exposed to SS smoke had significantly higher numbers of colonies compared to control cells. Cells exposed to SS smoke extract and treated with cisplatin showed significantly less apoptosis and necrosis than non-exposed cells. Key multidrug and DNA repair genes were significantly upregulated in SS smoke exposed cells.

**CONCLUSIONS:** Altogether, our data suggest that even short-term exposure to SH smoke can lead to cisplatin resistance in oral cancer cells by dysregulating the cells multidrug resistance, DNA repair, and cell death pathways. These data has major clinical implications for cancer patients exposed to SH smoke.

**FUNDING:** Federal; Academic Institution

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**POS1-15****TRAIT COGNITIVE CONTROL AND COGNITIVE ENHANCEMENT FROM SMOKING**

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**INTRODUCTION:** Cognitive control (CC) refers to the ability to pay attention and remember information relevant to the task at hand. Smokers lower in trait CC may find smoking reinforcing because of nicotine-induced enhancement of CC. We hypothesized that trait CC would be negatively correlated with 1) self-reported motivation to smoke to enhance CC and 2) nicotine-induced enhancement of CC. **METHOD:** 137 heavy smokers (at least 15 cigarettes per day) participated. The Adult Temperament Questionnaire attentional control subscale was administered to assess trait CC and the Wisconsin Inventory of Smoking Dependence Motives (WISDM) cognitive enhancement subscale was used to assess CC enhancement as a motivation to smoke. Participants attended two sessions following 12-hours of smoking abstinence. During one session participants smoked four nicotine containing cigarettes (.60 mg nicotine yield) that were smoked 40 minutes apart, and another session during which four very low nicotine content cigarettes (< .05 mg nicotine yield) were smoked (double-blind, counterbalanced). The "concentration" item from the modified Cigarette Evaluation Questionnaire (mCEQ) completed following each cigarette was used to assess the extent to which nicotine enhanced CC. **RESULTS:** As hypothesized, trait CC was negatively correlated with the WISDM cognitive enhancement subscale ( $r = -.26, p = .003$ ). In contrast, trait CC was positively correlated with nicotine-induced enhancement of CC ( $r = .17, p = .04$ ). **CONCLUSIONS:** This pattern of findings support that smokers with lower trait CC report greater motivation to smoke for cognitive reasons, but that the actual level of improvement in CC may be less than higher CC smokers. This apparent paradox suggests that lower CC smokers may find CC enhancement more reinforcing because it may offset CC decrements, even if the level of CC enhancement is less than among higher CC smokers.

**FUNDING:** Federal

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**POS1-16****IMPACT OF VERY LOW NICOTINE CONTENT (VLNC) CIGARETTES ON WEIGHT**

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US Food and Drug Administration is considering lowering nicotine levels in cigarettes to minimally-addictive levels. In assessing the public health effect of this proposal, unintended consequences, such as weight gain, must be considered. **METHODS:** A secondary analysis was conducted on data from a 10-site clinical trial randomizing 1250 subjects to either: 1) immediate nicotine reduction (0.4 mg/g tobacco); 2) gradual reduction over 5 months with monthly dose changes (~15.9, 11.8, 5.3, 2.4, and 0.4 mg/g tobacco); or 3) conventional nicotine cigarettes (~15.9 mg). Weight was measured at baseline and at the end of each monthly dosing period. Weight change was compared on compliant subjects (urinary TNE < 12 at Week 20; n=697) across groups over time. Gender was also examined. A linear mixed effects model was conducted for the weight gain (from baseline) with a random intercept to account for multiple observations from an individual. **RESULTS:** Mean (SD) age was 46.5 (13.5), smoking 17.9 (8.7) CPD for 28.5 (13.8) years with a mean TNE of 21.0 (38.6) and 49.5% were female at baseline. Weight gain over the 20 week intervention was 1.56 kg in the gradual, 3.35 kg in the immediate and 0.41 kg in the control groups. The rate of weight gain in both the immediate and gradual groups was significantly higher than the control group (both  $p < 0.001$ ). Weight gain in the immediate vs gradual group was also significant ( $p < 0.001$ ). Analysis of data post Week 8 reveals that the difference in the rate of weight gain between the



gradual and immediate group was not significantly different ( $p=0.248$ ), suggesting that most of the weight gain in the gradual group occurs after the 11.8 mg dose. Gender was not a significant overall predictor of weight gain. However, the rate difference between gradual and control was greater in males than females ( $p=0.006$ ). CONCLUSION: Subjects in the immediate reduction group were approaching the average weight gain observed with smoking cessation (4.5 kg) after 5 months on VLNC cigarettes. Albeit weight gain may be a negative unintended consequence of VLNC, reducing the addictiveness of cigarettes would provide ultimately a greater public health benefit.

FUNDING: Federal

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## POS1-17

### PERCEIVED DISCRIMINATION, POINT-OF-SALE MARKETING, AND TOBACCO USE NORMS IN YOUNG ADULTS

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SIGNIFICANCE: This experimental study examined whether exposure to different levels of point of sale (POS) tobacco marketing influence tobacco use norms and whether this relationship is moderated by perceived racial/ethnic discrimination. METHODS: Participants were young adults (ages 18-24) recruited via Amazon Mechanical Turk ( $n=599$ ) in March 2017 who were randomized to view an image of a convenience store with high levels of tobacco advertising ('traditional store') or the same store, but with no tobacco advertising ('healthy store'). Regression analyses examined main and interactive effects of the experimental condition (healthy vs traditional store) and perceived racial/ethnic discrimination on the outcomes of (a) perceived difficulty for youth ( $< 18$ ) to purchase tobacco at the store and (b) perceived prevalence of cigarette smoking in the store neighborhood. RESULTS: Participant characteristics were balanced across conditions. Participants exposed to the healthy vs. traditional store had greater odds of perceiving that it was difficult for youth to buy tobacco (OR: 5.5, 95% CI [3.8, 8.0]), but this was moderated by perceived racial/ethnic discrimination. At higher levels of perceived discrimination, respondents reported no difference in difficulty for youth to purchase tobacco in either the healthy or traditional store, but at lower levels of perceived discrimination, respondents in the healthy vs. traditional store condition thought it would be harder for youth to purchase tobacco. Additionally, perceived prevalence of cigarette smoking in the pictured store neighborhood was lower in the healthy vs. the traditional store condition ( $b: -1.2$ , 95% CI [-1.5, -0.9]). No moderating effect of perceived discrimination was found. CONCLUSIONS: A healthy store intervention may shift social norms about youth access to tobacco and perceived prevalence of smoking among young adults. However, reducing exposure to tobacco marketing at POS may not change norms for those with higher levels of perceived discrimination. Addressing factors that reduce experiences with discrimination may be necessary to denormalize tobacco among the most vulnerable populations.

FUNDING: Nonprofit grant funding entity

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## POS1-18

### PRESENCE AND PLACEMENT OF TOYS IN THE TOBACCO RETAIL ENVIRONMENT

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SIGNIFICANCE: Research on the promotion of tobacco products inside licensed retailers focus on point-of-sale (POS) advertisements. We expand this focus to measure the presence and placement of toys in the tobacco retail environment that may influence the traffic patterns of children in these retailers. METHODS: In June 2017, we visited all tobacco retailers within a half-mile radius of the 41 high schools participating in the 2014 NJYTS ( $n=191$ ). Raters coded for store type (e.g., chain convenience, non-chain convenience, etc.), product availability (e.g., cigarettes, cigarillos, e-cigarettes, and hookah) as well as the number of interior and exterior advertising for these products. We also documented if the stores sold toys and if toys were sold at the register. RESULTS: Almost half (46.6%) of all to-

bacco retailers surveyed sold toys and 28.8% sold toys at the register. Non-chain convenience stores had the highest percentage of toy availability (55.1%) and toys sold at the register (65.4%). Among stores that sold toys *anywhere* in the store, 30.3% had interior cigar ads and 27% had interior e-cigs ads, vs. 18.6% and 7.8%, respectively, in stores that did not sell toys. Among stores that sold toys *at the register*, 34.5% had interior cigar ads and 30.9% ad interior e-cig ads, vs. 19.9% and 11%, respectively, in stores that did not sell toys at the register. Among stores that sold toys *anywhere* in the store 64% sold e-cigs and 14.6% sold hookah vs. 26.4% and 7.8%, respectively, in stores that did not sell toys. Among stores that sold toys *at the register*, 58.2% sold e-cigs and 21.8% sold hookah tobacco, vs. 38.2% and 6.6%, respectively, in stores that did not sell toys at the register. CONCLUSION: We find higher rates of interior cigar and e-cigarette advertising along with higher rates of e-cigarette and hookah availability in stores that sell toys. More research is needed to more closely examine how the presence and placement of kid-friendly items such as toys in tobacco retailers may influence youth exposure to tobacco products and advertising as well as how states and localities may regulate the tobacco retail environment to decrease the appeal to youth.

FUNDING: State

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## POS1-19

### WHOLESALE CIGARETTE PRICES IN CANADA: INDUSTRY REVENUE VS. FEDERAL EXCISE TAX, 2003-2016

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SIGNIFICANCE: A key aspect of tobacco industry lobbying in Canada is strong opposition to all increases in tobacco taxes. Excise taxes, of course, are an important component of tobacco prices and have been a very effective tool for reducing tobacco consumption in Canada. A much less examined component of tobacco prices in Canada has been the revenue companies receive for their products and how those revenues are driven by cigarette price increases initiated by the companies themselves. This presentation examines key trends in reported wholesale cigarette prices in Canada since 2003. METHODS: Canada's Tobacco Reporting Regulations (TRR) require tobacco manufacturers and importers to report information on their products, including sales volume and wholesale value for each brand of cigarettes. Knowing both the average per-unit wholesale price of cigarettes and the excise tax rates since 2003, we asked the following question: To what extent have tobacco company price increases contributed to increases in the reported wholesale price under the TRR? RESULTS: The average unit wholesale price of cigarettes increased by 47% between 2003 and 2016. The federal excise tax has been responsible for 34% of this increase, while tobacco industry cigarette price increases have been responsible for 66%. In 2015 and 2016, there were significant increases in the average wholesale cigarette price. During these years, in which there were no increases in the federal excise tax, the average wholesale cigarette price increased by 18% and tobacco industry wholesale revenue per cigarette increased by 37%. In 2016, these price increases resulted in a revenue increase of approximately \$800 million to the industry despite a decline in volume sales of 2.8%. CONCLUSION: Despite tobacco industry opposition to increases in the federal excise tax on cigarettes, industry reported data under the TRR indicates that the wholesale value of the cigarette market in Canada is highly dependent on industry-led price increases. Since 2003, tobacco industry price increases have increased the reported wholesale price of cigarettes to a significantly greater extent than have increases in the federal excise tax.

FUNDING: Federal

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## POS1-20

### SIGNIFICANT ASSOCIATION OF THE CHRN3-CHRNA6 GENE CLUSTER WITH NICOTINE DEPENDENCE IN THE CHINESE HAN POPULATION

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Although numerous studies have revealed significant associations between variants in the nicotinic acetylcholine receptors (nAChR) subunits and nicotine de-





pendence (ND), only few studies were performed in Chinese subjects. Here, we performed a comprehensive association and interaction analysis for 20 single nucleotide polymorphisms (SNPs) in the *CHRNA3-CHRNA6* gene cluster with ND in a Chinese Han population (N=5,055). We found nominally significant associations for all tested SNPs with ND measured by the Fagerström Test for Nicotine Dependence (FTND) score; of these, 11 SNPs remained significant after Bonferroni correction for multiple tests ( $p=9\times 10^{-4}\sim 2\times 10^{-3}$ ). Also, our haplotype-based association analysis indicated that each haplotype block was significantly associated with ND ( $p<0.01$ ). Further, we provide the first evidence of the genetic interaction of these two genes in affecting ND in this sample with an empirical  $p$  value of 0.0015. Finally, our meta-analysis of samples with Chinese, Korean, and European origins for five SNPs in *CHRNA3* showed significant associations with ND, with  $p$  values ranging from  $2.39\times 10^{-17}$  for rs10958726 to  $4.88\times 10^{-12}$  for rs4950. This paper represents the first study of a large Chinese Han smoker sample, indicating that *CHRNA3* and *CHRNA6* are highly associated with ND.

FUNDING: Academic Institution

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## POS1-21

### DIFFERENTIAL EFFECTS OF AN APPETITIVE NICOTINE CONDITIONING HISTORY ON METHAMPHETAMINE SELF-ADMINISTRATION IN MALE AND FEMALE RATS

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**SIGNIFICANCE:** Nicotine functions as an appetitive interoceptive conditioned stimulus (CS) that can guide sucrose-seeking behavior. This appetitive conditioning history can enhance nicotine self-administration (SA). In this framework, inter-drug interactions have not yet been investigated. Nicotine exposure precipitates methamphetamine (meth) reinstatement following extinction. We hypothesized that an appetitive conditioning history with nicotine will further enhance nicotine-induced meth reinstatement. **METHODS:** Male and female Long Evans rats were trained with nicotine (0.1 or 0.4 mg/kg, SC) either explicitly paired (CS) with intermittent access to 26% sucrose (no sucrose available on interspersed saline sessions) or pseudo-conditioned (Pseudo) where sucrose was available on half of the nicotine and half the saline sessions. After establishment of nicotine-evoked sucrose-seeking in the CS group (16 nicotine; 16 saline sessions), all rats underwent intravenous catheter surgery and began meth SA (0.05 mg/kg/infusion). Rats received 3 fixed ratio 1 sessions followed by 12 variable ratio 3 sessions. All rats then returned to their assigned nicotine conditioning protocol for 4 nicotine and 4 saline sessions. They then received 2 additional meth SA sessions before entering extinction, where meth was withheld. There were 24 sessions of extinction with an intervening nicotine conditioning stage (4 nicotine; 4 saline sessions) between sessions 14 and 15. Nicotine-evoked meth reinstatement was then assessed in 2 sessions. Half the rats received a nicotine injection and half a saline injection before chamber placement; the opposite injection was given the next day. **RESULTS:** Rats in the CS groups learned to seek sucrose on nicotine sessions only; Pseudo groups showed high sucrose-seeking regardless of injection type. Meth SA was significantly lower in females with an appetitive nicotine conditioning history than in the pseudo-conditioned females and both groups of males. Reinstatement of meth seeking was triggered by nicotine regardless of dose or conditioning history. **CONCLUSIONS:** An appetitive nicotine conditioning history significantly decreases meth SA in female rats.

FUNDING: Federal

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## POS1-22

### ANALYZING BEHAVIOR OF E-CIG USERS IN THEIR NATURAL ENVIRONMENT USING CONTINUOUS REAL-TIME PLOTS OF AEROSOL CONSUMPTION

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**SIGNIFICANCE:** Effective tobacco regulatory policy is informed in-part by scientific findings on use behavior, including topography and consumption behavior associated with product characteristics. Others have demonstrated the collection of real-time data in subjects' natural environment, known as Ecological Momentary Assessment (EMA), is a valuable tool for studying tobacco product use. Our work builds on the conceptual analysis ideas of EMA by creating a data structure that provides intensive longitudinal data on e-cig use patterns over time. **METHODS:** Experienced e-cig users (N=34) were monitored continuously in their natural environment over the course of 2 weeks using the wPUM<sup>TM</sup> personal use monitor. The TAP<sup>TM</sup> analysis program was used to identify the date/time of each puff and create plots for each participant showing cumulative daily aerosol consumption for 12 full days of use in their natural environment. Within-person daily and weekly consumption plots were inspected for consumption patterns and behavior traits potentially unique to e-cig users. **RESULTS:** Inspection of field observation data reveals distinct consumption behavior patterns: traditional "discrete" puffing sessions (N=22), extended "grazing" sessions (N=6), and "hybrid" discrete and grazing behaviors (N=6). "Grazing" behavior is described as puffing which yields nominally continuous growth in cumulative volume over time, while "discrete" behavior yields alternating intervals of growth during and stability between puffing sessions. Extended periods of time with no puffing activity were observed for every person on every day, indicative of sleep patterns, and informing first- and last-puff-of-the-day data. In some cases, we observed clear variation in "weekday vs. weekend" consumption behavior patterns, including time of 1<sup>st</sup> puff of the day. **CONCLUSIONS:** A comprehensive data structure based on real-world, real-time monitoring of tobacco users was presented. **RESULTS:** suggest that longitudinal study of participants for periodic weekly observation periods may provide valuable insight into the evolution of user behavior.

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## POS1-23

### REPORTED EXPOSURE TO E-CIGARETTE ADVERTISING AND PROMOTION IN DIFFERENT REGULATORY ENVIRONMENTS: FINDINGS FROM THE INTERNATIONAL TOBACCO CONTROL FOUR COUNTRY (ITC-4C) SURVEY

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**SIGNIFICANCE:** Electronic cigarette (e-cigarette) advertising regulations differ across countries. This study examines how differences in e-cigarette advertising regulations influence exposure to e-cigarette advertising, and perceptions about e-cigarette information. **METHODS:** Data come from the ITC Four Country Survey (Canada [CA], United States [US], Australia [AU] and United Kingdom [UK]) carried out between August 2013 and March 2015. In 2014, AU and CA had laws prohibiting the retail sale of e-cigarettes containing nicotine while the US and UK had no such restrictions, although a voluntary agreement restricting advertising content in the UK was introduced during fieldwork. Smokers and former smokers (n=3460) were asked whether in the last six months they had noticed e-cigarette advertisements and received free samples/special offers (promotion). Respondents in AU and the UK were additionally asked about their perceptions (positive or otherwise) of what they had seen or read about e-cigarettes. **RESULTS:** US and UK participants were more likely to report that they had noticed e-cigarette advertisements and received free samples/special offers compared to CA or AU participants. For some types of advertisements, e.g. television, reports of exposure were higher in the US compared to the UK ( $p<0.001$ ). Fewer AU participants reported noticing advertisements than CA. Overall, nearly half of AU (44.0%) and





UK (47.8%) survey participants perceived e-cigarette information to be positive. These perceptions did not differ between AU and the UK, even after adjusting for advertising exposure. Participants who noticed advertisements on television ( $p=0.009$ ), the internet ( $p=0.008$ ) and at point of sale ( $p=0.011$ ) were more likely to report that the information they had seen/read about e-cigarettes was positive. CONCLUSIONS: Participants in countries with permissive e-cigarette advertising regulations and less restrictive e-cigarette regulations were more likely to notice e-cigarette advertisements than participants in countries with more restrictive regulations. Perceptions of e-cigarette information as positive did not differ even when adjusting for e-cigarette advertising.

FUNDING: Academic Institution; Nonprofit grant funding entity

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## POS1-24

### A REDUCTION IN NICOTINE CONTENT REDUCES PER CIGARETTE MOUTH-LEVEL SMOKE EXPOSURE AS MEASURED BY SOLANESOL DEPOSITED IN DISCARDED CIGARETTE BUTTS

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SIGNIFICANCE: The FDA recently announced that they are considering a mandatory reduction in the nicotine content of combustible cigarettes. One of the primary concerns surrounding a nicotine reduction policy has been that smokers might increase their smoking behavior to obtain more nicotine (i.e., compensation). Smokers could compensate by increasing the number of cigarettes they smoked or by changing how they smoke cigarettes to increase smoke exposure. One method for assessing changes in smoking behavior is to analyze solanesol levels in discarded cigarette filters. Solanesol is a long-chain terpenoid that occurs naturally in tobacco. It is deposited in cigarette filters during smoking and serves as an accurate marker of mouth-level mainstream smoke exposure. This approach is less invasive compared to lab-based measures of puff topography. The present analysis tested the solanesol levels in used cigarette filters collected by participants during a recent large clinical trial to determine whether nicotine reduction changed smoking behavior. METHODS: 839 participants smoked their usual brand cigarettes for one week and then were randomly assigned to receive either their usual brand cigarette or a research cigarette with one of five nicotine contents: 15.8, 5.2, 2.4, 1.3, or 0.4 mg nicotine / g tobacco for six weeks. Participants were instructed to save and return the cigarette filters they smoked during one day each at Baseline, Week 2, and Week 6. Solanesol in the filters from research cigarette groups (50-70 participants/group) was analyzed by the Centers for Disease Control using liquid chromatography coupled with a triple-quadrupole mass analyzer (HPLC-MS/MS). RESULTS: Solanesol was significantly reduced in all reduced nicotine content groups (5.2, 2.4, 1.3, and 0.4 mg/g) at Week 6 compared to the normal nicotine content research cigarette (15.8 mg/g,  $p<0.05$ ). These data suggest that reducing the nicotine content of combustible cigarettes reduces mouth-level mainstream smoke exposure. CONCLUSIONS: The findings are encouraging for a potential nicotine reduction policy because they suggest that such a policy would likely result in reduced toxicant exposure.

FUNDING: Federal

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## POS1-25

### CLOSING THE REGULATORY GAP FOR SYNTHETIC NICOTINE

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SIGNIFICANCE: The FDA has recently announced a new "comprehensive plan" to address the regulation of nicotine in tobacco products. This plan is focused on reducing nicotine in cigarettes while encouraging the development of less harmful and addictive nicotine-containing products. But a new product is emerging that could upset the FDA's plans for a well-balanced regulatory scheme: synthetic nicotine. These products, which are being used in e-liquids, currently fall into a reg-

ulatory gap because they fall outside the Federal Food, Drug, and Cosmetic Act's (FDCA) definition of a tobacco product. If this gap remains in place, it is likely that more companies will exploit it in order to evade regulation, undoing the potential benefits of the FDA's plan for tobacco and nicotine regulation. METHODS: We employed standard legal research methods, including database searches of relevant statutes, FDA regulations, FDA guidance documents, and case law, to examine whether the FDA can regulate synthetic nicotine products. We also examined the websites of manufacturers and retailers of synthetic nicotine products. RESULTS: Although the FDA cannot regulate synthetic nicotine products as tobacco products, it could potentially regulate these products under its drug-related authority. Based on our legal assessment, the products' ingredients, the circumstances of distribution, and the sellers' claims all combine to provide the FDA with authority to regulate synthetic nicotine products as drugs or drug-device combinations. CONCLUSIONS: The FDA has the legal authority to regulate synthetic nicotine products as drugs, and we explain why doing so would further the FDA's public health mission. If synthetic nicotine products evade FDA regulation, it would be a lost opportunity to motivate the e-cigarette industry to conduct rigorous research to answer the important questions about their products, and to incentivize the development and sale of innovative nicotine delivery products in accord with the FDA's comprehensive plan.

FUNDING: Federal

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## POS1-26

### BIASES IN THE PUBLISHED RESEARCH ON MRTPS: A BIBLIOMETRIC ANALYSIS

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BACKGROUND: FDA can approve modified risk tobacco product (MRTP) claims if tobacco manufacturers can demonstrate that such claims are supported by scientific evidence, and will reduce both individual- and population-level harm. MRTP approvals could create substantial market advantages for tobacco companies. Thus, tobacco manufacturers have a strong financial incentive to develop MRTPs and conduct research with favorable conclusions. METHODS: We conducted a bibliometric analysis of published MRTP research by searching Scopus for "modified risk tobacco" on August 19, 2017, and examined number of MRTP publications by year, author affiliations, and publishing journals. RESULTS: A total of 59 papers were published since 2008 on MRTPs, of which 44% were published in 2016. Authors with Philip Morris International affiliation published 49% of all MRTP articles. Other top author affiliations included Histovia GmbH (8%), British American Tobacco (7%), and Roswell Park Cancer Institute (7%). In addition, authors with other tobacco manufacturer affiliations published a combined 5% of MRTP research. Overall, 61% of MRTP research had tobacco company affiliation. Twenty-five percent of MRTP research was published in the journal Regulatory Toxicology and Pharmacology (RTP). Notably, RTP's sponsor has previously received financial support from the tobacco industry, and the journal's editor is a former tobacco industry consultant. Other journals publishing MRTP research included Food and Chemical Toxicology (10%), Chemical Research in Toxicology (5%), and Nicotine and Tobacco Research (5%). CONCLUSIONS: Over 60% of published MRTP research has been conducted by tobacco companies. Moreover, the journal publishing the most MRTP research has had financial ties to the tobacco industry. Independent research evaluating MRTPs is needed to inform FDA regulation.

FUNDING: Federal

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**POS1-27****DIFFERENTIAL EXPOSURE TO TOBACCO RETAIL OUTLETS AMONG SMOKERS AND NON-SMOKERS**

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**SIGNIFICANCE:** A substantial body of literature indicates that tobacco retail outlets (TROs) may play a critical role in the initiation and maintenance of smoking behavior. The majority of this literature has relied on relatively gross indices such as residential proximity to TROs or number of TROs within a given census tract. Though valuable, these approaches fail to account for the substantial heterogeneity in daily activity tracks. The purpose of this study is to examine differences between smokers and non-smokers in the nature of their contact with TROs. **METHODS:** Smokers ( $N = 19$ ) and Non-Smokers ( $N = 18$ ) who lived and worked in Durham County carried GPS trackers for approximately two weeks. These tracks were intersected with a ground-truthed database of every TRO in the county that also included information on TRO-specific features (e.g. store type, # of storefront ads). **RESULTS:** Findings confirmed that smokers had close contact ( $< 10$  m from store entrance) with a larger number of TROs compared to non-smokers ( $F = 8.46, p = .006$ ). Smokers also spent cumulatively greater time in close contact with stores ( $F = 13.04, p < .001$ ). However, these effects were not equivalent across store types. Effects were principally driven by increased contact with convenience stores (Number of Contacts:  $F = 9.31, p = .004$ ; Contact Time:  $F = 9.38, p = .004$ ) and drug stores/pharmacies (Number of Contacts:  $F = 7.36, p = .010$ ; Contact Time:  $F = 7.39, p = .010$ ). Critically, convenience stores were more likely than other store types to have exterior displays showing branding information (Non-Menthol:  $X^2 = 8.9, p = .003$ ; Menthol:  $X^2 = 3.7, p = .055$ ), pricing information (Non-Menthol:  $X^2 = 7.4, p = .007$ ; Menthol:  $X^2 = 3.5, p = .061$ ) and price promotions (Combined Menthol and Non-Menthol:  $X^2 = 11.5, p = .009$ ). **CONCLUSIONS:** Findings support the notion that smokers have relatively greater contact with TROs, which could potentially contribute to smoking behavior. Effective policies designed to limit TRO exposure may benefit from focusing on convenience stores due to the combination of elevated exposure rates and higher prevalence of tobacco-related marketing.

**FUNDING:** Academic Institution

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**POS1-28****ADVERTISING, AVAILABILITY, AND PERCEPTIONS OF ELECTRONIC CIGARETTES AMONG TOBACCO RETAILERS IN VULNERABLE ETHNIC COMMUNITIES**

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**SIGNIFICANCE:** Disposable e-cigarettes sold in tobacco retail stores, compared to vape shops, are among the cheapest in the market. Given the recent surge in e-cigarette use among adolescents and adults, it is imperative to assess tobacco retailer awareness of e-cigarette products and examine e-cigarette availability and marketing within vulnerable, lower-income ethnic communities. **METHODS:** Retail stores on American Indian (AI) Tribal lands in California and retail stores in low-income African American (AA), Hispanic/Latino (H/L), Korean (K), low-income Non-Hispanic White (NHW) communities in Southern California were recruited to complete 800 in-person retailer interviews and 775 store audits from January 2016 to January 2017. **RESULTS:** Interview findings indicate that 50% of retailers in NHW communities, 46% of retailers in K communities and 45% of retailers in AI communities were asked to sell e-cigarette products, compared to 32% and 27% of retailers in HL and AA communities. In addition, retailers in NHW (20%) and K (16%) communities were most likely to report that e-cigarettes were safer than combustible cigarettes. Retail stores in NHW (70%) and AI (52%) were most likely to sell e-cigarette products and stores in NHW (59%) and AI (40%) communities were most likely to sell flavored e-cigarettes. The lowest priced e-cigarette products (\$1.99) were found in the NHW and AA communities. Retail stores in NHW (17%) and AI (14%) were most likely to sell e-cigarette products placed within 12 inches of toys and candy, while stores with more storefront e-cigarette advertising were most likely to be found in NHW (16%) and AA (15%) communities. **CONCLUSIONS:** Findings indicate differences across ethnic communities regarding retailer perception of customer demand and safety of e-cigarettes. Moreover, store audits suggest that e-cigarette availability at the point of sale especially impacts NHW

and AA communities, while low-cost e-cigarettes and storefront marketing particularly impact NHW and AA communities. These findings can inform e-cigarette public education campaigns and suggest e-cigarette education campaigns should be community specific.

**FUNDING:** Federal

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**POS1-29****INDIVIDUAL DIFFERENCES IN ADOLESCENTS' RESPONSES TO EXPOSURE TO SMOKING IN MOVIES**

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**SIGNIFICANCE:** Exposure to smoking in movies is associated with greater risk of smoking in adolescents. Presumably, not all adolescents are equally susceptible to exposure effects, but information on who is most susceptible is limited. It is well established in the advertising literature that media effects depend on specific consumer characteristics, but this research has generally not focused on smoking media. This study fills this gap by identifying and comparing distinct clusters of adolescents based upon their reactions to viewing smoking in movies. Clusters were predicted by the level of youths' estimates of the numbers of their peers that smoke (perceived smoking norms) as well as whether and to what extent the smoking norms changed as a function of smoking movie exposure. **METHODS:** Adolescents ( $n=371$ ;  $M$  age=13.2 years; 54% male; Caucasian=57%) participated in an experimental study in which they were shown a set of movie scenes that either featured cigarette smoking or were devoid of smoking. Before and after watching the movies, they reported on their perceived smoking norms and other thoughts and feelings about smoking. **RESULTS:** Results from a clustered regression analysis identified three groups of adolescents: one group (47% of the sample) showed increased norms following movie smoking exposure ( $p=.001$ ); another group (29%) had high baseline norms that were uninfluenced by exposure ( $p=.76$ ); and a third group (24%) had low baseline norms that were uninfluenced by exposure ( $p=.40$ ). The clusters differed by baseline future smoking intentions and resistance self-efficacy, and demographic characteristics (e.g., youths in the group with increased norms following exposure were younger [ $p < 0.001$ ] than those in the two uninfluenced groups). **CONCLUSION:** There is heterogeneity in how smoking in movies influences adolescents, and reactions depend on demographic characteristics like age and race, as well as thoughts and feelings about smoking. Targeting at-risk youths for smoking prevention or media literacy interventions based on these characteristics may be help to reduce the adverse effects of smoking on the population at large.

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**POS1-30****TOBACCO OUTLET DENSITY AND YOUTH CIGARETTE SMOKING: A META-ANALYSIS**

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We conducted a random effects meta-analysis of studies that investigated the associations between tobacco outlet density around homes and schools and past month cigarette smoking among youths to address the mixed findings in the literature. Using EBSCOhost and PubMed, systematic literature searches were carried out to identify all such studies published before February 2017. Eleven studies were selected for inclusion, with 33 effect sizes related to different distances or types of outcomes. Given the average density catchment distance used across the studies was .76 kilometers, we selected effect sizes from each study that were closest to this average. We also selected the past month smoking outcomes that were most similar across studies. As a result, a total of 13 effect sizes were included in the meta-analyses. Specifically, two studies provided effect sizes for homes, seven studies provided effect sizes for schools, and two studies provided effect sizes for both homes and schools. **RESULTS:** showed that for homes, there was



an association between tobacco outlet density and adolescent tobacco use with an overall effect size of  $OR = 1.08$  (95%  $CI = 1.04, 1.13$ ;  $p < .001$ ;  $I^2 = 0\%$ ). However, for schools, this association was not significant ( $OR = 1.01$ , 95%  $CI = 0.98, 1.03$ ;  $p = .53$ ;  $I^2 = 39\%$ ). RESULTS: from sensitivity analyses indicated that the overall effect estimates from models where one study was removed each time were within the 95%  $CI$  range of the full model, suggesting that no one study strongly influence findings for either model. Our results suggest that exposure to tobacco outlets around the home environment may increase youths' smoking. Restricting access to tobacco outlets and controlling the number of outlets in residential areas may be an effective strategy to help reduce youth smoking. It is less clear whether outlet densities around schools are related to youths' smoking, perhaps because of existing state and municipal restrictions on their placement around these locations.

FUNDING: State

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## POS1-31

### QUIT INTENTIONS MODERATE SUBJECTIVE RESPONSES TO ACUTE NICOTINE REPLACEMENT THERAPY ADMINISTRATION: METHODOLOGICAL CONSIDERATIONS FOR HUMAN LABORATORY AND CLINICAL RESEARCH OF NICOTINE EFFECTS

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SIGNIFICANCE: Laboratory studies of nicotine effects frequently recruit participants with no immediate intentions to quit smoking, while clinical research often uses participants who intend to quit, yet it is unclear whether quitting motivated and unmotivated smokers exhibit comparable responses to nicotine administration. OBJECTIVE: To compare acute subjective responses to nicotine replacement therapy (NRT) administration between 21 quitting motivated and 26 quitting unmotivated smokers. METHODS: Nicotine administration and expectancy were crossed in a modified balanced placebo design. Participants were randomly administered a 4mg nicotine or nicotine-free inhaler across two sessions, yet received varying instructions about the inhaler's nicotine content (told nicotine vs. told nicotine free) and flavour (mint vs. citrus) across the sessions. Subjective mood (15 items, eg. 'relaxed', 'anxious', 'alert') and cigarette craving (1 item, 'crave cigarette') were assessed with visual analogue scales before and after inhaler administration. RESULTS: While nicotine expectancy ( $p=0.03$ ) and administration ( $p=0.02$ ) were independently effective in curbing ratings of 'crave cigarette' across all participants, quitting motivated and unmotivated smokers exhibited differing subjective responses to inhaler administration. In quitting motivated smokers, nicotine expectancy was associated with increased ratings of 'stimulated' ( $p=0.011$ ), while nicotine administration was associated with reduced ratings of 'jittery' ( $p=0.017$ ) and 'crave cigarette' ( $p=0.012$ ). Neither nicotine expectancy nor administration were found to impact subjective responding in quitting unmotivated smokers ( $p$  values  $>0.10$ ). CONCLUSIONS: Results are consistent with previous findings that quitting motivation moderates acute subjective and physiological responses to NRT, suggesting that researchers must closely consider participant sample characteristics when designing studies and interpreting/generalizing findings within a laboratory or clinical context.

FUNDING: Natural Sciences and Engineering Research Council of Canada

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## POS1-32

### TRENDS IN STATE TOBACCO CONTROL LEGISLATION, 2010-2015

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SIGNIFICANCE: Public policies implemented at the state level are a primary reason tobacco use rates have dropped. Despite this progress, tobacco use remains the leading preventable cause of death, and further improvements in state tobacco control policies are possible. Although states were very active in this policy arena ten years ago, there has been a stall in passing smoke-free air laws and cigarette excise taxes. Whether this reflects political barriers to tobacco control

in general, or a shifting of attention to other tobacco control policy initiatives is unknown. METHODS: To understand which tobacco control approaches and products are gaining traction in state legislatures, we conducted a content analysis of a random sample of 1000 tobacco-related bills introduced in state legislatures between 2010-2015, excluding budget and resolution bills. After identifying proposed legislation using *LexisNexis State Net*, a legal search engine, we developed and implemented a coding scheme to categorize the content of each bill, as well as its progress through the policymaking system. Codes included tobacco control topic (e.g., clean air bills, youth access), product types, stated intent (e.g., improve health, protect youth), and specified populations (e.g., youth, military populations). RESULTS: Of the 1000 introduced bills we examined, only 157 (15.7%) of them were enacted in our analysis period. Clean air restrictions and excise tax policies were the most prevalent introduced bills types, but enactment rates were higher for tax evasion bills (35.0%), licensing regulations (26.3%), and restrictions on product availability or placement (21.4%). Enactment rates were also high for bills focused on electronic cigarettes (22.4%). Whereas bills specifying American Indians, pregnant women or low income smokers were enacted at higher than average rates (24-29%), bills framed to promote health, protect costs, or reduce costs were less successful (8-14%). CONCLUSION: Although traditional tobacco control strategies and products remain popular topics in state legislatures, they are less likely to gain the support needed for enactment than some emerging strategies and products.

FUNDING: Academic Institution

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## POS1-33

### CHALLENGES OF ENDS AEROSOL SIZE MEASUREMENTS. SMOKING MACHINE, AND PUFF TOPOGRAPHY INFLUENCE

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SIGNIFICANCE: Aerosol size defines delivery/deposition efficiency and affects the toxicity of inhalable tobacco products, such as electronic nicotine delivery systems (ENDS). Measurement of particles generated by ENDS is complex because, unlike combustible tobacco smoke particles that mostly consist of heavy tar, ENDS aerosol contains more volatile and hygroscopic constituents that could evaporate or coagulate, and absorb moisture once they enter the human respiratory tract. Thus, the accuracy of ENDS aerosol size measurements, in terms of measuring what is actually inhaled by the vaper, is influenced by sample dilution, sample residence time, and the method of measurement. METHODS: Real-time differential mobility (DMS500) and inertial impaction (ELPI) techniques were used to simultaneously monitor and collect size-segregated samples of mainstream ENDS aerosol. Two types of smoking machines were used: direct sample delivery and piston-based (aerosol pulled into syringe then pushed back for analysis) to generate mainstream emissions from blu<sup>®</sup> e-cigarettes (6 flavors, 5 sec puffs at varying 15-45 mL/s flow rate). Aerosol size distribution measured by the DMS500 and ELPI was compared. PG, VG, and nicotine on size-segregated particles were determined by HNMR and confirmed by GC-FID. RESULTS: Aerosol generated using the piston-type smoking machine was larger than aerosol produced by direct sample delivery. An increase of puffing flow rate led to an increase of particle concentrations and a decrease of aerosol size (total aerosol mass remained unchanged). HNMR and GC-FID showed VG, PG, and nicotine in fine ( $>100$  nm) and ultrafine ( $<100$  nm) particles. CONCLUSIONS: The type of smoking machine and puffing regimen both affect ENDS aerosol size. To correctly assess lung delivery/deposition efficiency of ENDS aerosol, proper aerosol generation and measurement techniques are required. Regulatory data on ENDS emissions must be generated according to specific protocols that specify smoking machine type and puffing regimen.

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**POS1-34****NICOTINE AND TOBACCO RESEARCH AT THE NATIONAL INSTITUTE ON DRUG ABUSE: FROM MOLECULES TO MANAGED CARE**

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**SIGNIFICANCE:** NIDA supports nicotine and tobacco research across neuroscience, genetics, prevention, treatment, and health services domains. Recent expansions include collaborations with FDA's Center for Tobacco Products (CTP) on the Population Assessment of Tobacco and Health (PATH) study, Tobacco Centers of Regulatory Science (TCORS), and individual grants. The topics covered are quite broad, requiring the team managing the program to have multiple areas of expertise. Increasing the scientific community's understanding of how these programs are managed will help optimize our interactions, identification of research gaps, and development of new ideas. **METHODS:** Summary analysis of research at NIDA based on Research, Condition and Disease Categorization budget categories and organizational areas of science, across fiscal years 2014, 2015 and 2016. **RESULTS:** In 2016, NIDA supported \$93 million tobacco category grants (NIH total \$299 million). For 2015 and 2014, NIDA supported \$95 and \$101 million (NIH totals \$300 and \$321 million). In 2016, research supported by NIDA included 38% in neuroscience, 33% in treatment development, 29% in epidemiology, prevention and services. By comparison NCI supported \$97 million, \$92 million, and \$103 million in 2016, 2015 and 2014. CTP funded grants (not including PATH) managed by NIDA totaled \$37, \$45 and \$44 million in 2016, 2015 and 2014. **CONCLUSION:** NIDA supports a broad range of research focused on neuroscience, treatment, prevention, and population sciences. Coordination of this broad portfolio and integration into overall tobacco control efforts is managed by NIDA's Nicotine and Tobacco Research Team, established to bring together staff involved in tobacco science. Supporting the latest regulatory efforts by CTP and integrating other research with findings from PATH, as well as with the newly launched Adolescent Brain Cognitive Development longitudinal cohort study of adolescent substance use, are additional current NIDA research activities. These efforts by NIDA to manage and direct the nicotine and tobacco portfolio will optimize its impact and provide new opportunities to identify issues that remain unaddressed.

**FUNDING:** None

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**POS1-35****SUPPORT FOR TOBACCO 21 POLICY AMONG YOUTH AND YOUNG ADULTS (2014-2017)**

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**SIGNIFICANCE:** Several states and a growing number of municipalities have recently enacted Tobacco 21 policies to raise the minimum age of tobacco purchase to 21 years of age. These policies are expected to prevent or delay tobacco use initiation, reduce tobacco use, and improve health for young adults and society at large. A recent study found that a majority of youth support Tobacco 21, with those supporting Tobacco 21 more likely to report intentions not to use tobacco. This paper is the first to examine youth support for Tobacco 21 over time. **METHODS:** Survey data were collected as part of a rolling cross-sectional study of a nationally representative sample of youths and young adults. The telephone survey was administered from June 2014-June 2017 to 13-25 year olds ( $N = 11,847$ ; AAPOR response rate #3 = 21%). Respondents indicated their agreement or disagreement with the following statement on a four-point scale: "The legal age to buy tobacco cigarettes should be increased from 18 to 21." Analyses are weighted to be representative of the U.S. population. **RESULTS:** A majority of 13-25 year olds (69.8%) favored raising the minimum age of tobacco purchase to 21. 13-17 year olds were most supportive of the policy (79.9%), relative to 18-20 (61.4%) and 21-25 year olds (65.0%). Whereas 77.9% of never smokers endorsed the policy, 54.3% of ever smokers and about half of current smokers (49.8%) expressed policy support. Among those who would be most affected (13-20 year old current smokers), 40.1% supported the policy. Over most of the study period, Tobacco 21 policy support significantly increased among 13-20 year old smokers and nonsmokers, but has been declining only among smokers (from 42.1% from 6/2014-9/2016 to 33.1% from 10/2016-6/2017). **CONCLUSIONS:** Tobacco 21 legislation has the potential to influence smoking prevalence and subsequent disease. Our findings suggest that adolescents and young adults increasingly favor Tobacco 21 policies.

Through most of 2016, Tobacco 21 support had strengthened across age groups and by smoking status. Recently, support has declined but only among smokers younger than 21. Legislators will find solid support for the policy among young people.

**FUNDING:** Federal

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**POS1-36****PATTERNS OF E-CIGARETTE USE AMONG YOUTH AND YOUNG ADULTS: REVIEW OF THE IMPACT OF E-CIGARETTES ON CIGARETTE USE**

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There is concern that the increase in e-cigarette use among youth and young adults may lead to future cigarette or other combustible tobacco product use. A synthesis of the literature on this topic is needed because existing longitudinal studies are scant and not uniform in conclusions. This study is a synthesis and critical appraisal of the literature regarding the impact of e-cigarettes on cigarette use among youth and young adults. We conducted a search in PubMed through June 1, 2017 for peer-reviewed studies related to e-cigarette patterns of use. Of the 455 relevant studies we identified, 23 had a youth or young adult sample, were longitudinal in design, and addressed the question of whether use of e-cigarettes is associated with future cigarette smoking or if e-cigarette use may provide a pathway out of smoking. Most studies followed a sample over time and compared cigarette smoking at follow-up between baseline e-cigarette users and non-users. Other studies examined the difference at follow-up in persisted or desisted cigarette smoking among smokers by e-cigarette use status at baseline. Reviewed studies suggest that e-cigarette use is associated with future (ranging from six months to 2.5 years) cigarette trial among never smokers; however, conclusions cannot be drawn based on these studies because there are limitations including small sample size, measuring use that is experimental (i.e., ever use, past 30-day use) rather than regular, and inadequate controlling for confounding variables. **CONCLUSIONS:** also cannot be drawn from studies examining the impact of e-cigarette use on smoking cessation outcomes due to the limited number of studies and additional limitations (e.g., smokers in the study not motivated to quit, study results not stratified by age). A comprehensive understanding of this literature is needed to inform policy makers and consumers for evidence-based decision-making and to guide future research on e-cigarettes and youth and young adults.

**FUNDING:** Truth Initiative

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**POS1-37****FLAVOR TYPES USED BY YOUTH AND ADULT TOBACCO USERS IN WAVE 2 OF THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY 2014-15**

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Most youth and young adult tobacco users report using flavored tobacco products, though few studies identify specific flavor types used. This study reports specific flavor types used among new and past 30-day tobacco users in the United States. We analyzed data from Wave 2 of the nationally-representative Population Assessment of Tobacco and Health (PATH) Study, collected in 2014-2015. We examined flavor use and flavor type (mint/menthol, clove or spice, fruit, chocolate, alcoholic drink, candy/other sweet, or other flavor) of past 30-day use at Wave 2 as well as among first flavored use between wave 1 and 2. The weighted analyses used





a subset of past 30-day youth (12-17) (n=920), young adult (18-24) (n=3,726), and adult (25+) (n=10,346) tobacco users and new product users since Wave 1 (n=6,583). We also present product-specific flavor patterns across ages. Flavored tobacco use was prominent among youth (74.3% first use, 72.3% past 30-day use), young adult (59.5% first use, 67.6% past 30-day use), and adult any tobacco users (45.1% first use, 44.7% past 30-day use). All ages reported hookah and e-cigarettes as the most prevalent flavored products used (over 50% first use, over 60% past 30-day use). All ages reported mint/menthol, fruit, and candy/sweet flavors as the most prevalent flavor types overall at first use and at past 30-day use. Youth and young adults (compared with adults 25+) reported significantly higher prevalence of past 30-day use of each flavor type except menthol/mint. The high menthol use (over 50% among youth and young adults; 76% among adults) may be explained by fact that menthol is the only allowed cigarette flavor on the U.S. market. Flavored tobacco product use is prevalent at first use and past 30-day use, especially among youth and young adults. Data suggest the most commonly used flavor types were menthol/mint, fruit, and candy/sweet. For past 30-day use, all flavor types other than menthol/mint exhibited an age gradient with more prevalent use among youth and young adults, followed by adults. Mint/menthol exhibited a reverse gradient. Flavors appear to enhance appeal to younger tobacco users.

FUNDING: Federal

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## POS1-38

### TOBACCO CONTROL POLICY AND SMOKING IN A LONGITUDINAL SAMPLE OF US OLDER ADULTS

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**SIGNIFICANCE:** This study examines the associations between tobacco control policy change and smoking cessation and smoking intensity of older adults, and how they vary by education and race. **METHODS:** Geocoded longitudinal data from the 1992 to 2014 waves of the Health and Retirement Study including smokers 51 and older were used to assess the relationship between the implementation of 100% smoke-free nonhospitality and hospitality workplace laws, average cigarette pack price, and the likelihood of smoking cessation or change in the number of cigarettes smoked daily. All analyses were stratified by gender. **RESULTS:** The enactment of a non-hospitality workplace law was associated with an increased likelihood of cessation among men, but not among women. Transition to restaurant and bar smoke-free laws was not associated with increased cessation or lowered intensity. White men, nonwhite women, and high school graduates decreased their smoking intensity in response to cigarette price change more than others. The most consistent predictor of increased probability of cessation and decreased smoking intensity among these older adults was a negative change in health. **CONCLUSION:** These results suggest that the sensitivity of older U.S. adults to changes in smoke-free laws and cigarette prices is limited.

FUNDING: None

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## POS1-39

### DISENTANGLING THE ROLES OF POINT-OF-SALE TOBACCO DISPLAY BANS, TOBACCO RETAIL DENSITY, AND TOBACCO RETAIL PROXIMITY ON SMOKING CESSATION BEHAVIORS AMONG A COHORT OF SMOKERS IN CANADA

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**SIGNIFICANCE:** Few jurisdictions have implemented point-of-sale (POS) marketing bans. As such, the independent effects of marketing and tobacco availability on cessation behaviors are not well understood. This study examined the relationships between POS marketing bans, tobacco retailer density, and tobacco retailer proximity with smoking cessation behaviors among a cohort of smokers in Canada, where provincial POS bans were implemented differentially over time from 2004 to 2010. **METHODS:** Data from the International Tobacco Control (ITC) Canada Survey, a cohort survey of a nationally representative sample of adults 18 years and older, were linked via residential geocoding with tobacco retailer data

to derive for each smoker a measure of retailer density and proximity. An indicator variable was created to determine whether the participant's province banned POS displays based on interview dates between 2005 and 2011. Outcomes included: quit attempts since the previous wave; successful quitting for at least one month at follow-up among smokers from the previous wave who tried to quit; and relapse at follow-up among those who had quit at the previous wave. Longitudinal logistic generalized estimating equation models were used to determine the relationship between exposure to POS display bans, tobacco retailer density, and tobacco retailer proximity with the outcomes of quit attempts (n=4509), successful quitting (n=1697), and relapse (n=866). **RESULTS:** Exposure to provincial POS display bans was not associated with quit attempts or successful quitting. In adjusted models, POS display bans were associated with lower odds of relapse, which strengthened after adjusting for retailer density and proximity, although results were not statistically significant (OR 0.65, 95% CI 0.40, 1.04, P-value=0.0705). Neither tobacco outlet density nor proximity was associated with any of the outcomes. **CONCLUSIONS:** Banning POS marketing may help prevent relapse.

FUNDING: Academic Institution; Federal; Nonprofit grant funding entity

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## POS1-40

### NARRATIVES OF HURRICANE-ASSOCIATED LOSS INCREASE PREFERENCE FOR IMMEDIATE REWARDS AND CIGARETTE CRAVING IN SMOKERS

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**SIGNIFICANCE:** Both resource scarcity and the simulation thereof can direct attention towards immediate needs, leading to more myopic decisions. This could affect cigarette smoking both by increasing preference for immediate rewards (e.g., delay discounting) and by increasing negative affect. We hypothesized that narratives describing natural disasters, such as hurricanes, may increase craving for cigarettes as well as negative affect and delay discounting. We also hypothesized that of these two effects, delay discounting may be more strongly associated with craving. **METHODS:** To test these hypotheses, data were collected from n=109 daily smokers of 10+ cigarettes from Amazon Mechanical Turk. Participants first completed demographics including the Fagerstrom Test for Cigarette Dependence, then were randomly assigned to a narrative describing either a hurricane disaster (n=54) or a minor storm (n=55). Participants then completed a delay discounting task of \$1000, a Stress Appraisal Measure, an affect scale, and a measure of craving (the Questionnaire of Smoking Urges - Brief, or QSU), and self-report visual analogue scales of narrative qualities. Demographics did not differ between groups. **RESULTS:** As hypothesized, participants who engaged with narratives describing hurricanes demonstrated higher discount rates (p=0.001), greater negative affect (p=0.0008), and stronger craving for cigarettes (p=0.047) than individuals who engaged with minor storm scenarios, determined using t-tests with Welch's correction. Differences in craving were greater in the urgency factor of the QSU (p=0.028) than the intention factor (p=0.055). The variables most associated with craving for cigarettes were discount rate, self-reported narrative vividness, and appraisal of the uncontrollability of the event, determined by stepwise model selection with AIC. **CONCLUSIONS:** These results may suggest that the desire to smoke cigarettes is more closely associated with short-term thinking than with management of negative affect after a stressor. The particular stressor in question, hurricane-associated loss, may increase factors associated with risk for smoking.

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## POS1-41

### ABUSE POTENTIAL OF ELECTRONIC CIGARETTES IN EXPERIENCED ELECTRONIC CIGARETTE USERS

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**SIGNIFICANCE:** Electronic cigarettes (ECIGs) produce an aerosol by heating a liquid that often contains nicotine. ECIG use rates are increasing, but their abuse potential remains unknown. This study's purpose is to determine the abuse poten-



tial of users' own ECIGs relative to other tobacco/nicotine products. **METHODS:** Twenty-three male ECIG users (mean CPD = 0.04) attended four lab sessions that were preceded by 12 hours of ECIG/other tobacco product abstinence, and only differed by product used: EGO\_0, a 3.3V battery and a 1.5 Ohm, dual-coil cartomizer with 0 mg/ml nicotine liquid in participants' preferred flavor; EGO\_highest, with liquid of the highest nicotine concentration available in participants' preferred flavor; OWN, participants' own ECIG device with liquid in their preferred flavor/ nicotine concentration; and INHALE, a 4mg nicotine inhaler. During each session, participants used the session product then completed the multiple choice procedure (MCP) in which they chose between 10 puffs of the product or money. The MCP yields a crossover value: higher values indicate greater product reinforcement. Blood was sampled before and after product use to examine plasma nicotine delivery. **RESULTS:** Significant differences in crossover points were observed across conditions. The highest mean crossover value (SD) was observed for OWN at \$1.35 (0.90), significantly higher than EGO\_highest, at \$0.88 (0.89), EGO\_0 at \$0.83 (0.79), and INHALE at \$0.72 (0.84). Plasma nicotine boost levels for 22 participants were 6.97 ng/ml (SD = 7.12) for OWN, 6.59 ng/ml (6.18) for EGO\_highest, 0.67 (1.61) for INHALE and -0.12 (1.78) for EGO\_0. Nicotine boosts for OWN and EGO\_highest were not significantly different (all  $p > .05$ ). **CONCLUSIONS:** Similar nicotine delivery in the OWN and EGO\_highest conditions, but different crossover values, suggest that factors beyond nicotine delivery may influence ECIG abuse potential. This type of experimentally generated data can inform FDA in future regulations that could impact abuse potential.

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## POS1-42

### OVERVIEW OF IN VITRO METHODS USED TO ASSESS E-CIGARETTES BASED ON "TOXICITY TESTING IN 21ST CENTURY" PRINCIPLES

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When the National Academies of Sciences released "Toxicity Testing in 21st Century: A Vision and a Strategy" a new toxicological paradigm was created, focusing on the use of human cell lines and the disruption of key cellular pathways. Due to the evolving regulatory landscape and dynamic nature of innovation with e-cigarettes, new assays are required to quickly determine the subtle biological response of these products for stewardship purposes. The published literature reveals that e-cigarette aerosols display a lack of significant cytotoxic and genotoxic responses in standard *in vitro* toxicology assays. For stewardship of e-liquids, best practice involves screening of all ingredients to identify any Carcinogenic, Mutagenic and Reproductive (CMR) substances and respiratory sensitizing potential, using the scientific literature or *in silico* predictions. If no major alerts are detected, the ingredients are assessed in a panel of biologically relevant assays. Examples of these assays include High Content Screening (HCS), *in vitro* human cell biomarkers, dermal sensitization and irritation assays. Should assessment of the e-cigarette aerosol be required, 3D lung cell models can be exposed at the air-liquid interface to understand cytotoxic, inflammatory and oxidative response of the aerosol. This presentation will discuss the various methods described above and will present some of the data generated so far with or without nicotine and the impact of flavours. Briefly, we have observed that lungs cells employed in HCS and in *in vitro* human cell biomarker assay can detect increases in nicotine concentration in an e-liquid formulations. Moreover, characteristic fingerprint responses have been detected for certain e-liquid flavours, suggesting that flavours can play a role in the *in vitro* biological responses. These assays can greatly contribute to our current knowledge of e-liquid ingredients and aerosols and should form part of a weight of evidence approach for the assessment of this category of products.

**FUNDING:** E-cigarette/Alternative nicotine products Industry

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## POS1-43

### GENETIC ASSOCIATION BETWEEN VARIANTS IN CANNABINOID RECEPTOR 1 GENE (CNR1) AND PERSONALITY IN AFRICAN AMERICAN POPULATION

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Several genetic studies have revealed significant associations between single nucleotide polymorphisms (SNPs) in cannabinoid receptor 1 (*CNR1*) gene and a broad spectrum of psychiatric disorders. Personality traits, which account for a certain degree of susceptibility of these diseases, have been linked to the *CNR1* variants in the subjects with Caucasian origins. However, there was no reported study regarding the effects of *CNR1* polymorphisms on personality traits in African-American (AA) population. We performed an imputation-based association analysis for 26 *CNR1* variants with five dimensions of personality in AAs with a total sample size of 3,046. We found that four SNPs in *CNR1* showed significant association with Extraversion after Bonferroni correction for multiple testing ( $p < 0.0019$ ). Further, several Extraversion-associated SNPs are also significantly associated with Conscientiousness, Agreeableness and Openness. SNP priority score analysis implicated that SNPs rs806368, rs806371 and rs2180619 may play a role in the modulation of personality and psychiatric conditions. Together, this study first reveals that *CNR1* gene is implicated in determining personality traits in AA population.

**FUNDING:** Academic Institution

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## POS1-44

### CIGAR DEFINITIONS IN US POLICIES: VARIATIONS AND IMPLICATIONS

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**SIGNIFICANCE:** The Food and Drug Administration's (FDA's) publicly available tobacco product listing database includes 34,778 entries for "Cigar" and "Cigar-other" products as of August 28, 2017. The FDA regulates cigars in accordance with the requirements described in the Deeming Rule. Additionally, U.S. states and localities have broad authority to regulate cigars, including little and premium cigars, and have done so by including these products in smoke-free air laws and policies raising excise taxes, restricting sales of flavored varieties, and setting minimum pack sizes. Central to these policies are the cigar products themselves, which are defined in varying ways. We conducted a policy analysis to describe variations in state cigar-related policies and illustrate the regulatory and evaluation implications. **METHODS:** We reviewed all accessible state laws pertaining to cigar products using the Lexis legal database during August 2017. We summarized and synthesized the data gathered from our policy scan. **RESULTS:** We uncovered 4 key considerations: (1) definitions or product descriptions vary across states, (2) cigars are often defined by characteristics such as weight, circumference, pack size, wrapper, and price; (3) specific cigar products typically are broadly captured in "tobacco product" definitions but may be given standalone definitions (e.g., little cigars, premium cigars) for certain policy types; and (4) within a given state there can be separate cigar product definitions across the regulatory code (e.g., tax policy, smoke-free air policy, licensing policy), so a product may be defined and treated differently within a state based on the governing policy. **CONCLUSIONS:** While certain aspects of the sale, distribution, and labeling of cigars are regulated at the federal level, some cigar products are further regulated by state- and local-level policies. States have taken diverse approaches to definitional specificity and nuance included in cigar product descriptions.

**FUNDING:** Federal

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**POS1-45****DIFFERENCES IN THE USE OF PRODUCT PLACEMENT, PRICE, AND PROMOTION AMONG TOBACCO RETAILERS IN VULNERABLE POPULATIONS**

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**BACKGROUND:** Despite efforts to reduce inequities in tobacco use among ethnic minorities, disparities persist in tobacco. The retail environment can contribute to tobacco disparities by increasing accessibility to tobacco products, pricing behaviors, and promotional activities. There is a need for more research on independent retailers, as they are directly targeted and located in ethnic communities. **Method:** 800 individual interviews were conducted with retailers at the point-of-purchase, to examine the relationship between tobacco retailer characteristics and the placement, price, and promotion of tobacco products in African-American (AA), American Indian (AI), Hispanic/Latino (HL), and Low SES Non-Hispanic White (NHW) neighborhoods throughout Los Angeles, California. Participants were interviewed in person by teams of two community health workers that were members of the community of focus. A retail shop observation was also completed. **RESULTS:** Retailers in K (27.0%) and HL communities (33.5%) were less likely ( $p < 0.01$ ) to be educated in U.S. compared to NHW (58.5%), AA (44.0%), and AI (83%). There was a significantly ( $p < 0.01$ ) higher proportion of AI (38.0%) retailers that reported tobacco as their business' main source of revenue compared to retailers in AA (11.5%), HL (4.0%), K (17.8%) and NHW (18.8%) communities. Significantly more retailers from AI (36.7%) communities also reported being a current smoker ( $p < 0.05$ ). Retailers in HL communities were less likely to have price promotions for regular cigarettes, menthol cigarettes, and cigarillos compared to the other communities ( $p < 0.01$ ). **CONCLUSIONS:** In assessing the differences in product availability and promotional activities in tobacco retailers in different communities this study helps to inform public health regulators and professionals in how to mitigate tobacco use disparities among vulnerable communities. This information will help highlight the need for educational campaigns for population groups whose vulnerability may relate to their surrounding retail environment.

**FUNDING:** Federal

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**POS1-46****YOUTH RECEPTIVITY TO E-CIGARETTES AND TOBACCO CIGARETTES AFTER EXPOSURE TO E-CIGARETTE ADVERTISEMENTS**

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**SIGNIFICANCE:** Electronic cigarettes (ECIGs) are marketed to youth through all media channels. This study assessed how electronic cigarette (ECIG) advertising themes affect receptivity to trying ECIGs and tobacco cigarettes (TCIGs) among youth TCIG smokers and susceptible non-smokers. **METHODS:** Participants aged 13-18 years ( $n=646$ ) completed an in-person survey and were randomized to a control advertising condition (water advertisements [ads]) or one of three ECIG advertising conditions differing thematically ("general," "flavor and taste," "people and youth"), derived from a content analysis of 484 static (e.g., print, online banner) ECIG ads. Each condition involved exposure to three ads followed by items assessing receptivity to trying ECIGs and TCIGs ("not at all" [1] to "a great deal" [5]). Mixed effects regressions tested differences in receptivity to trying ECIGs and TCIGs after condition exposure, and whether smoking status moderated these effects. **RESULTS:** Susceptible non-smokers comprised 48.7% of the sample. Across conditions, almost half of youth were receptive to trying ECIGs (51.0%) and TCIGs (43.5%). Relative to the control condition, exposure to all ECIG advertising themes was associated with significantly greater receptivity to trying ECIGs and TCIGs (all  $p < 0.01$ ). Between ECIG conditions, the "people and youth" theme was associated with significantly greater receptivity to ECIGs and TCIGs than the "flavor and taste" theme. Smokers were more receptive to trying TCIGs than susceptible non-smokers when exposed to the "general" ECIG theme; no other moderation was observed across conditions. **CONCLUSIONS:** ECIG advertising messaging may affect youth's ECIG- and TCIG-related intentions and differ in their effectiveness by the themes portrayed within ads. Identifying the effects of ECIG advertising messages on the tobacco products youth initiate and continue using

is essential to crafting guidelines for ECIG advertising that achieve FDA's goals to disrupt the public health burden of tobacco products.

**FUNDING:** Nonprofit grant funding entity

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**POS1-47****LONGITUDINAL EVALUATION OF ELECTRONIC CIGARETTE DEVICE CHARACTERISTICS AND THE RELATIONSHIP TO CONTINUED USE**

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**SIGNIFICANCE:** Research is needed to help regulators understand e-cig device characteristics associated with long-term use. The purpose of this study is to examine e-cig device characteristics among long-term experienced users, examine how users transition between differing device characteristics over time, and to determine what device characteristics are associated with continued e-cig use. **METHODS:** In 2012, e-cig users completed an online survey about their e-cig use, preferred device, and preferences. In January 2017, participants were re-contacted via email to complete a follow-up survey. Continued users were those who reported any e-cig use in the past 30 days at both time points while stoppers reported no use at follow-up. Means and frequencies describe current device characteristics. T-tests (paired and independent) and chi-square analysis determine differences in device characteristics between baseline and follow-up among continuers and baseline differences in device characteristics between continuers and stoppers. **RESULTS:** The sample was 83.6% ( $n=511$ ) continuers and 16.3% ( $n=100$ ) stoppers. Most continuers reported current use of a "mod" device (62.6%) with variable voltage (67.7%) and/or wattage (76.8%) and with a tank system to hold the e-liquid (78.6%). At follow-up, continuers were significantly more likely to be using an advanced device (larger than cigarette and/or with a button) ( $p < .01$ ) and to have decreased the nicotine concentration of their e-liquid (15.3mg/ml to 7.6 mg/ml,  $p < .01$ ) compared to baseline. Stoppers were significantly more likely to be using a cigalike device ( $p < .01$ ) with cartomizers ( $p < .01$ ) and a greater nicotine concentration ( $p < .01$ ) at baseline compared to continuers. **CONCLUSION:** Long term e-cig users transition over time to e-cig devices with more advanced characteristics, such as "mod" devices, those with variable voltage and/or wattage, and those which use a tank system to hold e-liquid.

**FUNDING:** Federal

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**POS1-48****THE NEED FOR POLICIES AROUND THE MARKETING OF TOBACCO PRODUCTS 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. Regulation of point-of-sale tobacco marketing practices is not as widespread or commonly employed as taxation or clean indoor-air laws; however, evidence exists to suggest they are potentially powerful policy options. **METHODS:** This study consisted of an examination of federal, state, and local policies around the marketing practices of tobacco products at the point-of-sale. **RESULTS:** Although the point-of-sale is the least regulated environment on the federal level, some states and localities have enacted policies regarding tobacco retailer licensing and density, and the price, promotion, and placement of tobacco products at the point-of-sale. Several cities in California, Massachusetts, Minnesota, and New York and the city of Philadelphia have limited the number of tobacco retailers within a certain distance from school, prohibited pharmacies from selling tobacco products, and/or placed caps on the number of tobacco retail licenses. Many municipalities in Massachusetts and the cities of Chicago, New York, Minneapolis, Providence, and Washington, DC have prohibited retailers from redeeming coupons or other discounts on tobacco products, placed minimum limits on the number of cigars sold per pack, and/or placed price minimums on the sale of cigars and packs of ciga-





rettes. CONCLUSION: Restrictions on price, promotion and placement of tobacco products to reduce supply, availability and ultimately, consumer demand should be more frequently added to the traditional tobacco-control toolbox of taxation, public education and clean air laws to accelerate tobacco prevalence declines through increased cessation and prevention of initiation and progression.

FUNDING: None

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## POS1-49

### STATE AND LOCAL POLICIES REQUIRING CHILD-RESISTANT PACKAGING (CRP) FOR LIQUID NICOTINE

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SIGNIFICANCE: Calls to U.S. poison control centers about exposure to e-cigarette devices and liquid nicotine have increased dramatically in recent years, with about half of these cases involving children under age 6. To address concerns about accidental exposure to liquid nicotine, the Child Nicotine Poisoning Prevention Act (CNPPA), enacted in 2016, extends federal child-resistant packaging (CRP) requirements to liquid nicotine containers sold in the U.S. Additionally, states and localities may require CRP beyond federal standards, and several have enacted some form of CRP policy more expansive than the CNPPA. In April 2017, we conducted an environmental scan to identify and characterize U.S. state and local policies that regulate e-liquid packaging. METHODS: We searched Lexis legal databases and other data sources for information about state and local e-liquid CRP policies. We tabulated our findings and conducted a content analysis of the identified policies. RESULTS: Our environmental scan identified 31 state and local policies that address e-liquid CRP; 7 state and 6 local policies go beyond federal policy. For example, Oregon and California CRP policies include language broad enough to include closed-system products like e-cigarette cartridges, and the North Carolina e-liquid container CRP policy defines an e-liquid as "a liquid product, whether or not it contains nicotine." The majority of e-liquid CRP policies that are broader than the federal regulation cover e-liquids to be used in e-cigarette products regardless of nicotine content. CONCLUSIONS: Our policy analysis reveals that several states and localities are more expansive in their CRP regulations than the federal regulation in two important ways, by including closed systems in the policy and/or covering zero-nicotine liquids. As e-cigarette product characteristics, the marketing landscape, use patterns, and CRP-related state and local policies continue to evolve, the dynamic monitoring of all of these aspects will help inform potential educational and regulatory approaches to prevent liquid nicotine poisoning among children.

FUNDING: Federal

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## POS1-50

### PREVALENCE, BELIEFS, AND PREDICTORS OF ROLL-YOUR-OWN (RYO) CIGARETTE USE AMONG AFRICAN SMOKERS: FINDINGS FROM THE ITC ZAMBIA SURVEY

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SIGNIFICANCE: A large proportion of smokers in Zambia smoke roll-your-own (RYO) cigarettes. Little is known about RYO cigarette use, beliefs, and factors associated with its use, and what is known comes almost entirely from studies in Western countries and hardly in African countries. This study examined use, knowledge, beliefs, and predictors of RYO cigarette use among Zambian smokers. METHODS: Data came from the International Tobacco Control (ITC) Zambia Wave 2 Survey (2014), a longitudinal cohort survey of a nationally representative sample of adult smokers (N=1,040). Analyses focused on comparisons between RYO smokers and factory-made (FM) smokers. Logistic regression analyses adjusted for sex, age, and time-in-sample. RESULTS: 42% of Zambian smokers used RYO cigarettes. 86% of these RYO smokers reported choosing RYO (Vs. FM) cigarettes because of its price. Only 35% of RYO smokers chose it because of

its taste. RYO cigarette use was significantly associated with: residing in a rural Vs. urban area (OR=22.14; p<0.001), being 55 years and older (OR=5.60; p<0.001), having low (OR=6.10; p=0.004) or medium (OR=3.32; p=0.006) income (Vs. high income); low (OR=48.97; p<0.001) or medium (OR=4.04; p<0.001) level of education (Vs. high); higher nicotine dependence (OR=1.86; p=0.017), and believing that smoking is important in their life (OR=1.39. p=0.037). RYO use was not associated with gender, knowledge of harms of RYO use, quit intentions, quit attempts, health concerns, and justification for smoking beliefs. CONCLUSIONS: RYO cigarette use was high in Zambia and was mainly preferred for its affordable price. Compared with FM users, RYO users were not significantly different in most of the factors that were tested. These findings suggest that tobacco control policies that have been used to reduce the use of FM cigarettes may also be effective in reducing RYO use. For example, harmonizing taxes on RYO with FM cigarettes would be an effective strategy to reduce use especially among older, rural, low SES, and heavier smokers. By equating price across FM and RYO cigarettes, it is likely that tax/price policies would have a greater impact on reducing smoking.

FUNDING: Federal

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## POS1-51

### RESTRICTING THE SALE OF FLAVORED E-CIGARETTES IN THE US: AN EXAMINATION OF LOCAL REGULATIONS

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SIGNIFICANCE: The U.S. Food and Drug Administration currently does not restrict flavored e-cigs, a product that appeals greatly to youth. In the absence of federal laws, many local governments have banned the sale of flavored e-cigs to discourage youth e-cig use. This paper examines the characteristics of local restrictions to inform policymaking at the national level. METHODS We identified 114 U.S. jurisdictions with municipal or local sales restriction on flavored e-cigs as of July 2017. Many of these localities were from Massachusetts. We coded the restrictions from a systematic sample of localities (n=31) based on whether the restriction of selling flavored e-cigs 1) only applied to retailers within a certain radius of schools (e.g., has a restriction zone); 2) prohibited the sale of menthol/mint flavors; and 3) exempted retail tobacco stores. We then organized the localities according to the policies' strictness in preventing youth e-cig use. RESULTS: Among 31 local restrictions on flavored e-cigs, 3 included restriction zones, 8 prohibited menthol/mint flavors, and 17 exempted retail tobacco stores. The four localities with "strict" restrictions (e.g., San Francisco, CA) banned menthol/mint flavors and did not have restriction zones or exempt retail tobacco stores. The restrictions of ten localities (e.g., Barrington, RI) can be considered "moderate" since they failed to conform one of the provisions applied to the "strict" restrictions. Seven localities (e.g., Boston, MA) were considered to have "lax" restrictions since their policies only applied to retail tobacco stores, and at the same time, either had restriction zones or failed to prohibit menthol/mint flavors. CONCLUSIONS: Local governments demonstrate the ability to flexibly incorporate flavored e-cig sales restrictions into their pre-existing tobacco control regulations. Localities with less stringent regulations may need to further educate the public about the harm of flavored e-cigs in order to strengthen the policy impact on preventing e-cig use among youth. In addition, state-level regulations are greatly needed to maximize the efforts of restricting youth access to flavored e-cig products.

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## POS1-52

### ALPHA4ALPHA6BETA2\* AND NOT ALPHA4BETA2\* OR ALPHA6BETA2\* NACHRS ARE UPREGULATED BY NICOTINE CONCENTRATIONS SUFFICIENT FOR EVOKING CONDITIONED PLACE PREFERENCE

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Tobacco addiction is considered the most prolific cause of preventable death in America as it contributes ~440,000 premature deaths annually. Nicotine, the





primary addictive component in tobacco, is rewarding and reinforcing because it activates dopamine (DA) neurons in the ventral tegmental area (VTA) by binding to nicotinic acetylcholine receptors (nAChRs). The activation of nAChRs on these VTA DA neurons results in the release of DA in the nucleus accumbens as well as the prefrontal cortex and hippocampus. Given the low concentration of nicotine that is present in a smoker's brain (100 to 500 nM), only high-sensitivity nAChRs are activated by smoking-relevant concentrations of nicotine:  $\alpha 4\beta 2^*$ ,  $\alpha 4\beta 2\beta 3$ , and  $\alpha 4\alpha 6\beta 2^*$  nAChRs. We investigated how  $\alpha 4\alpha 6\beta 2^*$  nAChRs on VTA DA neurons are altered by nicotine concentrations that are sufficient to evoke reward-related behavior in mice using a conditioned place preference (CPP) assay. We used mice that contain  $\alpha 4$ -mCherry and  $\alpha 6$ -GFP nAChR subunits. Using confocal microscopy and pixel-based FRET methods, we identified regions on VTA DA neurons where  $\alpha 4$ -mCherry and  $\alpha 6$ -GFP nAChR subunits co-assembled to form  $\alpha 4\alpha 6\beta 2^*$  nAChRs. We observed no significant upregulation of  $\alpha 4$ (non- $\alpha 6$ ) $\beta 2^*$  or  $\alpha 6$ (non- $\alpha 4$ ) $\beta 2^*$  nAChRs following a nicotine dosing paradigm that is consistent with CPP assays. However, we observed a significant upregulation in  $\alpha 4\alpha 6\beta 2^*$  nAChRs. Using pixel-based FRET we examined changes in  $\alpha 4\alpha 6\beta 2^*$  nAChR stoichiometry. Compared to control (saline-treated)  $\alpha 4$ -mCherry/ $\alpha 6$ -GFP mice, nicotine treatment caused an increase in NFRET pixel count and mean NFRET intensity. This suggests that nicotine may stabilize the ( $\alpha 4$ ), $\alpha 6\beta 2$  nAChR stoichiometry. Together, these data highlight the importance of nAChRs that contain both the  $\alpha 4$  and  $\alpha 6$  nAChR subunits and suggest that  $\alpha 4\alpha 6\beta 2^*$  nAChRs on VTA DA neurons play a significant role in the cellular changes that mediate nicotine addiction.

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## POS1-53

### DUAL USE: EXPLORING THE POTENTIAL TSUNAMI OF PUBLIC HEALTH IMPACT OF LAYERING LEGAL CANNABIS USE ON TOBACCO USE AMONG THE YOUTH POPULATION

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**SIGNIFICANCE:** Public health is facing a new and growing global challenge. After making significant inroads in reducing tobacco use among Canadian youth, the federal government has plans to legalize non-medical cannabis use, with implementation set for 2018. Mounting evidence suggests potentially serious and harmful effects of cannabis use on youth, including impacts on the developing brain and the initiation and maintenance of smoking. There is concern about the possibility of tobacco use rising among youth cannabis users following legalization. Added to this is a growing concern about a rise in dual tobacco/cannabis use – and the compounding problem behaviors and health effects that will result. **METHODS:** From 2008/2009 to 2014/2015, the Canadian Student Tobacco Alcohol and Drugs Survey (CSTADS) (formerly the Youth Smoking Survey) collected biennial national substance use data. In 2014/2015, CSTADS data were collected from 42 094 students in 336 Canadian schools. **RESULTS:** One in five (21.8%) Canadian students (grades 7-12) reported ever trying cannabis; 16.5% reported use in the past 12 months. Prevalence of cannabis use (past 12 months) varied by province (11.5% [AB] to 24.8% [PE]). Current cigarette smokers reported greater prevalence of cannabis use than non-smokers and access to cannabis was perceived to be 'easier' by smokers. Cannabis use is more prevalent among certain sub-groups, including youth who under-perform in school and initiate substance use early. **CONCLUSIONS:** Compared to other developed countries, Canada consistently has one of the highest rates of youth cannabis use worldwide. As the second country to move towards legalizing cannabis, Canada has the opportunity to conduct a national evaluation of this policy change to examine its impact on rates of youth cannabis and tobacco use. Addressing concerns about the potential for legalized cannabis to undermine successful tobacco reduction efforts, while also creating new challenges of dual substance use, is essential. A 'global call to action' on dual substance use is needed, one which sets clear targets for reducing dual use, documents health impacts, and creates harm reduction policies.

FUNDING: Federal

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## POS1-54

### FOREIGN MARKETING APPEALS ON CIGARETTE PACKS: A SEVEN COUNTRY STUDY

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The tobacco industry uses pack design features and marketing appeals to attract new customers and retain current smokers. Foreign appeals can connote a superior social status and appealing lifestyle. This study examined unique cigarette packs from seven countries to assess the nature and extent of foreign marketing appeals. In 2015, we systematically collected and coded 1,365 packs from seven low- and middle-income countries: Brazil, India, Indonesia, Philippines, Russia, Thailand and Vietnam. Packs were assessed by two independent coders for an extensive variety of design features and marketing appeals, including foreign lexical and imagery appeals. We define foreign marketing appeals to be words or imagery that are not representative of the culture, locale or people of the country in which the product was purchased. Data analysis was conducted using Stata14. Within the full sample, 28% of packs had at least one foreign lexical appeal and 8% had at least one foreign imagery appeal. The use of foreign appeals was highest in Russia (42%) and lowest in Thailand (11%). The brand families with the highest proportion of foreign appeals were Winston (7%) and Lucky Strike (5%). Among packs with a foreign appeal, common lexical terms included London (36%) and "international" or "world" (8%). Frequent foreign imagery appeals included the Great Pyramid of Giza (33%) found exclusively in the brand Camel, and the national flag of the United Kingdom (13%). Within the full sample, 11% of packs had a US lexical appeal (e.g., "America", "USA", "Richmond", "New York") and 5% had a US imagery appeal (e.g., bald eagle, stylized Native American). Across the full sample, foreign marketing appeals were used in all seven countries with at least one foreign lexical and imagery appeal. Understanding the tobacco industry's marketing practices can help advocate for stronger tobacco control interventions such as expanding the amount of coverage of health warning labels and moving to plain packaging, which can restrict the area devoted to brand marketing.

FUNDING: Nonprofit grant funding entity; Academic Institution

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## POS1-55

### ARE THERE DIFFERENCES IN VAPE SHOP POINT-OF-SALE MARKETING AS A FUNCTION OF PROXIMITY TO SCHOOLS?

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**OBJECTIVE:** The rising prevalence of e-cigarette use in the US, especially among adolescents, has been accompanied by a surge in the number of vape shops. Unlike tobacco stores, there has not been much research examining whether the point-of-sale (POS) marketing practices and neighborhood socio-demographic characteristics of vape shops differ according to their proximity to schools. Our study seeks to address this gap. **METHODS:** Trained researchers audited all 74 operational vape shops in a Midwestern metro city area using a modified POS audit instrument based on vSTARS and StoreAlert. They assessed both exterior and interior POS marketing focusing on advertisements, displays and promotions as well as important products and services offered. Measures from the audit instrument were combined to create a POS marketing score. ArcGIS, a geographic information system, was used to identify census tracts and to map vape shop proximity to schools using 1 mile radius as the cut-off point. The 2014 American Community Survey 5-year estimates were used to obtain socio-demographic characteristics of census tracts containing the 74 vape shops. **RESULTS:** More than two-thirds (68%) of vape shops were located within a 1 mile radius of a school. There was no difference in POS marketing score between vape shops according to their proximity to schools ( $p=0.86$ ), neither were there any differences in the presence of e-cigarette safety/quit benefit messaging ( $p=0.55$ ), age of sale warnings ( $p=0.48$ ), availability of candy flavored e-juice ( $p=0.32$ ), and free e-juice sampling ( $p=0.42$ ). Similarly, vape shop proximity to school was not associated with any differences in socio-demographic characteristics such as age ( $p=0.54$ ), sex ( $p=0.64$ ), race-ethnicity ( $p=0.08$ ), education ( $p=0.21$ ), employment ( $p=0.07$ ), and median income ( $p=0.34$ ). **CONCLUSION:** Although a large proportion of vape shops are located in proximity to schools, they do not seem to be employing any specific POS strategies to target school age customers. However, the prevalence



of current/ever use of e-cigarettes among adolescents in the US is on the rise and the reasons behind this surge need to be investigated further.

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## POS1-56

### EVALUATING STATE-LEVEL DIFFERENCES IN E-CIGARETTE AND CIGARETTE USE AMONG ADULTS IN THE UNITED STATES BETWEEN 2012 AND 2014: FINDINGS FROM THE NATIONAL ADULT TOBACCO SURVEY

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**SIGNIFICANCE:** To examine the association between state-level tobacco control measures and current use estimates of both e-cigarettes and cigarettes, while accounting for socio-demographic correlates. **METHODS:** Using the 2012-2013 and 2013-2014 National Adult Tobacco Survey, we assessed prevalence estimates of US adults' e-cigarette awareness and use, as well as cigarette use. We incorporated the Tobacco Control Evaluation Index (TCI), which was created using the State of Tobacco Control annual reports for 2012 and 2013. Descriptive statistics and multinomial logistic regression examined the relationship of state-level tobacco control measures, as depicted by the TCI, and four US states categories by the combined current use estimates of e-cigarette and cigarette. These categories were low cigarette/e-cigarette, high cigarette/e-cigarette, high cigarette/low e-cigarette, and low cigarette/high e-cigarette. **RESULTS:** Current use of both, cigarette and e-cigarette varied substantially by state. The highest current e-cigarette and cigarette use estimate was found in Oklahoma (10.3%) and West Virginia (26.1%) respectively, and the lowest prevalence was in Delaware (2.7%), and Vermont (12.6%) respectively. Compared to low cigarette/e-cigarette category, all other US-state categories had significantly lower scores on their TCI (high cigarette/e-cigarette: aRRR=0.61; 95% CI: 0.60-0.61, high cigarette/low e-cigarette: aRRR=0.74; 95% CI: 0.73-0.74, and low cigarette/high e-cigarette: aRRR=0.72; 95% CI: 0.71-0.73). **CONCLUSIONS:** Enforcing existing tobacco control measures likely impacts e-cigarette use despite being cigarette-focused. Continuing to monitor e-cigarette use is critical to establish baseline use and evaluate future e-cigarette specific federal and state-level tobacco regulatory actions while accounting for the existing tobacco control environment.

FUNDING: Federal; Academic Institution

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## POS1-57

### CHARACTERISTICS OF ONLINE ELECTRONIC CIGARETTE AND OTHER TOBACCO RETAILERS IN ARKANSAS

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**SIGNIFICANCE:** The increase in electronic cigarettes (e-cigarette) use, particularly among young people, is a growing public health concern in the United States. E-cigarettes and their parts and components are easily accessible through online retailers. This study examined the prevalence and characteristics of online retailers who sell tobacco and e-cigarette products in Arkansas, a state where tobacco use is among the highest in the U.S. **METHODS:** Data on online e-cigarette and other tobacco retailers in the state of Arkansas were collected from February to April 2017 using multiple search engines and vaping hubs. Data were collected on the following variables: geographic location, number of products, number of brands sold, social media presence, age verification, and availability and type of e-cigarette liquids. **RESULTS:** We identified 360 e-cigarette and other tobacco online and brick and mortar retailers in Arkansas, of which 25% sold e-cigarettes only. Data show that 43% were online retailers only, and of online retailers, 47% had a website presence only, 26% had both website and social media, and 27% had social media presence only. Nearly 61% of online retailers asked for user age verification. Of online retailers that sold e-cigarettes, 34 advertised flavors. We found an average of 100.4 flavors per website with a range of 18-318 flavors across sites. Fifty percent of all retailers that sold e-cigarette products only were

in cities with populations 50,000 and over, 21.1% had populations ranging from 25,000 to 50,000, and 28.9% were in towns with less than 25,000 people. Of the 90 stores that sold e-cigarettes only, 11 companies with multiple stores accounted for 43% of all retail locations. **CONCLUSIONS:** Arkansas prohibits the online sales of e-cigarettes to customers in the state, but many retailers maintain an online presence. Longitudinal surveillance of the characteristics of online retailers and products sold will provide important information on how pending Food and Drug Administration regulation will influence tobacco product sales and availability.

FUNDING: Federal

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## POS1-58

### PACKAGING COLOR EFFECTS ON REDUCED NICOTINE CONTENT CIGARETTE USE, PERCEPTIONS, AND HARM EXPOSURE: RESULTS FROM AN EXPERIMENTAL PILOT STUDY

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**SIGNIFICANCE:** The US FDA intends to regulate and reduce cigarette nicotine content. Little data are available, however, to guide the marketing of low nicotine content cigarettes in order to maximize their potential health benefit. This pilot study examined the effects of extreme cigarette pack color and reduced nicotine content (RNC) on smoking behaviors, harm exposure, risk perceptions, and subjective ratings. **METHODS:** Thirty non-treatment-seeking, non-menthol, daily smokers (66.7% male, 90.0% White, mean [SD] = 42.13 [11.16], mean [SD] cigarettes per day = 16.13 [6.62]) completed a 16-day, randomized, mixed factorial design laboratory-based trial. Participants smoked their own cigarettes for a 4-day baseline period, and then were randomly assigned to receive either moderate ( $n = 14$ ) or very low ( $n = 16$ ) nicotine Quest brand RNC cigarettes, in three counter-balanced pack colors (black, white, purple) over three, consecutive 4-day periods. **RESULTS:** Smokers consumed more cigarettes per day ( $p < .01$ ), had lower CO boost ( $p < .001$ ), took fewer puffs ( $p < .001$ ), and had reduced risk perceptions ( $p < .001$ ) when using RNC cigarettes, regardless of pack color, compared to own brand during baseline. Those randomized to the very low (vs. moderate) RNC cigarettes smoked more cigarettes per day, had greater CO boost, lower total puff volume, and took fewer puffs (all  $p < .05$ ). Those using very low RNC cigarettes rated all three pack colors as weaker, less satisfying, faster burning, and too mild compared to own brand ( $p < .001$ ); however, there were no differences among those using moderate RNC cigarettes. **CONCLUSIONS:** Among adult daily smokers using previously commercially-available RNC cigarettes with extreme pack colors, pack color did not affect smoking behaviors, harm exposure, risk perceptions, or subjective ratings. In this context, nicotine content was a greater determinant of product use and perceptions than pack color. Future research should further investigate these effects using other, tobacco industry-utilized pack colors across varying nicotine content levels and subpopulations.

FUNDING: Federal

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## POS1-59

### TOBACCO INDUSTRY TARGETING OF YOUTH IN NIGERIA SINCE THE 1990S: AN ANALYSIS OF TOBACCO INDUSTRY DOCUMENTS

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**SIGNIFICANCE:** of study: Nigeria is seen by transnational tobacco companies (TTCs), seeking to compensate for declining sales in traditional markets, as a key emerging market. With a population of 180 million people, and gross domestic product (GDP) per capita of US\$1092 in 2014, Nigeria is the seventh most populous country in the world and Africa's largest consumer market. Existing evidence shows that a key strategy by TTCs, to grow new markets worldwide, has been to target youth. Given that half of regular smokers eventually die of their habit, tobacco companies must sustain demand by recruiting new users to replace them. Studies worldwide show that youth who start smoking in secondary school (13-18 years) are at least twice more likely to continue smoking than those who begin smoking after this age. About 22% of the Nigerian population is aged between 10 to 19 years. **METHODS:** The study systematically searched the Truth Tobacco



Industry Documents Library, and available secondary sources on industry activities, to identify such activities. The study then applied the three streams of the theory of triadic influence to organize document findings, and understand how TTCs sought to influence the smoking behaviour of Nigerian youth. This data was supplemented by key informant interviews with representatives of the Nigerian government, nongovernmental organizations concerned with tobacco control, and scholars studying Nigeria and tobacco. RESULTS: The findings suggest TTCs have actively targeted youth in Nigeria since the 1990s, with a focus on changing behaviour through the environmental/cultural and social streams. There is also evidence these practices continue despite restrictions adopted on the targeting of youth. CONCLUSION: The study recommends a substantial strengthening of protections in the implementation of the National Tobacco Control Bill adopted into law in 2015 but not yet implemented.

FUNDING: Federal; Nonprofit grant funding entity

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## POS1-60

### PERCEPTIONS OF NICOTINE AND ADDICTION AMONG EVER CIGARETTE SMOKERS REPORTING CURRENT USE OF ELECTRONIC CIGARETTES

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INTRODUCTION: The Food and Drug Administration (FDA) recently announced its interest in a nicotine reduction policy aimed at reducing the addictiveness of combustible tobacco products. Since the FDA's public health framework for tobacco regulation includes educating the public about its regulatory actions, it may be important to understand the existing knowledge and perceptions of nicotine and addiction. This qualitative study explored knowledge and perceptions of nicotine and addiction among a sample of experienced nicotine users: ever cigarette smokers reporting current use of a newer nicotine delivery product, electronic cigarettes (e-cigs). METHODS: Participants completed an online survey including items on demographics and tobacco and e-cig use history. Four open-ended items asked respondents to describe important e-cig features, effects from e-cig use, differences between e-cig and combustible cigarette use, and information public health researchers should know about e-cigs. Participants selected for analysis had written responses that included the words "nicotine" or variations of "addiction." Data were coded into themes in NVIVO 10 using the constant comparative method. RESULTS: Participants (n=960) were ever cigarette smokers reporting current use of an e-cig (67.2% male, mean age 41 years). Participants were 1) aware nicotine causes addiction (e.g., "Nicotine is highly addictive."), 2) believed e-cigs to be healthier alternative for nicotine (e.g., "I get my nicotine now without the smoke and combustion."), and 3) had the desire to control nicotine exposure (e.g., "Through the various nicotine levels, [e-cigs] offer a step-down system to break the nicotine addiction," and "As an e-cig user, I appreciate the options available to control my own intake of nicotine"). CONCLUSION: Experienced nicotine users understand nicotine is addictive and have sought a less harmful way to control and reduce their nicotine intake via use of e-cigs. Thus, educational messages formulated by the FDA should consider ever smoking e-cig users to be familiar with, and receptive to, the rationale for a nicotine reduction policy in combusted products.

FUNDING: Federal

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## POS1-61

### HOW THE CIGAR INDUSTRY MADE CIGARS COOL AGAIN

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SIGNIFICANCE: The Tobacco Control Act of 2009 gave FDA the authority to regulate tobacco products, but not cigars, among other products. In May 2016, FDA issued a final rule on deeming tobacco products, which included regulating all cigars. An updated review of the research is necessary to better understand the tobacco industry's marketing and promotion of cigars. 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: The cigar industry markets cigar products using the same strategies for marketing cigarettes. Many of these strategies target youth and young adults through lifestyle marketing, celebrity endorsements, social media, and at the point of sale. Sales of cigars in the US increased dramatically due to increased cigar marketing, such as the use of cigars by celebrities and increased advertising and promotion of new cigar brands. Advertising and promotional activities increased the visibility of cigar smoking, "normalizing" cigar use. Tobacco companies promote cigar smoking as pleasurable, a symbol of status, wealth, and class. Manufacturers reduced the size of cigars to make them more cigarette-like and introduced filters and flavored filter tips. Now, the packaging and marketing of small cigar products often mimic those of cigarettes. CONCLUSION: Knowing current practices and given the well-documented history, FDA and the tobacco control community should be concerned about the cigar industry's marketing and work to put policies in place limiting such predatory practices.

FUNDING: None

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## POS1-62

### DOES RISK PERCEPTION INHIBIT SWITCHING TO ELECTRONIC NICOTINE DELIVERY SYSTEM (ENDS) AMONG ADULT SMOKERS? EVIDENCE FROM GSU TCORS' 2014-2017 SURVEYS

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SIGNIFICANCE: In July 2017, the FDA announced a comprehensive regulatory plan to reduce the toll of tobacco use in the U.S., encouraging innovations in nicotine-delivery products, including electronic nicotine delivery systems (ENDS), which, many believe, pose significant less risk than smoking. However, recent data show that the growth of ENDS in the past decade has been stalled in 2016. To what extent the slowing-down of ENDS use relates to smokers' risk perception is not well understood. The goal of this study is to examine the relationship between adult smokers' risk perception about ENDS/cigarettes and use of ENDS. METHODS: This study used data from four waves of the Georgia State University's (GSU) TCORS Tobacco Products and Risk Perceptions Surveys, nationally representative cross-sectional surveys of the U.S. adults, conducted annually from 2014 to 2017. The relationship between current use of ENDS and the perceived harmfulness of ENDS relative to combustible cigarettes was examined using Logistic models, controlling for demographics and socioeconomic status. RESULTS: Our results show that between 2014 and 2016, the percentage of smokers who considered the harm associated with ENDS "about the same as" or "more harmful than" that of smoking increased from 31% to more than 40%. The rate of ENDS use, however, declined from 7.4% in 2015 to 5.4% in 2016. RESULTS: from the Logistic models show smokers perceived ENDS as harmful as (or more harmful than) smoking were less likely to use ENDS. At the time of writing this abstract, our 2017 survey is still in the field. The 2017 data will be added to our analysis as soon as they become available for the 2018 SRNT meetings. CONCLUSIONS: Adult smokers' risk perception about ENDS was associated with lower probability of ENDS use, hence lower likelihood of switching to ENDS. Accurately communicating the risks of ENDS may help encourage those smokers who do not intend to quit to switch completely to ENDS.

FUNDING: Federal

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## POS1-63

### CIGARETTE BRAND NAMES AND DESCRIPTORS AMONG ADULT CHINESE URBAN SMOKERS FROM 2009 TO 2015: LONGITUDINAL FINDINGS FROM THE ITC CHINA COHORT SURVEY

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**SIGNIFICANCE:** The China National Tobacco Company (CNTC) has a long history of selecting creative and meaningful brand names (e.g. national landmarks, famous cities, flowers, plants, animals) to solidify brand loyalty and signal image and social status. CNTC also incorporates colors, words (e.g. pure, classical), packaging features (e.g. hard vs. soft) and numbers (e.g., tar ratings) in the descriptor names to influence smokers' beliefs about the relative risks and quality of different brands. This study is the first to systematically examine brand preferences among Chinese smokers over time with reference to the CNTC's brand strategies. **METHODS:** Data are from a cohort of adult ( $\geq 18$  years) Chinese smokers (N=7,351) across 7 cities between Waves 3 (2009) and 5 (2013-2015) of the International Tobacco Control (ITC) China Survey. The 115 cigarette brand names and 500 descriptors smoked by the cohort members were classified into 6 brand themes and 9 descriptor categories. Weighted adjusted generalized estimating equation models were used to analyze changes in key brand themes and descriptors over time. **RESULTS:** From 2013-15, the most popular brand theme were national landmarks/legends (32.7%), followed by geographic names (23.3%, increased from 16.0% in 2009,  $p < 0.001$ ), the joyful spirit of ceremonies/festivals/holidays (21.5%), and flowers/plants/animals (13.3%; decreased from 22.8% in 2009,  $p < 0.001$ ). CNTC has increased the use of 3 or more descriptors on a cigarette pack (14.1% to 20.3%,  $p = 0.01$ ). The use of quality descriptors increase (31.9% to 36.7%,  $p = 0.05$ ) but the use of packaging features decreased (72.5% to 65.4%,  $p = 0.004$ ). **CONCLUSIONS:** China's cigarette packages do not currently include pictorial health warnings; the pack thus provides a blank slate for appealing, colorful cigarette package designs with positive messages. The use of brands names and descriptors is a powerful strategy for CNTC, particularly in linking cigarette brands to key geographic and sociocultural symbols of China. These findings enhance the need for large pictorial warnings in China, where the tobacco epidemic poses a health and economic threat, far surpassing that of any other country.

**FUNDING:** State; Federal; Nonprofit grant funding entity

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## POS1-64

### EXPLORING THE PERSONALITIES OF CIGARETTES: AN EXAMINATION OF SMOKERS' PERCEPTIONS OF CIGARETTE BRAND PERSONALITIES

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**SIGNIFICANCE:** In the U.S. alone, tobacco companies spend over \$8 billion on the marketing and advertising of cigarette products annually. Despite the strong influence product packaging has on consumers, the regulation of cigarette pack visual design is limited. Similar to other industries and products, tobacco brands rely on their packs to employ marketing tactics, like brand personalities, to attract customers. Consumer behavior research has shown that successful brand personality campaigns create long-lasting customers, increase brand loyalty, and increase perceived quality. As such, to inform regulation by the Food and Drug Administration, this study sought to examine if smokers were perceptive of brand personality in cigarette packs. **METHODS:** A qualitative research method was employed using focus groups. In March of 2017, we conducted six focus groups (33 adult smokers). All focus groups had regional, gender, and racial/ethnic diversity and were selected from the NORC AmeriSpeak Panel; two focus groups had lesbian, gay, and bisexual participants; two groups had less than four years of college education; one group had LGB and straight participants; and, one group had a general population. Data was analyzed using a grounded theory approach. **RESULTS:** Participants perceived the marketing strategy of brand personalities. When discussing the different types of cigarette packs, participants often used the personality characteristics of Rugged (Marlboro), Sincerity (American Spirit), and Excitement (Newport) to describe the look of the pack, as well as the cigarette brand and the actual cigarette. **CONCLUSION:** Smokers were able to identify brand personalities when discussing Marlboro, American Spirit, and Newport cigarette packs. Findings also revealed that participants treated the brand, the pack, and the cigarettes as interdependent concepts. In turn, the data indicate that the brand personality of a pack influences consumers' perception of the cigarette inside. This study provides insight into how a pack influences customers' perception about the actual cigarette, and can be used to support development of regulations on cigarette packs.

**FUNDING:** Federal

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## POS1-65

### THE EFFECT OF A UNIVERSITY-WIDE BAN OF ELECTRONIC CIGARETTES ON TOBACCO USE PATTERNS

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**INTRODUCTION:** Electronic cigarettes (ECs) have increased in popularity since they entered the market, particularly among college students. Many college campuses implement EC use bans within smoke-free policies, but there are concerns individuals will begin to use other tobacco products in the wake these bans. However, the effects of these regulations are unknown. The current study examined changes in tobacco use patterns and perceived product harmfulness following a university wide ban of ECs. **METHODS:** Participants were 1,727 undergraduate students ( $M_{age} = 19.48$ ,  $SD = 2.06$ ; 66.7% women) attending a large Midwestern university. Participants self-selected to participate via the university's online research pool system. Self-report measures were administered through an online questionnaire assessing demographics, smoking/vaping prevalence, and perceived product harmfulness. Data were collected in the fall semesters of: 2013 (pre-ban), 2014, 2015, and 2016 (post-ban). Participants were grouped by tobacco use status (never users vs. triers vs. occasional users vs. daily users). **RESULTS:** Results suggested the proportion of never EC users significantly decreased from pre-ban to 3 years post-ban ( $p = .004$ ). During the same time, the proportion of daily users remained relatively stable while the proportion of EC triers increased significantly. Alternatively, for all other tobacco products, the proportion of never users increased significantly while daily use either decreased or remained stable (all  $p < .05$ ). Perceived absolute harmfulness of ECs and cigarettes increased each year following the ban (all  $p < .001$ ). **DISCUSSION:** The current study is one of the first to examine use patterns of ECs following a campus-wide ban. Results suggest the ban did not result in significant decreases in EC daily use but did result in decreases in other tobacco use. This pattern of results demonstrates institutional bans of all tobacco products including ECs have a positive public health impact. Future directions include following up on the ban to observe if the findings from this study are maintained long-term.

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## POS1-66

### RETAIL SALES OF "LITTLE CIGARS" THAT MAY BE CIGARETTES IN WASHINGTON, DC

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**SIGNIFICANCE:** In December 2016, FDA sent warning letters to 3 firms selling rolls of tobacco labeled "little" or "filtered cigars," stating that they were cigarettes violating the Tobacco Control Act's ban on flavored cigarettes (other than menthol). This pilot study sought to determine the extent to which such mislabeled cigarettes are sold in Washington, DC and violate laws and rules that apply to cigarettes but not cigars. **METHODS:** The study identified two tobacco-selling retail outlets (one chain store and one independent) in each of DC's 8 wards and made purchases of "little cigars" at each outlet using a mobile-enabled survey to record data on the products' advertising, display, characteristics, and pricing. **RESULTS:** All 16 retailers sold cigarettes and a variety of cigars. 7 sold "little" or "filtered cigars" with





cigarette-type filters, with most offered in packs < 20 (88%) or with flavors other than menthol (88%). None were the brands in FDA's warning letters. 8 retailers had ads for bona fide cigars or filtered "little cigars" visible at the counter, 13 displayed them next to cigarettes, 15 next to candy, and 15 had brand displays. 12 offered such products in packs of 2, 9 as singles, and 16 offered flavored versions. CONCLUSION: This pilot study indicates that the problem of cigarettes mislabeled as "little" or "filtered cigars" being offered for sale at retail outlets may be relatively minor in DC. Further research is needed to confirm this preliminary finding and to determine whether it applies to other jurisdictions and whether such filtered "little cigars" are being sold into DC or other jurisdictions through Internet or other mail order sales. Consistently with prior research, this study found, that both bona-fide cigars and products labeled as "cigars" that might be cigarettes have characteristics permitted for cigars but not for cigarettes, which may make them more attractive or accessible to youth. Further research is needed to determine whether any of these tobacco products are being smoked as alternatives to cigarettes or increase youth initiation.

FUNDING: Academic Institution

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## POS1-67

### "THE PACKAGING IS VERY INVITING AND IT DOES MAKE THE SMOKER FEEL LIKE THEY'RE MORE SAFE": THE MEANINGS OF NATURAL AMERICAN SPIRIT CIGARETTE PACK DESIGN TO ADULT SMOKERS

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SIGNIFICANCE: Despite declines in cigarette smoking, over 36 million adults in the U.S. are currently smokers. In an effort to decrease negative perceptions about tobacco, some tobacco brands such as Natural American Spirit™ (NAS) are using pro-health oriented text and imagery to market their cigarettes. In addition, NAS uses bright colors and a logo of an American Indian warrior smoking a peace pipe with the text "100% additive-free natural tobacco" and "organic" on their packs. While some attention has been paid to these text descriptors and print ads, where smokers are more likely to perceive these cigarettes as less harmful to health when compared to other brands, less research has focused on the design of NAS packs (e.g., color, shape, typeface, logos, descriptors, iconography, images) and related perceptions about the product. Such research has important implications for FDA regulation of tobacco products. METHODS: We examined what NAS cigarette pack design elements were salient and what these elements meant to current smokers. Six focus groups of U.S. adult smokers (n=33) purposively recruited to maximize geographic diversity and include low SES and sexual minority smokers using the AmeriSpeak Panel. No visual stimuli were provided in these spring 2017 telephone-based groups; participants recalled the design and meanings of NAS packs that had stood out to them. Saturation of themes was confirmed. A professional moderator led the groups and data were analyzed using the constant comparison analysis method to derive themes. RESULTS: Participants identified unique colors and the American Indian warrior logo as the most salient design features. Pack designed conveyed that the brand was safer and healthier compared to other brands. Participants also reported that based on these design elements the brand was targeting specific groups such as American Indians, hippies and young adults, including hipsters. CONCLUSIONS: Adult smokers consider cigarette pack design elements used by NAS to communicate a lower risk to health and appeal to certain populations. These findings are relevant to FDA regulation of design changes to cigarette product labels and packaging.

FUNDING: Federal

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## POS1-68

### INEQUALITIES IN TOBACCO USE AMONG ADOLESCENTS (13-15 YEARS): A GLOBAL COMPARISON

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BACKGROUND: It is well known that majority of the tobacco users have tried their first tobacco before their 18th Birthday. However, there is limited information available on the relationship between Gini purchasing power parity (PPP) per capita (\$), tobacco use, and adolescent. Therefore, the present study aims to measure the relationship between PPP per capita (\$) and tobacco use among adolescent. METHOD: This study utilized country specific secondary data on the prevalence of tobacco smoking or smokeless tobacco use among 13-15 years adolescent, PPP per capita, and population size available at Data finder, population reference bureau 2017. The data were analyzed using Microsoft Excel 2016 and SPSS-20. Missing information was excluded from the analysis. Result: The global median prevalence of tobacco use for male and female was 21% (IQR: 15-28) and 14% (9-22). The highest prevalence of male tobacco use was in Papua New Guinea (55%) and lowest was in Zimbabwe (1.5%). Whereas, among females, it was highest in Czechoslovakia (43%) and lowest (2%) in Oman, Vietnam, and Uzbekistan. The PPP gap was \$ 12270 (Qatar: \$133850 & Central African Republic: \$ 610) with a gap in tobacco use prevalence of 5% for male and 22% for female. Among the top 10 highest income countries, the median prevalence of tobacco use was 13% (IQR:10-22). Similarly, in the top ten low-income countries, the median prevalence was 15% (IQR: 7.7-22.2). The scatter plot revealed that the distribution of prevalence rate for male and female were concentrated below \$ 40,000 PPP and \$20,000 PPP per capita. The median prevalence rate for first, second, third and fourth quartile PPP was 20% (IQR: 14.2-30.7), 19(12.7-26), 21.5 (16-24.8), -24(17-29) for male and 14 % (8.2-19.7), 11(6.2-22), 13(8.2-17.7), 24 (17.5-29) for female respectively. The overall concentration index was -0.18. CONCLUSION: There is inequality or gap in the prevalence of tobacco use between high- and low-income countries as well as by sex. The data also indicates tobacco use is higher among the low-income countries. The data indicates there is need to strengthen tobacco control intervention among adolescents in low-income countries.

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## POS1-69

### THE PREVALENCE OF POPULATION AND INDIVIDUAL-LEVEL DESCRIPTIVE NORM INFORMATION IN MEDIA COVERAGE OF E-CIGARETTES AND OTHER TOBACCO PRODUCTS

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SIGNIFICANCE: Young people can learn descriptive normative information about e-cigarette (e-cig) and other tobacco product (tobacco) use through the media, potentially affecting their beliefs about and use of these products. This information includes information about individuals' smoking behavior and information about populations' behavior (summarizing average smoking trajectory). In this study, we estimate the prevalence of both types of normative information in e-cig and tobacco-related articles. METHODS: Using four samples consisting of 2,400 texts each, we developed supervised machine learning classifiers with adequate precision and recall to identify texts that contain individual and population norms. We calculated the sample frequency and estimated normative prevalence in all e-cig (9,893) and tobacco (145,714) texts published from May 2014-June 2017 in four media sources: the AP, 50 major newspapers, 8 broadcast news sources, and more than 100 websites that are most popular with youth. RESULTS: Only 4% of tobacco texts mentioned population norms, while 28% mentioned individual norms. The plurality (44%) of tobacco population norm mentions described tobacco use as low or decreasing; contrarily the majority (86%) of tobacco individual norm mentions depicted individuals using tobacco rather than quitting or reducing their use. Among e-cig texts, 22% mentioned population norms while 19% mentioned individual norms. The majority of e-cig population norm mentions (83%) described e-cig use as high or increasing, consistent with the 96% of e-cig individual norm mentions depicting individual e-cig use. CONCLUSIONS: Consumers of tobacco-related media would more likely be exposed to individual norms than population norms, and would learn conflicting information. While population norm mentions would lead them to believe tobacco use was low or decreasing, more commonly-encountered depictions of individuals using tobacco could have the op-



posite effect. In contrast, individuals consuming e-cig-related media would learn consistent information about the high prevalence of and increasing trends in e-cig use from population and individual norms.

FUNDING: Federal

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## POS1-70

### "I PULLED OUT MY E-CIGARETTE RIGHT THERE AND I WAS PUFFING": AN EXPLORATORY ANALYSIS OF ADULT SMOKERS' PERCEPTIONS AND EXPERIENCES USING E-CIGARETTES IN SMOKE-FREE PLACES

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**SIGNIFICANCE:** Evidence indicates that one reason smokers value e-cigarettes is for their ability to use them in smoke-free spaces. We know little about how smoke-free policies and norms might affect adult smokers' self-regulated e-cigarette use. This study sought to: (1) understand smokers' e-cigarette perceptions and decisions about self-regulated use in smoke-free places; and, (2) describe smokers' perceptions of bystander reactions. **METHODS:** We used qualitative data from the Moment Study, a mixed-methods observational study that examined environmental and psychological factors influencing smokers' e-cigarette use. Participants (n=20) were followed for three weeks as they tried e-cigarettes for the first time. Participants took part in three semi-structured interviews (n=60) at the end of each week. All interviews were audio-recorded, transcribed, and analyzed using thematic analysis methodology. **RESULTS:** The sample comprised 10 women and 10 men, with a mean age of 37.9 years. Participants reported friends, co-workers, and media as sources of exposure to e-cigarettes; limited knowledge of e-cigarette use characteristics; perceptions of e-cigarettes as an alternative to smoking; and perceptions of e-cigarettes as less harmful than cigarettes. Participants expressed uncertainty about whether smoke-free policies included e-cigarettes and reported using the devices in their homes, personal vehicles, worksites, restaurants, and public transportation. Participants described approaches to self-regulated e-cigarette use in smoke-free places as part of a complex decisional balance influenced by both individual and situational factors, ranging from intentional use in smoke-free places to limiting use to inside their home. Moreover, perceived favorable, unfavorable, and impartial reactions from bystanders either facilitated or impeded e-cigarette use. **CONCLUSIONS:** Results suggest a continuum of factors, including sources of e-cigarette exposure, perceptions of smoke-free policies, and reactions from bystanders, may influence self-regulated e-cigarette use among smokers in smoke-free places.

FUNDING: Federal

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## POS1-71

### TOBACCO CESSATION TRAINING AND POLICY IN PRIMARY CARE: A NEW YORK STATE NEEDS ASSESSMENT

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**SIGNIFICANCE:** Public Health Service Guidelines recommend health system strategies to support tobacco cessation efforts, including written policies, patient screening and documentation, treatment services, and training for clinicians. However, many health systems may not adequately employ these strategies, thereby reducing clinicians' effectiveness. **METHODS:** Two on-line, state-wide needs-assessments queried, clinicians and other healthcare professionals about their clinical settings' current practices, resources and needs regarding tobacco dependence treatment, policy, and training. **RESULTS:** Participants (n=260) consisted of prescribers (43.08%), other health professionals (38.07%), and administrators/others (18.85%) across a variety of medical and behavioral health settings. Only 45.77% reported that their setting had a tobacco policy, and 40% reported that they routinely addressed tobacco dependence. Only 21.92% reported having had smoking cessation training in the past year, despite 81% specifying a preference

for such training. Larger clinical sites (health centers, hospitals, etc.) were more likely than other sites to have a written tobacco policy and to address tobacco with patients, but not to have had training in the past year. **CONCLUSIONS:** Important opportunities for educational interventions can be recommended for these clinical settings, including policy improvement, screening and treatment protocols, and sufficient clinical training in tobacco dependence. Several state-funded initiatives are addressing these needs with online training and train-the-trainer resources focused on policy, treatment, referral, quality improvement, and sustainability. Future assessments should track whether these needs are being addressed and further evaluate whether improved state services are having an impact on cessation among patient populations.

FUNDING: State

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## POS1-72

### SMOKING BEHAVIOR, NICOTINE DEPENDENCE, AND CESSATION COUNSELING: FINDINGS FROM GLOBAL HEALTH PROFESSIONAL STUDENT SURVEY (GHPSS) IN NEPAL

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**BACKGROUND:** Though the intervention by Amato<sup>1</sup> the health professionals helps to reduce the risk of smoking cessation, there is limited information available on smoking behavior and practices of smoking cessation among Nepalese health professionals. Thus, the present study aims to measure tobacco use, nicotine dependence, and their perception on cessation counseling among health professional students (HPS). **Method:** The second GHPSS-Nepal data, representative of the third-year medical (n= 662), dental (72), pharmacy (126), and nursing (150) students, was analyzed between June and July 2017. **RESULT:** Nearly 4 in 10 HPS smoke cigarettes of which 22.2% were female. Four in ten pharmacy, 2 in 10 medical, 2 in 10 dental, and 1 in 10 nursing students had their first cigarettes before their 20<sup>th</sup> birthday. Dental students had highest percentage of nicotine dependence (67%; 95% CI: 48.6-83.3) followed by pharmacy (54%; 39.3-68.1), medical (36%; 29.9-43.7), and nursing (9.09; 1.1-29.2) students respectively. Males were more likely to be addicted but not statistically significant (OR:1.43, 95% CI= 0.70-2.90). About 9 in 10 HPS learned to record tobacco use history from the patient of which 40% were smokers. 8 in 10 HPS believed to be served as a role model even though 36% of them were smokers. One in 20 HPS did not believe that their role is to advise their patient to quit smoking. Nine in 10 HPS believed that they should receive training on smoking cessation techniques. However, those who received a formal training ranged from 25.3% of medical students to 64.2% of nursing students. Nearly 5 in 10 HPS had heard about anti-depressant in tobacco cessation programs and universal among nursing students. Eight in 10 HPS had ever heard of using nicotine replacement therapy in tobacco cessation. **CONCLUSION:** The results indicate that smoking is prevalent among health professionals. There is need of education, training, and counseling on smoking cessation to bring down the level of nicotine dependence and assist themselves to improve their effectiveness in clinical settings as a role model.

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## POS1-73

### SWISHER SWEETS "ARTIST PROJECT": USING MUSICAL EVENTS TO PROMOTE CIGARS

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Although branded sponsorship events are banned for cigarettes and smokeless tobacco in the US, there are no restrictions on the ability of manufacturers, distributors or retailers of cigars to engage in cigar-branded sponsorships. We conducted an examination of web-based music-oriented promotions by Swisher Sweets, a top-selling cigar brand. We reviewed the Swisher Sweets "Artist Project," a marketing effort that promotes and supports musical artists, has a branded presence at concerts and holds pop-up music events in convenience stores that are promoted on their website and social media. As a part of the "Artist Project," Swisher Sweets promotes "Swisher Sweets Pack Nights," a concert series held across the US



where emerging artists perform. A \$2.00 payment for a voucher is included in the ticket price of \$20, which can be used to obtain several Swisher Sweets cigar products. The "Artist Project" also utilizes new and innovative marketing strategies, including the "Convenience Store Sessions." These sessions focus on the retail space, which is already heavily branded with tobacco advertising. Many of the Swisher Sweets events are recorded and promoted on the brand's social media sites, including YouTube. While currently permissible for cigars, many of these promotional efforts using music sponsorship would be in violation of the Tobacco Control Act and the MSA's youth marketing restriction if they utilized a cigarette or smokeless tobacco brand. Given the restrictions on this type of marketing for cigarettes and smokeless products and the high prevalence of cigar use among young people and African Americans, sponsorship restrictions for non-cigarette tobacco products are warranted.

FUNDING: Nonprofit grant funding entity

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## POS1-74

### THE CONTINUED IMPORTANCE OF TOBACCO TAXES: EXAMINING OUTCOMES FROM A RECENT CIGARETTE TAX INCREASE

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Increased cigarette taxes that result in higher prices are a mainstay of tobacco control policy because they lead to less initiation, lower consumption of cigarettes per day and decreased participation as smokers quit. Consistently a 10% increase in cigarette price has reduced consumption/participation 3-5%. However, an important policy question is whether increased cigarette taxes will continue to encourage quit attempts and smoking cessation, especially as norms shift away from smoking and prevalence rates drop. In this presentation we consider separate analyses from adult tobacco use data and retail sales data (Nielsen) to document the effects of a 2013 increase in Minnesota cigarette taxes (+\$1.75). The Minnesota Adult Tobacco Survey, a serial cross-sectional telephone survey conducted statewide, was examined to identify past-year cigarette smokers in 2014 (n=1382). Weighted estimates were calculated of: past-year smokers, smokers who attempted to quit smoking, and those who successfully quit by demographics, tobacco use, use of evidence-based cessation assistance to quit, and smoker perceptions of the tax increases. Overall, the tax increase led to a 30% average price increase and a statewide 15.6% quit rate measured in 2014. Year-to-year retail sales fell 12% post-tax compared to 3% pre-tax. Most smokers (60%), especially low SES, reported taking steps toward quitting including quit attempts. In multivariate models, after considering demographics and other variables including e-cigarettes, successful 12-month quits were predicted by the use of cessation aides (AOR=2.2; CI 1.2, 4.3) and reporting the tax increase helped maintain a quit (AOR=13.1; CI 7.2, 23.8). In a state with declining smoking prevalence and strong tobacco control policies including comprehensive smoke free policies and universal access to treatment, increasing the price of cigarettes had a robust effect by encouraging smoker quit attempts and quitting. In addition, from several data sources, we assessed multiple positive effects from the 2013 tax increase. The overall conclusion is that taxes remain an important public policy strategy to reduce population-level cigarette smoking.

FUNDING: Nonprofit grant funding entity

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## POS1-75

### LONG-TERM EXAMINATION OF NICOTINE STABILITY IN ELECTRONIC REFILL SOLUTIONS

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BACKGROUND: There are no regulatory standards for packaging and labeling of commercial electronic refill solution (e-liquids). Studies are needed to determine nicotine stability and e-liquid formulation shelf-life. This study examined nicotine stability in reference e-liquids stored in various containers and controlled environ-

mental conditions. Materials and Methods: We prepared 3 reference e-liquids by dissolving nicotine (24mg/ml) in: 1) propylene glycol (PG), 2) vegetable glycerin (VG), or 3) 50/50 PG/VG. Each solution was placed in four different containers: A) clear polypropylene (PP) plastic, B) clear polystyrene (PS) plastic, C) amber glass and D) clear glass. E-liquids in containers were stored over 24 months under three different conditions: ambient light and room temperature, dark place and room temperature or in a refrigerated dark place (4°C). Nicotine content and pH of each product were measured at baseline and after 1, 3, 6, 12, and 24 months. A GCMS analysis was carried out after 12 and 24 months, to identify potential nicotine degradation by-products. RESULTS: Nicotine in e-liquids stored in transparent containers exposed to ambient light and temperature degrade up to 10% after 12 months and up to 30% after 24 months. E-liquids that were exposed to ambient light but stored in amber glass containers did not degrade by more than 5%. E-liquids stored in a dark place remained stable regardless of storage temperature. Nicotine dissolved in PG degraded more than in VG under every storage condition. In products with degraded nicotine the pH decreased by up to 15% after 24 months. Several e-liquids showed evident discoloration from faint yellow to dark brown. GCMS analysis revealed the presence of cotinine and nicotine N-oxide in e-liquids after 24 months. CONCLUSION: Nicotine in e-liquids was found to be unstable when exposed to light. Degradation of nicotine is accelerated when dissolved in PG-based solutions as compared to VG. Nicotine degradation can be prevented by appropriate storage of e-liquids in opaque containers with lower temperatures.

FUNDING: Federal

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## POS1-76

### USING NARRATIVES TO PROMOTE SUBSTITUTION OF E-CIGARETTES FOR CIGARETTES IN AN ONLINE EXPERIMENTAL TOBACCO MARKETPLACE

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Despite promising decreases in overall smoking rates, a significant proportion of the population continue to engage in this maladaptive behavior. Additionally, many find it extremely difficult to stop smoking. The Competing Neurobehavioral Decision Systems Theory suggests that maladaptive health behaviors are in part a result of a reinforcer pathology where individuals overvalue cigarettes and thus choose the immediate effects of the cigarette over the delayed health consequences. These processes are encompassed by economic demand and delay discounting. Because of their theorized etiological role in the development of cigarette smoking, methods of intervening on demand and delay discounting are of great interest. One recently applied technique is the use of narratives to encourage behavioral change. In this study, participants (N = 180) were assigned to one of four narratives that described a close friend becoming ill. In the control group, participants read about a friend that became ill but learned it was only the flu. In the other conditions, participants read about a friend that became ill because of cigarette smoking. In one of these scenarios, the friend explicitly expressed remorse for ever starting to smoke. In another scenario, the friend said they had quit smoking, started using electronic cigarettes, and now felt much better. There was a decrease in the initial demand for cigarettes (e.g., intensity) in participants that read a narrative about their friend falling ill due to cigarette smoking. This effect was especially pronounced in participants whose narrative described their friend changing to electronic-cigarettes. Additionally, greater substitution for electronic-cigarettes was reported in these groups. Changes in delay discounting were also differentially observed. Participants whose "friend" reported switching to electronic cigarettes were more likely to choose a smaller, immediate amount of money over a larger, delayed equivalent amount of cigarettes after reading the narrative. These demonstrate that narratives are effective at changing behaviors related to cigarette smoking.

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## POS1-77

### INCREASED SUSCEPTIBILITY TO MENTHOL-INDUCED PULMONARY CELLULAR TOXICITY AND AIRWAY BRONCHODILATION IN THE IMMATURE LUNG

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**SIGNIFICANCE:** Approximately 39% of smokers report use of menthol cigarettes with a growing market for a range of mentholated products. The immature, developing lung is uniquely susceptible to toxins and may be at increased risk of lung injury with second-hand or gestational exposure to menthol. However, relative toxicity and airway responsiveness with menthol exposure during early lung development remains unknown. **METHODS:** Neonatal and adult ovine pulmonary artery smooth muscle cells (PASMC) were exposed to menthol flavored e-liquid [ECTO, 0mg nicotine, propylene glycol (PG)/glycerin (VG)], pure PG or pure VG at a 1:100 dilution for 24h. Viability was assessed on treated and untreated cells by lactate dehydrogenase (LDH) assay. Vasoreactivity to mentholated e-liquid (at 1:1000 dilution) was determined on isolated neonatal and adult ovine intrapulmonary bronchial rings. Rings were precontracted with 5-hydroxytryptamine (5-HT) and relaxation of treated and untreated tissue determined. **RESULTS:** Untreated control cells had comparable rates of cell death by LDH in both age groups [16.2 ± 4.4% (neonate) and 19.6 ± 4.5% (adult)]. Exposure to both PG and VG resulted in an insignificant increase in cell death above control. [4.4 ± 2.7% and 4.6 ± 3.0% for PG; 9.0 ± 2.7% and 3.7 ± 1.7% for VG in neonate and adult, respectively]. Treatment with menthol flavoring caused significant increases in cell death with exaggerated toxicity in neonatal as compared to adult PASMC (84.0 ± 6.5% and 59.0 ± 9.4% increase in neonates and adults,  $p = 0.037$ ). Exposure to menthol flavoring resulted in relaxation in both neonatal and adult bronchial rings with exaggerated responses in the neonate (8.0 ± 9.2% (neonate) and 84.7 ± 5.6% (adult) of 5-HT precontraction when normalized to untreated controls,  $p < 0.001$ ). **CONCLUSION:** The immature lung may be uniquely susceptible to menthol-induced cellular toxicity and airway bronchodilation. Exaggerated bronchodilatory responses may enhance delivery of tobacco toxins in the vulnerable developing lung. Further studies to determine the consequences of second-hand and gestational menthol exposure during early lung development are needed.

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## POS1-78

### COMPARISON OF FIRST AND SECOND GENERATION ELECTRONIC CIGARETTES

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Comparisons between tobacco cigarettes and electronic cigarettes (e-cigarettes) are difficult to make, particularly as e-cigarettes have continued to evolve rapidly relative to tobacco cigarettes. Across two separate studies, we assessed changes in heart rate using a remote physiological device while individuals smoked their preferred brand of cigarette vs. e-cigarettes in a controlled manner using a within-subject design. Procedures across the two studies were similar and differed only in the type of e-cigarette used (1<sup>st</sup> vs. 2<sup>nd</sup> generation e-cigarette). For both types of e-cigarettes, we assessed a placebo, mid, and high nicotine dose. Participants consisted of non-treatment seeking tobacco cigarette users that were inexperienced with e-cigarettes. Participants were abstinent from tobacco smoking overnight prior to session visits and sessions were separated by one week. During sessions, participants either smoked their preferred brand of cigarettes or e-cigarette in a controlled manner (i.e., 10 puffs, 30-s inter-puff interval). Overall, results showed that smoking tobacco cigarettes increased heart rate significantly compared to placebo e-cigarettes. Neither study showed significant increases in placebo vs. active dose e-cigarettes, although the study using 2<sup>nd</sup> generation e-cigarettes may have been underpowered. Overall, results suggest that inexperienced e-cigarette users have difficulty obtaining nicotine from electronic cigarettes, but newer e-cigarettes may be more effective in doing so.

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## POS1-79

### INVESTIGATING POSSIBLE CAUSAL ASSOCIATIONS BETWEEN EXTERNALISING BEHAVIOURS AND TOBACCO INITIATION: A MENDELIAN RANDOMISATION ANALYSIS

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Externalising disorders are characterised by behaviours including impulsivity, aggressiveness, and sensation seeking. These behavioural traits are strongly associated with smoking, and longitudinal studies suggest that externalising behaviours in children are associated with early onset tobacco use. However, the causal nature of this relationship remains unclear. Mendelian randomisation analysis, where genetic variants are used as proxies for an exposure of interest, allows for stronger causal inference without risk of bias, residual confounding, or reverse causation. Single nucleotide polymorphisms (SNPs) associated with childhood aggression and attention deficit hyperactivity disorder (ADHD) were identified from relevant genome wide association studies (GWAS). They were then examined in GWAS of tobacco initiation and combined using an inverse-variance weighted approach. Other methods robust to potential pleiotropy (MR-Egger and weighted median approach) were used to assess whether any observed associations are due to biological pleiotropy (when a gene influences multiple phenotypes). There was no evidence of a causal effect of aggression risk on later tobacco initiation for all ages ( $P=0.81$ ), early childhood ( $P=0.29$ ), or late adolescence ( $P=0.61$ ). However, there was weak evidence of an association of ADHD risk on tobacco initiation (OR = 1.23, 95% CI 1.10 to 1.35,  $P=0.016$ ). MR-Egger analysis indicated some evidence of pleiotropy ( $P=0.020$ ), but confirmed weak evidence of a causal effect (OR= 1.40, 95% CI 1.10 to 1.78,  $P=0.087$ ). **RESULTS:** from the weighted median analysis (OR= 1.18 95% CI 1.03 to 1.33,  $P=0.068$ ). Our results provide some evidence that ADHD risk, but not aggression risk, is causally associated with tobacco use initiation. Prevention efforts should target these risk groups, and explore whether interventions to reduce these behaviours influence subsequent tobacco use initiation.

**FUNDING:** Academic Institution

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## POS1-80

### USE OF ADVERSE OUTCOME PATHWAYS TO INFORM TOBACCO PRODUCT RESEARCH

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An adverse outcome pathway (AOP) is a conceptual framework that describes a sequential chain of causally linked events at different levels of biological organization that lead to an adverse health effect. The AOP is anchored at the front end by the molecular initiating event (MIE), which represents a direct interaction between a chemical and its biological target. At the other end of the pathway is the adverse outcome, measured at any level of biological organization. This conceptual framework has been developed by the Organisation for Economic Co-operation and Development (OECD) as a knowledge-based assessment tool for understanding pathways leading to toxicity, versus observation of adverse outcomes. This presentation will examine the AOP concept, the state of its current development, and more specifically, how it intersects with toxicology of regulated tobacco products. By examining the AOP framework, this presentation will investigate the potential utility (strengths, limitations) of AOPs, relative to tobacco products. For instance, how the underlying concepts of the AOP framework interlink with central topics in regulatory toxicology of hazard identification and characterization of chemicals found in tobacco products. Some examples of well-documented pathways will be described. Pragmatic issues with AOP development (time-intensiveness and validation of methods) will be discussed. Application of structured integration and weighing of existing data with predictive technologies may inform toxicology research on tobacco products to fill data gaps. Therefore, the integration of data from novel methods to assess toxicological hazards (e.g., *in silico* (Q)SAR toxicity, read-across) may play an important role in AOP development. While AOPs are not risk assessments, they can support a mechanistic, biological pathway-based approach to toxicological evaluation of ingredients found in tobacco products. Such an approach could add to a mechanistic understanding of the adverse health effects from tobacco products, and thus, serve as part of a larger knowledge-based toolbox to enable public health strategies in harm reduction at individual and population levels.





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**POS1-81****INCREASES IN ATTENTION AND EXECUTIVE FUNCTION ASSOCIATED WITH E-CIGARETTE USE**Edward Bernat<sup>\*1</sup>, Mary Andrews<sup>2</sup>, Spencer Fix<sup>1</sup>, Kelvin Choi<sup>2</sup>, Debra Bernat<sup>3</sup>, <sup>1</sup>University of Maryland-College Park, MD, USA, <sup>2</sup>National Institutes of Health (NIH), MD, USA, <sup>3</sup>George Washington University, DC, USA

**BACKGROUND:** It is well established that nicotine increases attention, improves inhibitory control, and increases engagement during cognitive tasks for established smokers. The present study examines whether e-cigarette users also experience improved concentration with use, and utilizes advanced time-frequency signal processing approaches to better isolate effects. **METHODS:** The current study examined processes underlying executive function and inhibitory control using event-related potential (ERP) measures, among regular E-cigarette users ( $N = 35$ ), while in withdrawal (4+ hours abstinent) and after vaping to satiation. ERP data was recorded during a conventional go/no-go task, known to index executive functioning and inhibitory control more broadly. In a single-use session, participants engaged in the task once while in withdrawal (4+ hours abstinent), and then again after vaping to satiation. Amplitude and intertrial phase-synchrony (ITPS, indexing consistency of responding) measures were assessed from the ERP data. **RESULTS:** Results for go trials indicated increases in early medial-frontal theta amplitude from pre to post vaping, pointing to increased early stimulus registration (e.g. greater engagement), as well as increases in delta activity during the N2 component and late frontal activity (400-1000 ms). No-go trials evidenced increase in delta activity during the conventional N2 component, consistent with increases in inhibitory control. **DISCUSSION:** Results are consistent with increased inhibitory control and executive functioning more broadly. Taken together, results from the present study suggests that regular e-cigarette users experience increased attention and improved inhibitory control after use, in a manner highly consistent with addiction to combustible cigarettes.

FUNDING: Federal

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**POS1-82****INCREASES IN ATTENTION AND EXECUTIVE FUNCTION ASSOCIATED WITH E-CIGARETTE USE**Edward Bernat<sup>\*1</sup>, Spencer Fix<sup>1</sup>, Mary Andrews<sup>1</sup>, Kevin Choi<sup>1</sup>, Debra Bernat<sup>2</sup>, <sup>1</sup>University of Maryland College Park, MD, USA, <sup>2</sup>George Washington University, DC, USA

**BACKGROUND:** It is well established that nicotine increases attention, improves inhibitory control, and increases engagement during cognitive tasks for established smokers. The present study examines whether e-cigarette users also experience improved concentration with use, and utilizes advanced time-frequency signal processing approaches to better isolate effects. **METHODS:** The current study examined processes underlying executive function and inhibitory control using event-related potential (ERP) measures, among regular E-cigarette users ( $N = 35$ ), while in withdrawal (4+ hours abstinent) and after vaping to satiation. ERP data was recorded during a conventional go/no-go task, known to index executive functioning and inhibitory control more broadly. In a single-use session, participants engaged in the task once while in withdrawal (4+ hours abstinent), and then again after vaping to satiation. Amplitude and intertrial phase-synchrony (ITPS, indexing consistency of responding) measures were assessed from the ERP data. Results for go trials indicated increases in early medial-frontal theta amplitude from pre to post vaping, pointing to increased early stimulus registration (e.g. greater engagement), as well as increases in delta activity during the N2 component and late frontal activity (400-1000 ms). No-go trials evidenced increase in delta activity during the conventional N2 component, consistent with increases in inhibitory control. **DISCUSSION:** Results are consistent with increased inhibitory control and executive functioning more broadly. Taken together, results from the present study suggests that regular e-cigarette users experience increased attention and improved inhibitory control after use, in a manner highly consistent with addiction to combustible cigarettes.

FUNDING: Federal

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**POS1-83****OPPORTUNITY COST AND E-CIGARETTE SUBSTITUTION: NICOTINE CONCENTRATION AS A UNIT PRICE MANIPULATION**Jeffrey Stein<sup>\*</sup>, Derek Pope, Warren Bickel, Virginia Tech Carilion Research Institute, VA, USA

**SIGNIFICANCE:** Behavioral economic substitution describes the phenomenon in which price-dependent decreases in consumption of one commodity are accompanied by increases in consumption of a fixed-price alternative commodity. In a within-subject design examining current cigarette smokers ( $N = 25$ ), we have previously shown that the degree to which nicotine-containing e-liquid substitutes for conventional cigarettes is monotonically related to e-liquid nicotine concentration, with 0 mg/mL serving as the poorest substitute and 24 mg/mL serving as the strongest substitute. **METHODS:** In this prior study, participants were provided with a second-generation e-cigarette, sampled a range of e-liquid nicotine concentrations (0-24 mg/mL), and completed sessions in which purchased conventional cigarettes across ascending prices and/or e-liquid available at a fixed price. Here, we reanalyze these data, applying a novel opportunity cost model of substitution, which incorporates the unit prices (i.e., total nicotine per unit divided by price) of both conventional cigarettes and e-liquid. This model predicts substitution because the unit price of e-liquid relative to the unit price of conventional cigarettes varies as a function of cigarette price. Importantly, at high cigarette prices, the unit price of e-liquid is lower than, and hence preferred to, the unit price of conventional cigarettes. Moreover, this model predicts that substitution effects increase as a function of e-liquid nicotine concentration. **RESULTS:** Observed measures of e-liquid substitution, including slope (sensitivity of e-liquid purchasing to conventional cigarette price) and the y intercept (quantity of e-liquid purchased when conventional cigarettes were free) were statistically indistinguishable from model-predicted values. Thus, empirical substitution data conform to the opportunity cost model. **CONCLUSIONS:** These data suggest that novel tobacco product substitution for conventional cigarettes may be predicted using only the nicotine content and price of conventional cigarettes and e-cigarettes. These predictions, in turn, may be used prospectively to inform possible tobacco product regulation.

FUNDING: Federal

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**POS1-84****EFFECT OF E-LIQUID PRODUCT CHARACTERISTICS ON TOPOGRAPHY BEHAVIOR OF E-CIG USERS IN A 2-WEEK NATURAL ENVIRONMENT SWITCHING STUDY**Risa Robinson<sup>\*1</sup>, Edward Hensel<sup>1</sup>, Abdulaziz al Olayan<sup>1</sup>, James Nonnemaker<sup>2</sup>, Youn Lee<sup>2</sup>, <sup>1</sup>Rochester Institute of Technology, NY, USA, <sup>2</sup>RTI International, NC, USA

**SIGNIFICANCE:** Tobacco product characteristics influence user behavior and have a confounding effect on emissions, thus complicating our ability to assess claims of modified risk or substantial equivalence. Extended-duration observational studies in the natural-use environment are needed to assess differences in topography as a function of product characteristics. **METHODS:** Topography was observed continuously using the wPUM™ personal use monitor for  $N=34$  experienced e-cig 2<sup>nd</sup> gen users during a 2-week flavor switching study. Participants selected their nicotine concentration (6, 12, or 18 [mg/mL]), and were assigned tobacco flavor week 1 and either menthol ( $N=17$ ) or berry ( $N=17$ ) flavor week 2. The TAP™ topography analysis program was used to determine the date, time, duration, volume, flow rate, and inter-puff interval for each puff over the course of two-weeks. The mean topography characteristics for each participant by flavor, and mean topography characteristics for all participants by nicotine strength were compared using a two-sided t-test. The statistical power and significance resulting from different observational period durations (1 session, 24 hr., or 1 wk.) were computed to inform future study design. **RESULTS:** Differences in puff flow rate ( $p < 0.05$ ) were found for both within person comparisons; 17 of 17 users (tobacco vs menthol) and 16 of 17 users (tobacco vs berry), and between the secondary factor of low ( $N=20$ ), medium ( $N=7$ ), and high ( $N=7$ ) nicotine strength users.



Variations in puff duration, puff volume and total aerosol consumption relative to e-liquid flavor or nicotine strength were inconclusive for 95% CI. Comparison of observation periods indicate short durations (1 session or 24 hr.) are not sufficient to yield conclusive findings of topography and flavor relationships. Periods longer than 1 week are needed to assess differential consumption. **CONCLUSIONS:** Topography characteristics, specifically flow rate, exhibit a correlation with e-liquid flavor and nicotine strength. Study designs should consider extended-duration natural-environment monitoring if the desired outcome is to test the influence of product characteristics on behavior.

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## POS1-85

### PILOT STUDY COMPARING THE REWARD VALUE OF FOOD AND CIGARETTES IN TREATMENT-SEEKING SMOKERS

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The Choice Behavior Under Cued Conditions (CBUCC) procedure is a cue-reactivity paradigm developed to examine motivational processes related to use of tobacco cigarettes. Past research has supported the use of CBUCC as a reliable and valid procedure to measure multiple variables such as reward value, craving, drug seeking, and consumption of tobacco cigarettes. There has been limited research on the relationships between cigarette and food rewards in the same study, and there is no established experimental paradigm to directly compare the reward value of cigarettes and food. This is an important gap in the literature given that nicotine dependence and cessation may have a pronounced impact on food reward value. The primary aim of this pilot study was to provide a proof of concept that CBUCC can be modified to include food as a primary reward in addition to cigarettes, and to validate CBUCC for treatment-seeking smokers. Four treatment-seeking dependent cigarette smokers completed CBUCC following overnight abstinence. During CBUCC, participants were presented with either a cigarette, food, or neutral (water) cue over 36 trials. As a measure of reward value, participants selected an amount of money that corresponded to a probability they would have access to that cue. Cigarette craving, food craving, and mood were also collected on each trial. All participants spent more than the minimum amount allowed for access to cigarette, food, and water cues, with spending highest on cigarette trials. These results demonstrate that the CBUCC procedure can be modified to include food as a primary reward, and that treatment-seeking smokers will spend money to access cigarettes. This pilot study demonstrates a novel application of the CBUCC procedure to assess the impact of nicotine abstinence on the reward value of tobacco cigarettes and food. By establishing parameters of food as a nondrug reward in comparison to cigarettes within the CBUCC paradigm, this procedure will be utilized in the future to study pharmacological manipulations (e.g., treatment medications) that might influence the motivational processes of drug and food rewards during smoking cessation.

**FUNDING:** Federal

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## POS1-86

### DOPAMINE D1 AND SEROTONIN 5HT2C INTERACTIVE EFFECTS ON NICOTINE SELF-ADMINISTRATION IN RATS

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More than just nicotinic cholinergic receptors are important controls of nicotine self-administration (SA). The brain is an organ of communication. A variety of interacting neural systems including dopamine and serotonin are also involved in the neural basis of nicotine reinforcement. We have shown that the dopamine D<sub>1</sub> antagonist SCH-23390 (SCH) and the serotonin 5HT<sub>2c</sub> agonist lorcaserin (LOR) both significantly reduce nicotine SA in rats. We also found that both SCH and LOR significantly potentiate the efficacy of chronic nicotine infusion for reducing

nicotine SA. The current studies examined the acute and chronic SCH and LOR interactions with regard to nicotine SA. Adult female Sprague-Dawley rats were trained to SA nicotine (FR1, 0.03 mg/kg/infusion, 1-h sessions). First, acute (SCH 0.1 and 0.3 mg/kg; LOR 0.2 and 0.6 mg/kg, sc) then chronic interactions of SCH (0.02 mg/kg) and LOR (0.06 mg/kg) were tested. In the chronic study, rats were given injections for two weeks of nicotine SA. After a week of enforced abstinence to model a cessation attempt, the rats were re-introduced to SA with continued drug treatment to test relapse. Finally, they were tested for a week without drug treatment to test for persistence. The acute study replicated our previous studies that acute SCH and LOR both reduce nicotine SA. SCH and LOR significantly potentiated each others' effects of reducing nicotine SA. In the chronic interaction study, we replicated our earlier studies that chronic SCH or LOR significantly reduce nicotine SA. The drugs were not seen to significantly potentiate each others' effects because chronic SCH brought nicotine SA to near zero levels. Interestingly, after the therapy was stopped SCH treated rats immediately resumed nicotine SA levels that they had prior to the onset of treatment. Furthermore, the combination of SCH and LOR were not seen to potentiate each others' effects even though the floor effect was no longer in place. This stands in contrast to the interactions of either SCH or LOR with chronic nicotine infusions in which each drug did significantly potentiate chronic nicotine's effect of reducing nicotine SA.

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## POS1-87

### VALIDATION OF A PROBABILITY-BASED PURCHASE TASK TO ASSESS INTEREST IN TRYING NOVEL TOBACCO PRODUCTS

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**SIGNIFICANCE:** Hypothetical purchase tasks, in which participants report the quantities of a tobacco product they would purchase across a broad range of prices, facilitate rapid assessment of behavioral economic demand and can provide measures of tobacco product abuse liability (addictive potential). However, this methodology is in some cases limited in its ability to assess abuse liability of novel tobacco products, requiring participants to have thorough experience with the magnitude, duration, and speed of onset of relevant drug effects in order to inform the quantities purchased. **METHODS:** In the present study, we explored a probability-based (rather than quantity-based) version of the purchase task (Roma, Hursh, and Hudja, 2015), which requires only that a participant report the likelihood that they would purchase a product across a range of prices. In Experiment 1, we examined degree of correlation between probability- and quantity-based cigarette purchase tasks in current cigarette smokers ( $N = 187$ ). In Experiment 2, we examined a probability-based e-cigarette purchase tasks in non-smokers who were naive to e-cigarettes ( $N = 173$ ). **RESULTS:** In Experiment 1, in existing cigarette smokers, probability- and quantity-based cigarette demand measures were positively correlated ( $\rho = .44-.58$ ). In Experiment 2, in non-smokers naive to e-cigarettes ( $N = 173$ ), probability-based e-cigarette demand measures were positively and significantly associated with e-cigarette appeal ( $\rho = .40-.47$ ), interest in trying e-cigarettes ( $\rho = .39-.64$ ), and delay discounting ( $\rho = .17-.33$ ); and negatively associated with perceived e-cigarette health risks ( $\rho = -.28-.30$ ). **CONCLUSIONS:** Together, these findings suggest probability- and quantity-based tasks measure similar constructs (Experiment 1) and that the probability-based task also measures the effects of price on interest in trying tobacco products in inexperienced product users (Experiment 2). In future research, the probability-based task may be used prospectively to identify those at risk for initiating tobacco product use or to examine effects of possible regulatory conditions that may influence initiation of use.

**FUNDING:** Federal

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**POS1-88****ACUTE NICOTINE DISRUPTS CONTEXTUAL FEAR EXTINCTION AND ALTERS MEMORY-ASSOCIATED HIPPOCAMPAL KINASES**

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Long-term memory consolidation and its cell-signaling cascades are regulated by nicotinic acetylcholine receptors (nAChRs). Evidence showed that nicotine, an agonist of nAChRs, has enhanced hippocampus dependent fear learning by altering phosphorylation patterns of several cell-signaling kinases that are involved in the consolidation of long-term memories including ERK1/2 and JNK1. In addition, past work has indicated that acute nicotine impairs contextual fear extinction. However, the effects of nicotine administration on cell signaling pathways during acquisition and consolidation of fear extinction memories are unknown. In this study, we examined the effects of acute nicotine on the phosphorylation of dorsal and ventral hippocampal ERK1/2 and JNK1 during contextual fear conditioning. Our results showed that acute nicotine administered immediately, and 30 minutes, but not 6 hours following extinction impaired contextual fear extinction. This suggests that acute nicotine injections within the memory consolidation window disrupts the consolidation of contextual fear extinction memories. We also found that acute nicotine administered prior to extinction sessions downregulated the phosphorylated forms of ERK1/2 in the ventral hippocampus, but not dorsal hippocampus, and JNK1 in the dorsal and ventral hippocampus during the consolidation phase on the 3<sup>rd</sup> day of extinction, results which were not present on the 1<sup>st</sup> extinction day. Finally, our results showed that acute nicotine injections immediately after each session upregulated the phosphorylated form of ERK1/2 in the ventral hippocampus, but did not affect dorsal hippocampal ERK1/2 phosphorylation or phosphorylated form of JNK1. In summary, these results illustrate that acute nicotine impairs contextual fear extinction potentially by altering molecular processes responsible for the consolidation of extinction memories.

FUNDING: Academic Institution; Federal

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**POS1-89****TOBACCO SPECIFIC NITROSAMINES (TSNAS) IN GUATEMALAN E-LIQUIDS**

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Legalized in 2009, e-cigarettes have evolved from cig-a-like disposable and rechargeable products to more advanced items such as vaporizers and e-hookahs. Despite their variations, e-cigarettes all have a battery, atomizer, and a tank which holds flavored-liquid. The negative and positive effects of e-cigarettes are still emerging; in particular, Tobacco Specific Nitrosamines (TSNAs; NNN, NNK, NAT, and NAB), naturally occurring plant-based alkaloids found in tobacco, are known carcinogens causing cancers of the lung, pancreas, esophagus, and oral cavity, that can be transferred into e-liquids through flavorings and/or nicotine. In attempt to better understand the health risks of e-cigarettes, this project focused on quantifying TSNAs in Guatemalan e-liquids. Using a modified version of the Kim and Shin 2013 Liquid Chromatography Tandem Mass Spectrometry (LC-MS/MS) method, 47 e-liquids purchased throughout Guatemala were analyzed in triplicate. TSNAs were not able to be quantified in all the Guatemalan e-liquids using this methodology. However, qualitative, NNK, NNN, NAT, and NAB were detected using peak area. Future work will focus on method optimization to enable quantitative detection of TSNAs, so that safety limits may be deciphered for upcoming legal regulation.

FUNDING: Federal

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**POS1-90****CHARACTERIZATION OF ORAL NICOTINE CONSUMPTION USING A FREE-CHOICE PARADIGM IN MICE**

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**SIGNIFICANCE:** Although the rate of smoking has decreased in the last decade, the smoke-free laws in the United States induced alternative marketing of nicotine. There is an increasing interest to use oral nicotine delivery systems such as strips, orbs, sticks, and lozenges. Therefore, we aimed to characterize oral nicotine consumption by using free choice paradigm in mice. **METHODS:** Adult C57Bl/6J or genetically modified mice, mice carrying deletions for the certain nicotinic acetylcholine receptor (nAChR) subunits, (n=8-10/group/sex) were given a choice of water or nicotine (a range of concentrations of 10 – 960 micrograms per milliliter) solution using two bottle free choice drinking assay. **RESULTS:** Oral nicotine intake and preference were higher in female compared to male C57Bl/6J mice without an effect on total fluid intake and body weight change. At the end of the study, absence of nicotine led to nicotine withdrawal. Intermediate access of nicotine exposure (every other day) resulted an escalation of nicotine consumption during the study and nicotine withdrawal at the end of the study. In addition, nicotine consumption varies in genetically modified mice due to subunit of nAChRs. In general, we observed that females consumed significantly more nicotine than males. While beta 2 nAChRs KO mice showed significant decrease on nicotine intake at all concentrations, deletion of alpha 5 nAChRs induced increase on nicotine consumption at high concentrations. Alpha 6 nAChRs KO female mice also consumed lesser than WT controls. In general, beta 2 and alpha 6 subunits seem to mediate the intake and preference to nicotine, while alpha 5 subunit seems to mediate the aversion to nicotine. These data are consistent with the findings of other models of nicotine reward and reinforcement. **CONCLUSIONS:** We validated the two-bottle choice drinking paradigm to study nicotine's reward-like properties and nicotine withdrawal after oral nicotine exposure.

FUNDING: Federal; This study was supported by Center for the Study of Tobacco Products, Virginia Commonwealth University.

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**POS1-91****THE INFLUENCE OF CIGARETTE FILTER VENTILATION ON ALDEHYDE YIELDS IN CIGARETTE MAINSTREAM SMOKE USING FOUR DIFFERENT MACHINE TESTING PROTOCOLS**

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**SIGNIFICANCE:** The WHO Study Group on Tobacco Product Regulation advised to regulate and lower toxicant yields in cigarette smoke. The smoke toxicants priority list is based on the impact on human health, with the volatile aldehydes as one of the chemical classes identified. The levels of 12 aldehydes in mainstream cigarette smoke of 11 Dutch brands were quantified in the present study. The influence of brand characteristics, such as filter ventilation, on aldehyde yields was determined by using 4 machine testing protocols. These protocols allowed us to study systematically how variations in smoking behavior and cigarette design will affect human exposure to aldehydes. **METHODS:** Machine smoking was based on the International Standardization Organization (ISO) and Health Canada Intense (HCI) regime, both with and without taping the filter vents. The 11 cigarette brands differed in design, blend characteristics; tar, nicotine, and carbon monoxide (TNCO) levels; popularity, and manufacturer. Cigarette smoke was trapped on a Cambridge filterpad and carboxen cartridge. After dissolving in methanol/CS<sub>2</sub> and derivatization, the aldehyde yields were determined with high-performance liquid chromatography using a diode array detector. **RESULTS:** An intense smoking regime (increasing puff volume, shorter puff interval) significantly increased aldehyde yields. Generally, cigarette smoke emissions of aldehydes showed the same pattern: ISO<ISO taped<HCI<HCI taped. Specifically, there is a strong correlation between acetaldehyde, acrolein and other aldehydes (r=0.804). The difference between regular and low-TNCO cigarettes diminishes when smoking more intense; this effect is stronger when combined with taping filtervents. The low-TNCO brands show 6 times more aldehyde production per mg nicotine for the more intense smoking regimes. **CONCLUSIONS:** Acetaldehyde and acrolein can be used as representatives for the class of volatile aldehydes in the different brands and smoking regimes. The aldehyde to nicotine ratio increased when highly ventilated,





low-TNCO cigarettes are intensely smoked, increasing the potential for higher aldehyde exposures of a smoker who titrates for nicotine levels.

FUNDING: Academic Institution

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## POS1-92

### COUNTERING TOBACCO INDUSTRY CLAIMS OF THE ECONOMIC COSTS OF RESTRICTING MENTHOL: AN ANALYSIS IN MINNESOTA

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**SIGNIFICANCE:** In August 2017, the Minneapolis city council voted to restrict the sale of menthol tobacco to adult-only tobacco and liquor stores. As momentum for this policy grew, tobacco retailers and the tobacco industry argued restricting menthol tobacco would cause economic hardship and cost local businesses 73 million dollars annually. Advocates for the policy successfully fought against these arguments using existing and new data. **METHODS:** Convenience industry reports on national and regional sales and profit trends for top retail categories, including tobacco, were compiled and analyzed. In addition, an online survey of local menthol smokers (N=94) assessed the potential impact of a menthol restriction on purchasing behavior. Data were summarized using descriptive statistics. **RESULTS:** Convenience stores profit more from prepared foods and packaged beverages than tobacco. According to national reports, convenience store tobacco profits (17%) are much lower than tobacco sales (36%). In 2015, the National Association of Convenience Stores reported that in the Central region, which includes Minnesota, monthly profits from cigarettes were \$6,253 per convenience store. Given menthol reflects one-quarter of cigarette sales in Minnesota, it was estimated that if menthol cigarettes were no longer sold in convenience stores, each store would lose \$1,519 per month. Additionally, 61% of menthol smokers from the online survey reported that they buy other items such as snacks and gas when they buy cigarettes and 93% reported they would still buy non-tobacco items at convenience stores if menthol products were restricted to adult-only tobacco shops. **CONCLUSION:** The estimated cost of a menthol restriction is likely a fraction of what the industry claimed. Policy advocates should be prepared to collect primary data to build support for policies restricting youth access to menthol tobacco products. Minneapolis smoker data were useful and effective in countering the opposition argument that a menthol restriction would cause catastrophic harm to convenience stores. These data, presented alongside convenience industry reports were useful for decision makers and the local media.

FUNDING: Nonprofit grant funding entity

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## POS1-93

### THE ROLE OF PACAP/PAC1 RECEPTOR SYSTEM IN NICOTINE-ALCOHOL CODEPENDENCE

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Nicotine addiction is a major public health and socioeconomic issue. Importantly, the public health and socioeconomic burdens of tobacco and alcohol co-abuse are tremendously high. The use of each drug alone or in combination is the major preventable cause of premature death worldwide. The number of death is estimated to be about 5 million individuals worldwide each year. Nicotine is a powerful addictive substance and can serve as a "gateway drug" for experimentation of alcohol and other addictive drugs. Indeed, research has shown that alcohol consumption is twice more in people who smoke compared to non-smokers. Likewise, the prevalence of alcoholism is also higher in smokers than non-smokers. Likewise, there seems to be a good correlation between chain smoking and heavy drinking. Quitting smoking is also a major issue in subjects with history of nicotine and alcohol co-abuse. Indeed, although smoking has declined in the US over years, there is virtually no reduction in subjects with co-abuse problem. Despite these issues, there are a limited number of medications to treat nicotine or alcohol abuse and

particularly their co-abuse. This is probably due to the fact that the underlying mechanism of this co-abuse is not well understood. Notably, little is known about the influence of age and sex in nicotine and alcohol co-use. Considering that nicotine use precedes alcohol consumption, and is initiated during the adolescent period, we conducted some preliminary studies to determine if nicotine would serve as a gateway drug to alter alcohol reward if nicotine is administered during adulthood. Our results showed that alcohol intake and reinforcing actions were enhanced in mice lacking the pituitary adenylyl cyclase activating polypeptide (PACAP), suggesting that PACAP is involved in the cross-talk between nicotine and alcohol. Studies are underway to fully characterize the role of the PACAP/PAC1 receptor system in the gateway effect of nicotine.

FUNDING: State

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## POS1-94

### SUPPORT FOR POLICIES REGULATING NICOTINE IN CIGARETTES: FINDINGS FROM THE ITC FOUR COUNTRY TOBACCO AND E-CIGARETTE SURVEY

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**SIGNIFICANCE:** In July 2017, the US FDA announced that it would consider a product standard that would lower the amount of nicotine in cigarettes and other combustible products to minimize appeal and abuse liability as part of a comprehensive nicotine-focused regulatory framework. This study presents the results of a survey in four countries (Australia (AU), Canada (CA), England (EN), and the United States (US)) where current cigarette smokers were asked about their support for a policy that would reduce the nicotine content of cigarettes. **METHODS:** Data came from 10,698 adult (18+ years) smokers in the 2016 International Tobacco Control (ITC) Four Country Tobacco and E-Cigarette Survey conducted in AU (n=1,332), CA (n=3,205), EN (n=3,865) and US (n=2,296). The web-based survey recruited respondents from online panels with selection criteria to obtain representative samples of current smokers in each country. Respondents were asked: "If you could get nicotine in products other than tobacco, would you support or oppose a law that reduced the amount of nicotine in cigarettes and tobacco to make them less addictive?" This study describes support for this policy and examines correlates of support including whether the respondent smoked only cigarettes or also used e-cigarettes, desire to stop smoking, and country. **RESULTS:** Overall, 63% of smokers supported reducing nicotine in cigarettes if they could get nicotine in other products, with 21% opposed and 16% indicating don't know. Smokers currently using e-cigarettes were slightly more likely to support the policy compared to those only using cigarettes (66% vs 60%). Smokers who wanted to stop smoking "a lot" were also more likely to support the policy compared to those whose interest in quitting was "somewhat," "a little," or "not at all" (72% vs 58%). Canadian smokers were more likely to support the policy (70%) compared to those in the US (59%), EN (60%), and AU (60%). **CONCLUSIONS:** In all four countries, the majority of smokers supported lowering nicotine in cigarettes to make them less addictive. Smokers with a strong desire to stop smoking and those also using e-cigarettes were more likely to support the policy.

FUNDING: Federal

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## POS1-95

### PERCEPTIONS OF REDUCED NICOTINE CONTENT CIGARETTES AMONG CIGARETTE SMOKERS AND OTHER TOBACCO PRODUCTS USERS

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**BACKGROUND:** The Food and Drug Administration in the U.S. has recent announced a comprehensive regulatory plan to reduce nicotine in cigarettes. The present study responds to the new regulatory trajectory and examined current tobacco users' behavioral beliefs, attitude and intentions towards using reduced





nicotine content cigarettes (RNCC). **METHODS:** A nationally representative online sample of 614 current tobacco users were recruited to take a survey on their perceptions of cigarettes that contain a *very low level* of nicotine. Cigarette smokers were compared with other tobacco product users on their perceived risk, attitude, and intention toward using RNCC. In addition, a hierarchical multiple linear regression was conducted with only the cigarette smokers in the sample to identify the behavioral beliefs and demographic variables that are predictive of smokers' intention to use RNCC. **RESULTS:** Compared with users of other tobacco products, cigarette smokers held a significantly more favorable attitude toward RNCC ( $M_{\text{cigarette smoker}} = 3.57$ ;  $M_{\text{other}} = 2.22$ ),  $t(591) = 9.46$ ,  $p < .001$ , and showed a significantly higher intention toward using RNCC ( $M_{\text{cigarette smoker}} = 2.5$ ;  $M_{\text{other}} = 1.48$ ),  $t(550.75) = 11.60$ ,  $p < .001$ . Among cigarette smokers, a greater RNCC intention was associated with the belief that RNCC is less harmful to health than regular cigarettes, and the belief that RNCC could help them quit smoking. In addition, cigarette smokers were more likely to use RNCC if they were older, female, and less educated. The full model explained about 22% of the variance in smokers' RNCC intention. **CONCLUSIONS:** Current cigarette smokers held a moderate attitude and a moderate intention toward RNCC use. Communication interventions are needed to address smokers' misperceptions on RNCC's relative health risk to regular cigarettes and on RNCC's role as a quitting tool. We also recommend banning relative health claims and cessation claims when regulating the packaging and marketing of RNCC.

FUNDING: Federal

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## POS1-96

### CHARACTERIZATION OF FLAVIN MONOOXYGENASE (FMO) VARIANTS AND THEIR POTENTIAL ROLE IN NICOTINE DEPENDENCE

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**SIGNIFICANCE:** Nicotine is mainly metabolized *in vivo* primarily by hydroxylation by CYP2A6, but is also glucuronidated by UDP-glucuronosyltransferases (UGTs) and oxidized by flavin monooxygenases (FMOs). When the main metabolic pathway for nicotine metabolism is diminished or impaired, the urinary levels of nicotine-*N'*-oxide are increased up to 31%. While previous studies have suggested that hepatic FMO3 is the principal enzyme involved in nicotine-*N'*-oxidation, a comprehensive analysis of nicotine *N'*-oxidation by all FMOs has not previously been performed. Additionally, previous studies have shown that polymorphisms in FMO1 and FMO3 are associated with variations nicotine dependence. **METHODS:** To characterize the catalytic activities of FMOs in the formation of nicotine-*N'*-oxide, wild-type FMOs 1 through 5 were individually overexpressed in HEK293 cells and used in oxidation reactions containing between 0.005 – 5 millimolar (mM) of (-)-nicotine and NADPH-regenerative system. Nicotine-*N'*-oxide formation was monitored by UPLC-MS/MS. The most prevalent non-synonymous variants in FMO 1, 2 and 3 were overexpressed and examined for their activity vs their corresponding wild-type counterparts by kinetic analysis. **RESULTS:** FMO1, FMO2 and FMO3 exhibited oxidation activity against nicotine, with  $K_m$ 's of 0.9, 3.4 and 0.7 mM, respectively. FMOs 4 and 5 did not reach saturation at 5 mM. The following variants were evaluated: FMO1 I303V, FMO2 Q472stop and FMO3 N61S, D132H, E158K, V257M, V277A and E308G. A significant decrease in *N'*-oxidation activity ( $V_{\text{max}}/K_m$ ) was observed for the FMO1 I303V, FMO2 Q472stop and FMO3 N61S, FMO3 D132H, FMO3 V257M, and FMO3 E308G variants. **Conclusions:** This is the first report demonstrating that, in addition to FMO1 and FMO3, the functional FMO2<sup>427Gln</sup> isoform is active against nicotine. These results are consistent with previously published studies demonstrating that functional genetic variants in FMO1 and FMO3 are associated with differences in nicotine metabolism. These variants could play a role in nicotine-*N'*-oxidation efficiency, potentially affecting local nicotine levels within the brain.

FUNDING: Federal

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## POS1-97

### ASSESSING A CONTEXT OF CONSUMPTION FRAMEWORK FOR USE IN CIGARETTE PACK VISUAL DESIGN RESEARCH

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**SIGNIFICANCE:** In the U.S., researchers and regulators need to know how changes to cigarette packages could influence population health. We sought to advance research on the role of cigarette packaging by assessing a theory-informed framework from the fields of design and consumer research. The selected framework, the context of consumption, posits cognitive and affective responses mediate consumers' subsequent behavioral responses to visual design. To assess the framework's potential for guiding research on changes to the visual design of cigarette packaging, this study seeks to understand to what extent the context of consumption framework converges with how adult smokers think and talk about cigarette pack designs. **METHODS:** Data for this qualitative study came from six focus groups conducted in March 2017. Two groups consisted of lesbian, gay, and bisexual participants; two groups of participants with less than four years of college education; one group of LGB and straight identity; and, one group of the general population. All groups were selected for regional, gender, and racial/ethnic diversity and came from the NORC AmeriSpeak Panel. Participants ( $n=33$ ) represented all nine U.S. Census divisions. We conducted deductive qualitative analysis and a negative case analysis. **RESULTS:** Participant discussions of cigarette packs confirmed all cognitive and affective domains of visual product design are relevant to consumers' perceptions of cigarette pack design. The proposed framework was consistent with how smokers think about cigarette packaging designs. **CONCLUSIONS:** Use of the context of consumption framework for cigarette product packaging design can inform research on tobacco product packaging. Researchers and regulators should consider cognitive and affective mediators between cigarette pack design and consumer behaviors.

FUNDING: Federal

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## POS1-98

### WHY WE CAN'T GIVE PREMIUM CIGAR MANUFACTURERS A BREAK

Maham Akbar\*, Truth Initiative, DC, USA

**SIGNIFICANCE:** In May 2016, FDA issued a final rule on deeming tobacco products, which included regulating all cigars, including premium cigars. Recently, there have been efforts in Congress to prevent FDA from regulating premium cigars with the argument that these cigars are not as harmful. The agency also stated in July 2017 that it would solicit additional comment and scientific data related to the patterns of use and resulting public health impacts from premium cigars. An updated review of the research on these cigar products is necessary in order to better understand their addictiveness. **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:** The nicotine in the smoke of a single cigar can vary from an amount similar to a single cigarette to that of nearly smoking an entire pack of cigarettes. Because of their size, large and premium cigars contain significant amounts of tobacco, and therefore large amounts of nicotine. Inhalation parameters have a dramatic effect on nicotine delivery. Most cigar smokers inhale some amount of smoke and are unaware that they are doing it, even among those who do not intend to inhale. While some data suggests that premium cigar users do not use cigars every day or even every week, some studies do show that those who smoke less than daily still exhibit nicotine dependence. **CONCLUSION:** There is evidence that large premium cigars can develop and sustain addiction. FDA should continue to regulate these cigar products or it would create incentives for the cigar industry to modify their products to become exempt from regulation.

FUNDING: None

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**POS1-99****WHY A BAN ON FLAVORED CIGARS IS LONG OVERDUE**

Maham Akbar\*, Truth Initiative, DC, USA

**SIGNIFICANCE:** When FDA released its final deeming rule in May 2016, the agency stated a proposed rule banning flavors from cigars was forthcoming. The agency in July 2017 stated it would seek public comment on the role that flavors in tobacco products, including menthol, play in attracting youth, as well as the role they may play in helping some smokers switch to potentially less harmful forms of nicotine delivery. However, it has still not done either. 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. 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, 64.7% of high school students and 56.6% of middle school students used a flavored cigar in the past 30 days. Among youth cigar smokers, flavored use is associated with lower intentions to quit smoking. 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. **CONCLUSION:** The cigar market is the most heavily flavored market of tobacco products and flavored cigar use is especially high among youth and young adults. FDA should immediately prohibit the sale of flavored cigars. Until FDA does so, state and local governments can and should enact policies that restrict the sale of flavors in tobacco products, including cigars.

FUNDING: None

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**POS1-100****A SYSTEMATIC REVIEW OF ORGANISATIONAL CHANGE INTERVENTIONS FOR TOBACCO DEPENDENCE TREATMENT IN THE ALCOHOL AND OTHER DRUG SETTING**Eliza Skelton\*, Flora Tzelepis<sup>1</sup>, Anthony Shakeshaft<sup>2</sup>, Ashleigh Guillaumier<sup>1</sup>, Sam McCrabb<sup>1</sup>, Billie Bonevski<sup>1</sup>, <sup>1</sup>The University of Newcastle, Australia, <sup>2</sup>The University of New South Wales, Australia

**SIGNIFICANCE:** Organisational change interventions involve six strategies for systems and cultural change within alcohol and other drug (AOD) services to make smoking cessation support delivery part of usual care. This review aimed to examine the evidence for organisational change interventions in the AOD setting on: a) number and type of organisational change strategies implemented; b) changes in smoking cessation care; c) smoking cessation outcomes; and d) attitudes towards provision and/or receipt of smoking cessation strategies. **METHODS:** A systematic review with narrative synthesis was conducted. MEDLINE, PsycINFO, CINAHL, EMBASE and Scopus were searched using keywords and MeSH terms from database inception to 31<sup>st</sup> August 2017. Interventions were assessed against the six organisational change strategies: 1) Implementation of a system for identifying individuals; 2) Providing education; 3) Dedicated staff to provide treatment; 4) Promoting smoking policy; 5) Including effective treatments; 6) Reimbursing providers for the delivery of treatment. **RESULTS:** A total of 13 publications were included. No study employed all six strategies. The most common strategies were: providing education, promoting smoke free policy, and including smoking cessation care. Seven papers examined staff provision of smoking cessation care and all reported significant increases in delivery of care. Four papers examined client-reported changes to receipt of smoking cessation care, all found a significant increase. Three papers reported on staff smoking outcomes, though only one study reported a significant decrease. Of five studies that examined client smoking outcomes, two found a reduction in smoking. Six studies examined staff and client attitudes towards providing smoking cessation care, and all showed a significant improvement. **CONCLUSIONS:** Most studies employed four or less strategies in their organisational change intervention to integrate smoking cessation care. Our findings show organisational change interventions provide promise for changing smoking cessation practices, cessation and attitudes in the AOD treatment setting.

FUNDING: Federal

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**POS1-101****THE CROWDING-OUT EFFECT OF TOBACCO EXPENDITURE ON HOUSEHOLD SPENDING PATTERNS IN BANGLADESH**Biplab Datta<sup>1</sup>, Muhammad Husain<sup>\*1</sup>, Mandeep Virk-Baker<sup>2</sup>, Mark Parascandola<sup>2</sup>, Bazlul Khondker<sup>3</sup>, <sup>1</sup>US Centers for Disease Control and Prevention (CDC), GA, USA, <sup>2</sup>National Institutes of Health, MD, USA, <sup>3</sup>University of Dhaka, Bangladesh

**SIGNIFICANCE:** Expenditures on tobacco constitute a significant portion of household budget, which can lead to reduced expenditures on other basic commodities (crowding-out). This analysis examines the crowding-out effect of tobacco expenditures and its implications on household resource allocation in Bangladesh. **METHODS:** We analyzed data from the 2010 Household Income and Expenditure Survey from Bangladesh, a nationally representative survey (n=12,240 households). The survey collected consumption information on over 300 food and non-food items, which were separated into 11 subgroups (tobacco, food, clothing, housing, education, health, lifestyle and hygiene, energy and utility, transport and communication, entertainment, and miscellaneous). To evaluate the crowding-out hypothesis of tobacco expenditure, we estimated a system of Engel curves using 'Quadratic Almost Ideal Demand System' for each non-tobacco consumption category, conditional on the tobacco-expenditure, household socio-demographic characteristics, and region fixed effects. We applied instrumental variable regressions to obtain consistent and unbiased estimates for a causal interpretation. Comparisons were made between tobacco user and non-user households among the full sample. Additionally, the tobacco non-user households were assessed separately with mutually exclusive household tobacco use categories: smoking-only, smokeless-only, and both smoking and smokeless. **RESULTS:** The OLS estimates suggested crowding-out effects for the tobacco-user households for clothing, housing, education, lifestyle and hygiene, energy and utility, and transport and communication. The instrumental variable regression estimates indicated crowding-out effects attributable to tobacco expenditure for: housing ( $\beta = -11.08$ ,  $p < 0.0001$ ), education ( $\beta = -2.52$ ,  $p < 0.05$ ), lifestyle and hygiene ( $\beta = -0.47$ ,  $p < 0.03$ ), and energy and utility ( $\beta = -2.61$ ,  $p < 0.0001$ ). In general, similar patterns were observed for other subgroup comparisons. **CONCLUSION:** Policy measures that reduce tobacco use could reduce displacement of commodities by households with tobacco users, including those commodities that can contribute to human capital investments.

FUNDING: None

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**POS1-102****DID THE AFFORDABLE CARE ACT CREATE DIFFERENTIAL BENEFIT DESIGNS FOR SMOKING CESSATION TREATMENTS AMONG MEDICAID ENROLLEES?**Sara McMenamin<sup>\*1</sup>, Sara Yoeun<sup>2</sup>, Helen Halpin<sup>3</sup>, <sup>1</sup>University of California, San Diego, CA, USA, <sup>2</sup>The George Washington University, DC, USA, <sup>3</sup>University of California, Berkeley, CA, USA

**SIGNIFICANCE:** The Affordable Care Act (ACA) contained four provisions (4107, 4106, 2502, and 2001) that expanded coverage for smoking cessation treatments for Medicaid enrollees. Each provision contained different requirements and targeted specific segments of the Medicaid population. This research aims to determine the extent to which enrollees in programs for pregnant women, traditional Medicaid, and Medicaid Expansion have different coverage policies for smoking cessation treatments. **METHODS:** From January through June, 2017, data were collected and analyzed from 51 Medicaid programs (50 states plus D.C.) for a 100% survey response rate. This was conducted through a web-based survey and review of benefits documents to assess smoking cessation treatment coverage policies and determine differential benefit designs for each population. **RESULTS:** Overall, coverage for various Medicaid populations, including pregnant women, enrollees in traditional Medicaid, and enrollees in Medicaid expansion programs has increased significantly. Differences in coverage for smoking cessation treatments between traditional and expansion Medicaid programs were found, with 79% of Medicaid expansion programs reporting coverage for all drugs and counseling compared to 51% of traditional programs. In addition, traditional Medicaid programs were more likely to charge a copay (36%) compared to Medicaid expansion programs (12.5%). **CONCLUSIONS:** With the passage of the ACA and



its relevant provisions emerged the development of differential benefit designs for Medicaid coverage of smoking cessation treatments. As a result of the more generous benefits required for Medicaid expansion enrollees, traditional Medicaid populations in expansion states had more generous benefits even though it was not required by law.

FUNDING: Nonprofit grant funding entity

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## POS1-103

### REPORTED FIRE SAFETY AMENITIES IN SMOKING-PERMITTED AIRBNB VENUES: FINDINGS FROM 16 COUNTRIES

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**SIGNIFICANCE:** The death and destruction of fires caused by cigarette smoking is considerable. Cigarettes are the first or second-leading cause of fire-related deaths in the US every year. Fires in hotels are commonly caused by smoking materials. Hotels fires can be particularly deadly because guests are generally unfamiliar with the building. Peer-to-peer (P2P) hospitality businesses, such as Airbnb, are increasing in relevance for the sector. Airbnb venues are not generally subject to the same fire safety standards required in hotels. Little is known about tobacco-use and fire safety in Airbnb settings. **METHODS:** Airbnb hosts describe their venue's attributes in their online profile. Venue descriptions for Airbnb venues in 43 markets in 16 countries are collected & freely available from InsideAirbnb.com. This study examines the reported proportion of Airbnb venues which permit smoking and reports which profiles include the presence of a smoke-detector (SD). **RESULTS:** The sample included 362,375 Airbnb venues from 16 Countries/jurisdictions including: Austria, Australia, Belgium, Britain, Canada, Denmark, France, Germany, Greece, Hong Kong, Ireland, Italy, Netherlands Spain, Switzerland & the US. Across the entire sample, 12.3% of venues permit smoking, ranging from 4.2% in Denmark and 40.1% in Greece; 62.7% reported in their online profile that their property had a SD (ranging from a low of 5.2% of venues in Italy to a high of 81.6% of venues in Canada). Among the Airbnb venues that permitted smoking (n=50,965), less than half (46.2%, n=23,563) reported having a SD. In 3 countries (Australia, Belgium & Ireland), venues that permitted smoking were slightly more likely to report having a SD. For the remaining 13 countries, venues that permit smoking were less likely to report having a SD with the greatest disparity being in Austria where 13.7% of smoke-free venues reported having a SD compared to 8.5% of smoking permitted venues. **CONCLUSIONS:** The presence of a smoke-detector is absent in most Airbnb venues that permit smoking in the present sample. This presents an important policy opportunity to protect lives and property caused by fires caused by smoking materials.

FUNDING: None

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## POS1-104

### CIGARETTES AREN'T THE ONLY THREAT TO OUR YOUTH: WHAT WE NEED TO KNOW ABOUT CIGARS

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**SIGNIFICANCE:** The Tobacco Control Act of 2009 gave the FDA the authority to regulate tobacco products, but not cigars, among other products. In May 2016, FDA issued a final rule on deeming tobacco products, which included regulating cigars. An updated review of the science is necessary for the tobacco control community to better understand the issues surrounding cigars and youth and young adults. **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:** Major findings from the review of the science were: 1) cigar consumption and prevalence among youth has increased since 2000 and could be undermining progress made in reducing cigarette prevalence, 2) prevalence of little cigar and cigarillo use among youth is likely underestimated due to misreporting, 3) youth believe cigar smoking to be less harmful and more socially acceptable than cigarette smoking, 4) cigar smokers are likely to experiment or be current users of other tobacco products and marijuana, 5) cigars are the most heavily flavored

market of tobacco products and flavored cigar use is especially high among youth, and 6) tobacco industry advertising and promotional activities of cigar products cause youth to start smoking. **CONCLUSION:** While the prevalence of cigarette use has decreased in the US, the tobacco control community and FDA should be concerned about cigar use among youth and young adults and work on policies to address the use of these products among these populations.

FUNDING: None

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## POS1-105

### THE ROLE OF TRAVEL DISTANCE AND PRICE PROMOTIONS IN TOBACCO PRODUCT PURCHASE QUANTITY

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**SIGNIFICANCE:** Tobacco purchasing behavior, such as unit quantity purchased, can be used by consumers to self-impose limits on their rate of tobacco use. Therefore, explanation of variations in tobacco purchase quantity, particularly among those identified as vulnerable populations in the field of tobacco control and tobacco regulatory science (e.g. rural and low income) is important. We examined whether (1) distance from home to the nearest tobacco outlet, which is larger on average in rural areas, and (2) price promotion use, which is disproportionately high among low income consumers, explain variation in purchase quantity for cigarettes and snuff. **METHODS:** We used an ecological momentary assessment methodology to collect data about tobacco users' purchasing patterns, including products and quantity purchased and use of price promotions. A parent cohort study provided important data for distance calculation and covariates. **RESULTS:** Our sample included 54 combustible tobacco users (296 purchases) and 27 smokeless tobacco users (112 purchases). Combustible users showed an increased cigarette pack purchase quantity if they lived further from an outlet and used a price promotion (i.e., an interaction effect; RR=1.50, 95% CI [1.01, 2.27]). Smokeless users purchased more units of snuff when they used price promotions (RR=1.94, 95% CI [1.07, 3.54]). **CONCLUSIONS:** Regulatory action that imposes restrictions on the availability or use of price promotions could be useful to support tobacco users who, regardless of intent, restrict their own use through their purchasing behavior. Such action would also restrict flexibility in the price of tobacco products, which is a powerful tobacco control lever.

FUNDING: Federal

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## POS1-106

### ADULTS' ATTITUDES TOWARD RAISING THE MINIMUM LEGAL AGE OF SALE FOR TOBACCO PRODUCTS: UNITED STATES, 2017

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**SIGNIFICANCE:** Earlier initiation of tobacco use increases the likelihood of nicotine addiction. Policies that increase the minimum legal age of sale for tobacco products to 21 years (Tobacco 21) could help prevent tobacco experimentation and initiation. As of September 2017, five U.S. states and over 250 localities have implemented Tobacco 21 legislation. This study assessed attitudes toward Tobacco 21 policies among U.S. adults in 2017. **METHODS:** Data came from the 2017 Summer Styles, a nationally representative Internet survey of U.S. adults aged 18 and older (n=4107) fielded during June-July. Respondents were asked, "Do you favor or oppose raising the minimum legal sale age for tobacco products to 21 years?" The prevalence of favorability (strongly favor, somewhat favor, somewhat oppose, strongly oppose) was assessed overall and by sex, age, race/ethnicity, educational attainment, having children <18 years in the household, cigarette smoking status, U.S. region, and income. Associations between covariates and favorability (strongly or somewhat favor) were assessed by multivariate logistic regression. **RESULTS:** In 2017, 53.8% of U.S. adults strongly favored, 21.4% somewhat favored, 14.6% somewhat opposed, and 10.2% strongly opposed raising the minimum legal age of sale for tobacco products to 21 years. By smoking status,





80.0% of never smokers, 72.4% of former smokers, and 64.7% of current smokers favored Tobacco 21 policies. Adjusted odds of favorability were higher for females (Odds ratio [OR]=1.4), older adults (45-64: OR=1.9; ≥65: OR=3.1) vs. those aged 18-24 years, Hispanics (OR=1.6) vs. non-Hispanic whites, those with higher household incomes (\$25,000-39,999: OR=1.5) vs. <\$15,000, and those with children <18 years in the home (OR=1.4). Former (OR=0.5) and current (OR=0.4) cigarettes smokers had lower odds of favorability than never smokers. CONCLUSIONS: In 2017, three-quarters of U.S. adults favored raising the minimum legal age of sale for tobacco products to 21, including nearly two-thirds of cigarette smokers. Tobacco 21 policies, in coordination with other proven tobacco control strategies, could prevent tobacco product use experimentation and initiation.

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## POS1-107 DIVERSITY OF CIGARILLO PACKAGING DESIGNS AND VISUAL ATTENTION TO PACKAGE IMAGES

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SIGNIFICANCE: Tobacco packaging is acknowledged as a critical vehicle to extend marketing to promote purchase and tobacco use. Despite shifting tobacco use trends highlighting use of cigarillos among youth and young adults, little attention has focused on understanding product packaging attributes that attract users. We present a summary of a comprehensive audit of cigarillo package attributes as well as discuss the visual attention given to various attributes of a cigarillo package as measured by an eye tracking study. METHODS: For the package audit, a random sample of 50 retail stores known to sell cigarillos was drawn from an existing database. One package of each unique brand and flavor of cigarillos was purchased to ensure maximum saturation of packages. Packages were coded by two coders to document: color, flavor, package type, number and price. A descriptive eye tracking study was conducted to examine precise measure of visual attention (measured in milliseconds of viewing time) for cigar packaging. Adult (18+) participants were recruited to complete this eye tracking assessment (n=31). Exposure stimuli included a foil-pouch package of a popular, national brand of cigarillos. Participants completed this self-paced study for an average of 10 minutes. RESULTS: The package audit yielded 101 unique cigarillo products, predominated by foil pouch packaging (91%). Packaging was printed with price promotions (92%), many displayed fruit flavoring or names (38%). Package quantities sold included 2-pack (52%), followed by 3-pack (16%), and 4-pack (4%) quantities. In the eye tracking study, participants spent an average of 7.1 s viewing the cigarillo package stimuli. The product package attracted 4.4 s of viewing time; within the product package, 1.1 s on the warning label, 0.51 s viewing the cigar itself, 0.52 s on brand name, and 0.47 s on pricing information. DISCUSSION: Cigar packaging includes a diversity of elements which attract visual attention. Given the diversity of cigarillo packaging types, quantities, and flavors, it is important to understand how these varying features attract attention and convey appeal to current and potential cigar users.

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## POS1-108 USING DISCRETE CHOICE EXPERIMENTS TO CHARACTERIZE DEMAND FOR WATERPIPE TOBACCO SMOKING AMONG UNIVERSITY STUDENTS IN THE EASTERN MEDITERRANEAN REGION

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SIGNIFICANCE: Waterpipe smoking originated in the Eastern Mediterranean region. It is highly prevalent among university students, and has been increasing in popularity despite growing evidence showing it is harmful to health. The aim of this study was to measure preferences for waterpipe smoking and determine which product characteristics are most important to smokers. METHODS: Participants (n=1859) in 4 countries (Jordan, Oman, Palestine, and the United Arab Emirates) completed an Internet-based discrete choice experiment (DCE) to reveal their preferences for, and trade-offs between, the attributes of hypothetical waterpipe smoking sessions. The DCEs followed a balanced incomplete block design. Participants were presented with waterpipe café menus, each with 5 fruit-flavored options and 1 tobacco flavored option, in addition to an opt out option. Items on the menu were assigned to 1 of 3 nicotine content levels (0.5%, 0.05%, 0.0%) and 2 price levels. Participants were randomized to either receive menus with a pictorial + text health-warning message or no message. Multinomial logit models were used to estimate the impact on consumer choice of attributes and between-subject assignment of health warnings respectively. RESULTS: On average, participants preferred fruit-flavored varieties to tobacco flavor. They were less likely to choose options labelled with higher nicotine content and higher price. CONCLUSION: Fruit-flavored tobacco and lower nicotine content labels, two strategies widely used by the industry, increase the demand for waterpipe smoking among young adults. Waterpipe-specific regulation should limit the availability of flavored waterpipe tobacco and require accurate labelling of constituents. Waterpipe-specific tobacco control regulation, along with research to inform policy, is required to curb this emerging public health threat.

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## POS1-109 THE GEOGRAPHY OF TOBACCO DISPARITIES

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Although the significant declines in tobacco use is laudable, the average national rate does not reveal the significant variation found within the country. Twelve (12) contiguous states (i.e., Alabama, Arkansas, Indiana, Kentucky, Louisiana, Michigan, Mississippi, Missouri, Ohio, Oklahoma, Tennessee, and West Virginia) make an area we call "Tobacco Nation," where the smoking prevalence exceeds not only the national average but that of many low-income countries. Unfortunately, both in Tobacco Nation and across the world, the tobacco epidemic disproportionately burdens those least financially able to afford it. Average life expectancy is lower and cancer mortality is higher in Tobacco Nation as compared to the rest of the U.S. Tobacco Nation residents also have less access to primary care physicians and rely more heavily on hospital care. If current trends continue, the region's residents are likely to remain at a significant disadvantage. Yet, since 2010, there has been roughly a 130% difference in tobacco control expenditures between Tobacco Nation and the rest of the U.S. Tobacco Nation states have lower levels of tobacco policy implementation than much of the nation. Cigarette packs are 19% cheaper in Tobacco Nation (\$5.48) than the rest of the U.S. (\$6.72), and the average excise tax is significantly lower (\$.98 vs. \$1.89). When compared to the Bloomberg Initiative's 10 countries with the highest rates of tobacco use, Tobacco Nation has the fourth-highest rate of youth smoking, behind only Indonesia, Ukraine, and Mexico, and the fifth-highest rate of adult smoking, behind Indonesia, Ukraine, China, and the Philippines. This significant portion of the U.S. appears to have troubling





similarities to less well-developed countries, which lack the income, infrastructure and health care resources to provide aid and support to their residents. Simply put, Tobacco Nation is a country within a country. This study provides in depth geographical analyses of how a lack of tobacco control policy implementation is associated with morbidity and mortality.

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## POS1-110

### A QUASI-EXPERIMENTAL STUDY OF THE EFFECT OF TOBACCO 21 ON YOUTH SMOKING PREVALENCE IN KANSAS

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**BACKGROUND:** Raising the minimum age of tobacco sales to 21, termed Tobacco 21, is gaining momentum in the U.S. In 2015 and 2016, 12 cities or localities in Kansas adopted the Tobacco 21, representing 670,356 Kansas residents covered by Tobacco 21. Very few studies have assessed whether Tobacco 21 policy changes appear to be affecting youth smoking behaviors. **Study Design:** Youth smoking prevalence were collected from The Kansas Communities That Care (KCTC) annual survey of Kansas schools. The effects of Tobacco 21 were examined by matching middle and high schools in Tobacco 21 (T21) and non-Tobacco 21 (Control) areas through rigorous selection criteria, including grade composition, enrollment size, past 30-day cigarette use, and socio-economic status. The difference-in-difference approach was used to examine changes in youth cigarette and smokeless tobacco use prevalence from 2014 to 2017 and logistic regression was performed to evaluate the effects of Tobacco 21. **RESULTS:** Twenty middle and high schools (10 schools in T21 and 10 schools in Control) were matched. At baseline (2014, n=3,852 in T21 and n=3,297 in Control), 4.99% of T21 students and 4.42% of Control students reported current use of cigarettes in the past 30 days, while 5.25% of T21 students and 3.74% of Control students reported current use of smokeless tobacco. In 2017, the current use of cigarettes declined to 3.14% in T21 areas (a reduction of 37%) and 3.20% in Control areas (a reduction of 28%). Current use of smokeless tobacco declined to 2.77% in T21 areas (a reduction of 47%) and 2.73% in Control areas (a reduction of 27%). Similar trends were observed for lifetime use of cigarettes and smokeless tobacco. **CONCLUSIONS:** There was a reduction in lifetime and current use of cigarettes and smokeless tobacco from 2014 to 2017 in Kansas. Continuous monitoring the long-term impact of Tobacco 21 is needed.

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## POS1-111

### REGULATION OF VAPING SPACES: A QUALITATIVE ANALYSIS OF VAPERS' PERCEPTIONS

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**SIGNIFICANCE:** Although smokefree area policies are well developed in many countries, policies regulating vaping spaces remain nascent and considerable debate exists over whether smokefree spaces should also include vaping. Addressing this question requires a fine balance to ensure policies support full transition from smoking to vaping among smokers who cannot otherwise quit, yet also respect those who wish to avoid second-hand vapor. **METHODS:** Using in-depth interviews with 56 current electronic nicotine device (ENDS) users, including former smokers who used ENDS to remain smokefree; current dual users, and never-smokers, we explored how participants perceived this balance. In addition to exploring participants' smoking and vaping behaviors, we probed their views of whether and how ENDS use should be regulated. We used an inductive thematic analysis approach to analyze the data and identified three initial themes that varied along a liberal - conservative continuum. **RESULTS:** Participants who saw vaping as harmless, or who had few concerns about its long-term effects, believed they

should be able to vape anywhere and regarded vape-free area restrictions as too constricting. The second theme included participants who had taken a semi-liberal stance and thought vaping should be permissible in some settings, particularly those frequented by adults, but not allowed in areas where children congregated. The final group, which comprised mainly never-smokers who vaped, held more conservative views and were more likely to consider that smokefree areas should also be vape-free. Participants using ENDS to quit smoking or remain smokefree were more likely to support liberal regulation; however, most were willing to subordinate their desire to vape in smokefree settings if doing so protected children. **CONCLUSIONS:** Applying smokefree indoor space policies to vaping could reduce children's exposure to vaping practices and vapor while protecting them and non-vapers from vaping by-products. Allowing vaping in outdoor smokefree areas could foster transition from smoking to vaping, and seems unlikely to present direct health risks.

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## POS1-112

### USING THE THEORY OF PLANNED BEHAVIOR TO ASSESS PEER ENFORCEMENT OF TOBACCO POLICIES ON COLLEGE CAMPUSES IN TEXAS

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**SIGNIFICANCE:** Colleges and universities across the United States are implementing tobacco-free policies in an effort to curb tobacco use on campus; however, enforcement of these policies remains a challenge. One possible enforcement strategy used on campuses is peer enforcement through bystander intervention. Understanding the underlying influences of students' willingness to intervene is critical for developing effective programs to give students the skills necessary for intervening when they witness someone using tobacco on their campus. The purpose of this study was to use the Theory of Planned Behavior (TPB) to examine associations between the theoretical constructs of attitudes, subjective norms, and perceived behavioral control and whether students had actually ever intervened when they witnessed someone using tobacco on their campus. **METHODS:** Participants were 11,183 college students, aged 18-29 (M=21.19, SD=2.7; 63.6% female; 32.2% non-Hispanic white, 27.7% Hispanic, 13.7% Asian, and 7.4% African American) attending one of 12 colleges in Texas. Students completed an online survey in spring 2017: measures included self-reported attitudes toward intervening, subjective norms relative to intervening, and perceived behavioral control to intervene (response options range from 1 to 5). **RESULTS:** Overall, only 7.2% of students ever intervened when they witnessed someone using tobacco on their campus. Binary logistic regression analyses indicated that each determinant of the TPB was significantly associated with students performing the bystander intervention behavior [attitude OR=1.36 (1.25, 1.46); subjective norms OR=1.19 (1.10, 1.29) OR=1.26 (1.17, 1.35); perceived behavioral control OR=1.44 (1.35, 1.54)] over and above the covariates of sex, age, race/ethnicity and tobacco status. **CONCLUSION:** The TPB is a useful framework for developing a clear understanding of students' likelihood to intervene when they witness someone using tobacco on their campus. This theory can inform effective programs to increase the number of students with the necessary skills to intervene, thus strengthening peer enforcement efforts on college campuses.

FUNDING: State

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## POS1-113

### DO CONSUMERS PERCEIVE FILTERED "LITTLE CIGARS" TO BE CIGARETTES?

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**SIGNIFICANCE:** FDA warned 3 manufacturers that their flavored products labeled as "little cigars" were cigarettes marketed in violation of the Tobacco Control Act's

flavoring ban. This suggests FDA determined, despite their labeling, these products fit the legal definition of a cigarette. This study tested the extent to which consumers perceive filtered "little cigars" as cigarette substitutes; characteristics they associate with cigars vs. cigarettes; and if these varied based on different labeling and characteristics. **METHODS:** 1,030 adults were recruited for an online study (*M* age 31.1 years, 34% male, 25% non-white race). Quotas balanced the sample by: non-smokers ages 18-30; smokers ages 18-30; smokers ages 31+. Participants were randomized in a 2x2 between-subjects design to view images of filtered "little cigar" products that varied by their labeling (cigars: yes/no) and the product displayed in front of the packaging (filtered "little cigar" or cigarette). Measures assessed perceptions that the product shown can be used as a substitute for cigarettes and characteristics perceived to be associated with cigarettes vs. cigars. **RESULTS:** Participants generally perceived filtered "little cigar" products as substitutes for cigarettes (*M* 4.4, *SD* 1.8, scale 1-7), perceived certain characteristics (e.g., no filter or a tip, sold in packs of 5 or singles) to be more like cigars (*M* 3.6, *SD* 1.0, scale 1-5), and perceived others (e.g., filtered, sold in packs of 20) to be more like cigarettes (*M* 2.2, *SD* 0.7, scale 1-5). In adjusted analyses assessing effects of the experimental conditions, participants viewing images displaying conventional cigarettes endorsed stronger perceptions that "little cigars" could be used as a substitute for cigarettes and had conventional characteristics cigarettes (*p*'s < .01). **CONCLUSIONS:** Consumers perceive filtered "little cigars" as substitutes for conventional cigarettes with key similar characteristics. Perceptions shift when conventional cigarettes are shown instead of filtered "little cigar" products, but this effect is small. This study provides new evidence to support FDA regulation of filtered "little cigars" as cigarettes.

**FUNDING:** Academic Institution

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## POS1-114

### EVALUATION OF HEALTH WARNINGS FOR WATERPIPE TOBACCO SMOKING AMONG UNIVERSITY STUDENTS ACROSS FIVE COUNTRIES IN THE EASTERN MEDITERRANEAN REGION

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**SIGNIFICANCE:** Waterpipe tobacco smoking is a global public health problem that originated in the Eastern Mediterranean region (EMR). It is highly prevalent among university students, and has been increasing in popularity despite mounting evidence showing it is harmful to health. The aim of this study was to evaluate responses to various health warning messages and their location on waterpipe devices, among young residents of EMR countries. **METHODS:** Adult university students who were waterpipe smokers completed an Internet-based survey across 5 EMR countries (Egypt [N=728], Jordan [N=790], Oman [N=117], Palestine [N=772], and UAE [N=180]). The survey evaluated their responses to text-only and pictorial waterpipe-specific health warnings and their location on waterpipe devices. **RESULTS:** Among both text-only warnings and text + pictorial warnings, messages that communicated harm to children were rated highest in raising concerns about the health consequences of smoking and in motivating smokers to think about quitting. In terms of warning location, the mouthpiece was rated as most noticeable to smokers. **CONCLUSION:** This study is the first to compare responses to waterpipe-specific health warnings across EMR countries. Requiring health warnings on waterpipe devices may be an effective policy to educate smokers about the consequences of waterpipe use.

**FUNDING:** Nonprofit grant funding entity

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## POS1-115

### A STUDY OF GRUESOME GRAPHICAL HEALTH WARNING LABELS AMONG GEORGIAN ADULTS: FOR WHOM ARE THEY MORE EFFECTIVE?

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Graphic health warning labels demonstrate effectiveness, particularly for low- and middle-income countries. This study examined six recommended health warning labels, three of which include gruesome imagery and three relatively benign imagery, in a sample of 1,163 adults in Georgia, a middle-income country with high smoking prevalence and with lagging tobacco control policies. We examined: 1) each of these graphical warning labels to text only as well as to one another in terms of "effectiveness in motivating smokers to quit or preventing people from starting smoking"; and 2) prevalence and correlates of rating gruesome (versus benign) images as more, equally, or less effective. We conducted a split-half experimental design in the context of a national survey, whereby participants were asked to rate two different sets of text and graphical warning labels. Gruesome images were rated as more effective than text and benign images (*p*'s < .001); only one benign image was rated as more effective than text (*p* = .003). While 43.8% rated gruesome images more effective on average, 43.4% rated gruesome and benign images equally effective (no difference), and 12.9% rated benign images as more effective. Nominal logistic regression indicated that, compared to those rating the images equally effective (referent group), those reporting benign images more effective had higher monthly income (*p* = .034) and fewer friends who smoked (*p* = .042); no significant predictors of rating gruesome images as more effective were identified (*R*-squared = .058). Among current smokers, compared to those rating the images equally effective, those reporting benign images as more effective rated quitting smoking as more important (*p* = .006) and were older at age of initiation (*p* = .023); those reporting gruesome images more effective had lower household income (*p* = .002), were less likely to have children (*p* = .05), and were more likely to be unemployed (*p* = .05; *R*-squared = .534). Gruesome imagery is not more effective for all people; understanding the effectiveness in different populations is critical.

**FUNDING:** Nonprofit grant funding entity

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## POS1-116

### ASSOCIATIONS BETWEEN ENGAGEMENT WITH ONLINE TOBACCO MARKETING AND SUBSEQUENT TOBACCO USE: RESULTS FROM THE LONGITUDINAL PATH STUDY OF US ADOLESCENTS

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**SIGNIFICANCE:** Nearly 2.9 million US adolescents engaged with online tobacco marketing in 2013-2014. We assess whether engagement is a risk factor for tobacco use initiation, increased frequency of use, progression to poly-product use, and cessation. **METHOD:** We analyzed data from 11,996 adolescents sampled in the nationally representative, longitudinal Population Assessment for Tobacco and Health Study. At baseline (2013-2014), we ascertained respondents' engagement with online tobacco marketing. At follow-up (2015-2016), we determined whether respondents had initiated tobacco use, increased frequency of use, progressed to poly-product use, or quit. Accounting for demographic, psychosocial, and behavioral risk factors, we fit a weighted multivariable logistic regression model among never-users who engaged at baseline to predict initiation at follow-up. We fit similar models to predict increased frequency of use, progression to poly-product use, and cessation. **RESULTS:** Compared with adolescents who did not engage, those who engaged reported higher incidences of initiation (19.5% versus 11.9%), increased frequency of use (10.3% versus 4.4%), and progression to poly-product use (5.8% versus 2.4%), and lower incidence of cessation at follow-up (16.1% versus 21.5%). Accounting for other risk factors, engagement was positively associated with initiation (adjusted odds ratio [aOR] = 1.26; 95% confidence interval [CI]:



1.01-1.57), increased frequency of use (aOR=1.58; 95% CI: 1.24-2.00), progression to poly-product use (aOR=1.70; 95% CI: 1.20-2.43), and negatively associated with cessation (aOR=0.71; 95% CI: 0.50-1.00). CONCLUSIONS: Engagement with online tobacco marketing represents a risk factor for adolescent tobacco use. Marketing regulation by the Food and Drug Administration and cooperation of social-networking sites could limit engagement.

FUNDING: Academic Institution; Federal

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## POS1-117

### USE OF TERM "LESS SMOKE SMELL" ON TOBACCO PACKS IN LOW- AND MIDDLE-INCOME COUNTRIES

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Less Smoke Smell (LSS) cigarettes were developed by the tobacco industry to have the appearance of reducing negative qualities of cigarette smoke including secondhand smoke (SHS). LSS products were introduced during a time of rising public knowledge of SHS health effects and demand for smoke-free spaces. LSS cigarettes are no safer than regular cigarettes. LSS cigarettes have been sold in high-income countries like Japan and Canada for about 10 years. It is unclear to what extent LSS cigarettes have been marketed in low- and middle-income countries (LMICs). The Tobacco Pack Surveillance System (TPackSS) systematically collects tobacco packs available in 14 low and middle income countries with high tobacco use including: Bangladesh, Brazil, China, Egypt, India, Indonesia, Mexico, Pakistan, Philippines, Russia, Thailand, Turkey, Ukraine and Viet Nam. Between 2013-2017, TPackSS collected and coded over 4,000 packs for marketing appeals including lexical content related to smoke smell. The current study reports the countries and tobacco manufacturers that included LSS or Less Smoke Smell or similar claims on their packs. "LSS (Less Smoke Smell)" or "Less Smoke Smell" was present (in English) on packs purchased in China, India, Philippines, Russia, Ukraine, and Vietnam. The country with the greatest number of packs was Russia (126 packs). Variant lexical content included phrases such as "odor reduction technology" on packs from Brazil (English); "crafted for less smell" - a pack from the Philippines (English); and "Low Smell", "Clear Sense" and "Smoke Smell Down-SSD" on packs in India. Packs from Mexico had "menos olor" - Spanish for less odors. Companies using these terms include: BAT (Vogue), PMI (Chesterfield, Marlboro) and JTI (Camel, Glamour, Winston). The world's largest tobacco companies are using terms LSS and Less Smoke Smell, as well as terms like Smoke Smell Down on packs in LMICs. The marketing tactic of less smoke smell is likely salient to consumers in jurisdictions, like Russia, that have implemented smoke-free environments. Terms like LSS should be considered when jurisdictions regulate misleading terms on tobacco products.

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## POS1-118

### DOES E-CIGARETTE TV ADVERTISING ENCOURAGE YOUTH SMOKING AND USE OF E-CIGARETTES? A POPULATION LEVEL ESTIMATE

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SIGNIFICANCE: The recent rapid growth of e-cigarette use among American youth coincided with an increase in marketing and promotion of e-cigarettes on a variety of media platforms. While several experimental studies have demonstrated that exposure to e-cigarette ads increases awareness and intention to use. The evidence of the impact of e-cigarette advertising at the population level is scarce. In addition, little is known about whether e-cigarette advertising may have influenced youth's smoking behavior. The goal of this study is to examine, at the population level, the impact of e-cigarette advertising on TV, still one of the most dominant media platforms, on youth use of e-cigarettes and smoking. METHODS: This study used data from the Monitoring the Future (MTF) surveys, nationally representative cross-sectional surveys of the U.S. high school and middle school

students, conducted annually from 2014 to 2017. E-cigarette use in the past 30 days prior to the survey and respondents' current smoking status were analyzed. Measures of potential exposure to e-cigarette TV advertising were constructed using the Nielsen TV ratings, compiled from the Nielsen company, and were linked with the MTF data using state and county identifiers, as well as year and quarter indicators. Logistic regressions, controlling for demographics and socioeconomic status, were conducted. RESULTS: Our results show that higher e-cigarette TV ratings were associated with higher probability of using e-cigarettes, with the TV ratings for adolescents showing the strongest and the largest impact. E-cigarette TV ratings were positively associated with smoking, but the relationship was not statistically significant, except for the ratings for disposable e-cigarettes. CONCLUSIONS: Exposure to televised advertising of e-cigarette may increase the use of e-cigarettes among adolescents. Restricting youth-targeted e-cigarette television advertising may reduce use of e-cigarettes among adolescents. Restricting youth-targeted disposable e-cigarette advertising may have added benefit of reducing smoking among adolescents.

FUNDING: Federal

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## POS1-119

### STAFF SURVEY OF BARRIERS AND FACILITATORS TO IMPLEMENTATION OF HOSPITAL SMOKING CESSATION CARE

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SIGNIFICANCE: Understanding the barriers and factors to facilitate smoking cessation care can help to optimise care provision and have the greatest impact on inpatient smoking. This study aimed to determine staff-reported barriers and factors to facilitate smoking cessation care provision. METHODS: An online survey of employees at two public hospitals in New South Wales, Australia was conducted. Descriptive statistics were determined for all measures. Logistic regression models were used to examine staff characteristics related to agreement with barriers. RESULTS: A total of 805 staff participated (response rate 18%). Over a quarter (27.3%) agreed/strongly agreed that smoking cessation care was not part of their role, more than a third (39.9%) agreed it was not the priority in the acute setting, and more than half (51.9%) felt there was uncertainty about the effectiveness of smoking cessation interventions. There were moderate to high rates of agreement with all factors that may facilitate implementation of the smoke-free policy (ranging from 64.8% to 91.5%). Gender, age, role at hospital and employment were found to be related to staff agreement with barriers. CONCLUSIONS: There remains uncertainty among hospital health workers regarding who is responsible for providing smoking cessation care, and the effectiveness of such care.

FUNDING: Federal

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## POS1-120

### HOW TOBACCO COMPANIES HAVE USED PRODUCT QUANTITY FOR CONSUMER TARGETING: AN INDUSTRY DOCUMENT REVIEW

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SIGNIFICANCE: Tobacco product quantity refers to the number of cigarettes or amount of smokeless or other tobacco product in a package. U.S. federal laws restrict minimum but not maximum cigarette product quantities and generally do not apply to other tobacco products. Little research has evaluated how changes in product quantity influence tobacco product use or appeal. To begin to fill this gap, the present study examined tobacco companies' previously secret internal documents concerning tobacco product quantity. METHODS: We reviewed Truth Tobacco Industry Documents for descriptions of how changing product quantity influences consumer behavior and product appeal. We used a snowball sampling method, searching an initial set of keywords and reviewing documents for rele-





vance and additional keywords. Searches were conducted from June 15, 2015 to April 27, 2016. We identified a total of 53 documents including documents about cigarettes (43), smokeless (6), and roll-your-own tobacco (4). RESULTS: Documents described product quantity decreases as lowering prices, matching the consumption rates of young or new users, and increasing products' novelty, ease of carrying or concealment, and perceived freshness. Product quantity increases were used to offer value-for-money often by making products more affordable on a per-unit basis. Quantity increases were also used to make products more appealing by matching the daily consumption rates of older, more established tobacco users. Product quantity changes were often used to counter the effects of tax increases. Furthermore, the tobacco industry has used product quantity changes to target specific consumers based on psychographic and lifestyle characteristics as well as race, region, age, gender, and brand characteristics. CONCLUSION: Product quantity decreases and increases may have multiple complex effects on tobacco use and product appeal. Understanding the population health effects of both decreases and increases in product quantity, including effects on non-users as well as current users of different product types, can help inform regulatory efforts.

FUNDING: Federal

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## POS1-121

### IS THE CIGARETTE PACK JUST A WRAPPER OR A CHARACTERISTIC OF THE PRODUCT ITSELF? A QUALITATIVE STUDY OF ADULT SMOKERS

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SIGNIFICANCE: In the U.S., tobacco products, which were less regulated than strawberry jam until 2009, are now regulated by the Food and Drug Administration (FDA). Litigation has quickly followed. One area of controversy is if a change to the design of the cigarette pack but not the cigarettes inside constitutes a new product and thus requires approval through the FDA's premarket review process. In this paper, we see if this conclusion on its face matches the perceptions of adult U.S. smokers. METHODS: Data for this qualitative study came from six focus groups conducted in March 2017 with adult smokers. Two groups consisted of lesbian, gay, and bisexual participants; two groups of participants with less than four years of college education; one group of LGB and straight identity; and, one group of the general population. All groups were selected for regional, gender, and racial/ethnic diversity and came from the NORC AmeriSpeak Panel. Participants (n=33) represented all nine U.S. Census divisions. We conducted constant comparison qualitative analysis utilizing a grounded theory approach. RESULTS: Participants believe that pack design is clearly a reflection of the cigarettes within and that a change in the pack signaled a change in the cigarettes. However, participants also shared the belief that pack design did not matter, nor impact their purchase and that instead, price did. Nonetheless, these participants did believe that pack design did impact and entice new and young smokers. CONCLUSIONS: Smokers perceive the visual design of cigarette packs as a reflection of the cigarettes in the pack. Changes in pack design signal a different product to smokers. Changes and pack design in general are seen as particularly relevant to new and young smokers. These findings provide support for the development of regulations that require FDA approval for changes to pack design assessed based on impact on public health.

FUNDING: Federal

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## POS1-122

### THE REMOVAL OF POINT-OF-SALE TOBACCO DISPLAYS AND SMOKING BEHAVIOUR AMONG ADOLESCENTS IN EUROPE: A QUASI-EXPERIMENTAL STUDY

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SIGNIFICANCE: An increasing number of European countries implemented a point-of-sale (PoS) display ban on tobacco products. This study assessed the association between PoS display bans in Europe and adolescent smoking and perceived accessibility of tobacco, two to six years after PoS display ban implementation. METHODS: This study used data of 174,878 15- and 16-year-old adolescents from 25 European countries from the 2007, 2011 and 2015 European School Survey Project on Alcohol and Other Drugs (ESPAD) surveys. A quasi-experimental design was applied; before-after comparison of individuals in countries that did and countries that did not implement a PoS display ban. PoS display ban implementation was related with smoking status (regular smokers versus others) and perceived accessibility of tobacco (easy versus difficult), using multi-level logistic regression models. Interaction with gender was tested. RESULTS: The implementation of a PoS display ban was associated with a 20% drop in the odds of regular smoking (OR: 0.80, 95%CI: 0.75 to 0.86), but was not significantly associated with perceived accessibility of tobacco (OR: 0.97, 95%CI: 0.92 to 1.02). The association with regular smoking was stronger in females than in males (OR females: 0.75, 95%CI: 0.69 to 0.82, and OR males: 0.87, 95%CI: 0.79 to 0.94, p for interaction: 0.005). CONCLUSION: The implementation of PoS display bans in Europe was associated with a decrease in smoking prevalence among adolescents. This decrease does not appear to be due to a decreasing accessibility of tobacco, but might be caused by further denormalisation of tobacco as a result of PoS display bans.

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## POS1-123

### SMOKING CESSATION AMONG E-CIGARETTE USERS: DOES POINT OF PURCHASE MATTER?

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Studies have suggested e-cigarette users who go to vape shops differ from those who purchase their products from other outlets. This study aims to systematically examine the smoking cessation behavior of e-cigarette users by points of purchase. Data from two (2014 and 2016) nationally representative surveys in the US were combined, and 1622 e-cigarette users were analyzed. During the study period, the most likely point of purchase for e-cigarettes were retail stores (30.8%) and vape shops (29.3%), followed by smoke shops (20.4%) and the internet (19.4%). Among those smoking 12 months before the survey, significantly higher rates of quit attempt were reported among vape shop (66.3%), internet (59.0%) and retail clients (62.3%), compared to smoke shop clients (50.6%). Furthermore, vape shop (22.3%) and internet clients (22.6%) were significantly more likely to have quit smoking at time of survey than those purchasing from retail (10.8%) and smoke shops (9.5%). Similarly, vape shop (59.0%) and internet (43.0%) clients were significantly more likely to use e-cigarettes daily than smoke shop (22.8%) and retail (19.9%) consumers. Vape shop clients almost exclusively used open-system devices (93.0%), compared to 52.7% of internet clients, 48.5% of smoke shop clients and 17.9% of retail clients. Surprisingly, among those who made a quit attempt in the last 12 months, retail clients used FDA-approved cessation aids (40.6%) at a rate more than double the other three groups. Our findings show that vape shop and internet consumers tend to be frequent e-cigarette users and use more recent devices, factors that may contribute to their higher smoking cessation rate. These findings have important regulatory implications.

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## POS1-124

### THE EFFECT OF CIGARILLO PACKAGING ELEMENTS ON YOUNG ADULT PERCEPTIONS OF PRODUCT FLAVOR, TASTE, SMELL, AND APPEAL

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**SIGNIFICANCE:** Characterizing flavors have been prohibited in cigarettes since 2009, though the federal ban on flavors has not extended to other tobacco products, such as little cigars and cigarillos (LCCs). Perceptions of tobacco products can be altered by flavor descriptors, as well as other product packaging elements. As evidence is limited on the effect of LCC pack design elements on consumer perceptions, this study experimentally examined how cigarillo pack elements are associated with perceptions of flavor, taste, smell, and pack appeal. **METHODS:** A convenience sample of 2,664 young adults (LCC current users, ever users, and never users) completed an online survey. Participants were shown three randomly selected, digitally manipulated cigarillo packs with survey items after each pack image. Cigarillo packs varied on flavor descriptor, color, size, branding, and warning. Linear mixed effects models were used to estimate fixed effects for LCC use status and pack elements. **RESULTS:** Cigarillo packs with grape, sweet, wine, and tropical flavor descriptors were perceived as having a more favorable taste ( $\beta=0.22-0.35$ ,  $p<.0001$ ) and smell ( $\beta=0.17-0.34$ ,  $p<.0001$ ) compared to packs with no flavor descriptor. Compared to black/white packs, purple and pink packs were more likely to be perceived as containing a flavor ( $\beta=0.08$ ,  $p=.01$  and  $\beta=0.15$ ,  $p<.0001$ ), and were rated more favorably on taste ( $\beta=0.16$  and  $0.24$ ,  $p<.0001$ ), smell ( $\beta=0.14$  and  $0.23$ ,  $p<.0001$ ), and pack appeal ( $\beta=0.22$  and  $0.29$ ,  $p<.0001$ ). Pack warnings decreased favorable perceptions of product taste (text plus pictorial:  $\beta=-0.07$ ,  $p=.03$ ) and smell (text-only:  $\beta=-0.07$ ,  $p=.03$ ; text plus pictorial:  $\beta=-0.10$ ,  $p<.01$ ). **CONCLUSIONS:** This study provides novel data on how cigarillo pack elements relate to product perceptions. Though the FDA has indicated their intention to prohibit the use of flavors in LCCs, the tobacco industry has a history of using pack elements such as colors to signify differences between products. Evidence that cigarillo pack elements such as flavor, color, and size affect perceptions and use behavior can be used to implement LCC flavor ban policies and restrictions on product packaging.

**FUNDING:** Academic Institution

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## POS1-125

### EXPOSURE TO THE MARKETING OF E-CIGARETTES: FINDINGS FROM THE 2016 ITC FOUR COUNTRY TOBACCO AND E-CIGARETTES SURVEY (ITC-4CE1)

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**BACKGROUND:** Australia (AU), Canada (CA), and England (EN) have strong limitations on the marketing and sale of cigarettes, but differ on the marketing and sale of ECs. In 2016, AU and CA prohibited the retail marketing and sale of nicotine ECs. EN allows the sale of nicotine ECs but has some limits on marketing. The US has weaker regulations on the marketing and sale of both cigarettes and ECs. This study examines reported exposure to EC marketing in countries with different marketing regulations. **METHODS:** We analyzed data from the 2016 ITC-4CE1 survey in AU ( $n=1,493$ ), CA ( $n=3,818$ ), EN ( $n=4,392$ ) and US ( $n=2,813$ ), a web-based survey of adult smokers, ex-smokers, and current and past EC users. The outcomes were proportion of respondents who reported (1) noticing cigarette and EC ads in the past month via three channels (point-of-sale [POS]; websites/social media; and e-mail/texts) and (2) receiving special price offers. Logistic regression assessed predictors of the outcome variables, including age and respondent type (cigarette-only smokers, dual users, EC-only users, and ex-smokers who don't use EC). **RESULTS:** Exposure to EC ad at POS was higher in EN and US than AU and CA ( $p<.05$ ), but exposure via other channels or price offers did not differ by regulatory environment. In within-country analyses, exposure to ads in any channel and price offers were higher for ECs than for cigarettes in AU, CA (except e-mail/texts) and EN, but not in the US ( $p<.05$ ). Overall, exposure to EC ads via POS, websites/social media, and price offers was higher in 18-24 year olds than other

age groups ( $p<.01$ ). EC ad exposure in any channel was higher among dual users, EC-only users and ex-smokers than cigarette-only smokers ( $p<.05$ ). **CONCLUSIONS:** Restricting the marketing of nicotine ECs was associated with reduced exposures to EC ads at POS, but was not associated with reduced exposure from online channels.

**FUNDING:** Federal

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## POS1-126

### ASSESSING CIGARETTE PACK INSERT CHARACTERISTICS ON ADULTS IN CANADA: RESULTS FROM A DISCRETE CHOICE EXPERIMENT

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**BACKGROUND:** Canada remains the only country to have implemented inserts with messages about cessation benefits (response efficacy) and tips to quit (self-efficacy) within cigarette packs. This study used discrete choice experiments (DCEs) among Canadian adults to assess the effect of different combinations of topics and images on inserts. **METHODS:** Two DCEs that manipulated combinations of insert topic and images were conducted in Canada with 1000 adults aged between 18 to 64 years old. In the first DCE, 5 response efficacy topics were assessed, and in the second, 5 self-efficacy topics were assessed. In both DCEs, 5 image types were used (young man, young woman, older man, older woman, symbolic). In both DCEs, participants were randomly assigned to evaluate 5 of 50 contrasting sets of 4 inserts. For the first DCE, participants were asked to indicate which insert most and least motivated them to quit, and the second DCE asked which was most and least helpful for quitting. Linear mixed models using effects coding were used to assess the effect of insert attributes on choice. Interactions between age, sex, and image type were also tested. **RESULTS:** In the first DCE, new disease ( $b=0.02$ ,  $p<0.001$ ) and diabetes ( $b=0.02$ ,  $p=0.001$ ) topics were most motivating to quit. Only imagery of young women was found to be more motivating than other imagery ( $b=0.01$ ,  $p=0.041$ ) and this was more pronounced among older participants ( $b=0.02$ ,  $p=0.005$ ). Compared to females, males found symbolic images more motivating ( $b=0.02$ ,  $p=0.041$ ) and images of older women less motivating ( $b=-0.02$ ,  $p=0.028$ ). In the second DCE, image type did not have an effect on helpfulness to quit though topics of social support ( $b=0.02$ ,  $p<0.001$ ), nicotine replacement therapy ( $b=0.01$ ,  $p=0.004$ ), and stress ( $b=0.01$ ,  $p=0.007$ ) were found to be more helpful to quit than other topics. Younger participants found topics of physical activity more helpful ( $b=0.03$ ,  $p=0.001$ ) than older participants, who found social support topic more helpful ( $b=0.03$ ,  $p<0.001$ ). **CONCLUSIONS:** Some insert topics and images appear more motivational and helpful to quit smoking than others with some effects differing by age and sex of Canadian adults.

**FUNDING:** Federal

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## POS1-127

### "ORGANIC," "NATURAL," AND "ADDITIVE-FREE" CIGARETTES: DO DISCLAIMERS OFFSET THE EFFECTS OF ADVERTISING CLAIMS ON PERCEPTIONS OF HARM?

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**SIGNIFICANCE:** The U.S. Tobacco Control Act restricts advertising or labeling that suggests that a tobacco product is less harmful than another commercially marketed product. Natural American Spirit, a cigarette brand with rapidly increasing market share, frequently uses "organic," "natural," or "additive-free" claims in advertising. Brands such as Winston and Nat Sherman have also used similar claims. We examined how "organic," "natural," and "additive-free" advertising claims and corresponding disclaimers affect perceptions of cigarettes' harm. **METHODS:** Participants were a national probability sample of adults in the US ( $n=1,114$ ). We conducted a between-subjects experiment in which participants viewed a Natural American Spirit cigarettes ad claiming they were "organic," "natural," "additive-free," "light," or "regular," and with or without a matching disclaimer (e.g.,



"Organic does not mean a safer cigarette."). The outcome measure was perceived harm of the advertised cigarettes. Among smokers ( $n = 344$ ), we also assessed interest in switching within their current brand to cigarettes with this characteristic (e.g., "additive-free"). RESULTS: Advertising claims in the ad had a large effect on perceived harm (Cohen's  $d = 0.87$ , 95% CI: 0.47–1.29). "Organic," "natural," or "additive-free" claims reduced perceived harm from the advertised cigarettes as compared to "regular" or "light" claims. Disclaimers had a small effect, increasing perceived harm ( $d = 0.25$ , 95% CI: 0.08–0.41). The problematic claims also increased smokers' interest in switching while disclaimers had no effect on smokers' interest in switching. CONCLUSIONS: "Organic," "natural," and "additive-free" claims may mislead people into thinking that the advertised cigarettes are less harmful than other cigarettes. Disclaimers do not offset these misperceptions of harm. The U.S. Food and Drug Administration should restrict the use of these misleading claims in tobacco advertising. Our findings may also support the regulatory efforts of the 181 countries that have committed to banning misleading claims under the WHO Framework Convention on Tobacco Control.

FUNDING: Federal

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## POS1-128

### IMPACT OF WARNINGS ON YOUNG ADULTS' THINKING ABOUT THE RISKS OF AND DISCOURAGEMENT FROM USE OF LITTLE CIGARS AND CIGARILLOS

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SIGNIFICANCE: The use of little cigars and cigarillos (LCCs) remains high among young adults, even as cigarette smoking rates decline. The Food and Drug Administration (FDA) has mandated six text-only cigar warnings beginning in 2018. We evaluated the impact of these warning statements on young adults' thinking about the risks of and discouragement from using LCCs. METHODS: We conducted a between-subjects experiment in a national telephone survey of 791 young adults ages 18–25. Participants were randomly assigned to hear one of the six FDA-mandated cigar warnings, and then were asked how much the warning made them think about the harmful effects of smoking LCCs and how much it discouraged them from wanting to use LCCs. Both measures were on a 4-point scale. RESULTS: Participants were 50.1% female, 59.4% white, with a mean age of 21.3. 17.5% were past 30-day (current) users and 32.7% were lifetime (not current) users of LCCs. Young adults who received "Warning: Cigars are not a safe alternative to cigarettes" or "Warning: This product contains nicotine. Nicotine is an addictive chemical" reported significantly ( $p < .0001$ ) lower levels of thinking about the risks ( $M = 3.0$ ,  $SD = 1.1$ ;  $M = 3.0$ ,  $SD = 1.1$ , respectively) and discouragement ( $M = 3.0$ ,  $SD = 1.1$ ;  $M = 3.1$ ,  $SD = 1.1$ , respectively) compared to those exposed to the other four warnings, each which highlighted specific health effects and were not significantly different from one another. For example, ratings for "Warning: Cigar use while pregnant can harm you and your baby" were higher for both thinking about the risks ( $M = 3.6$ ,  $SD = 0.8$ ) and discouragement ( $M = 3.5$ ,  $SD = 0.9$ ). Similar results were found for lifetime and current users, except no significant differences were observed for discouragement among current users. DISCUSSION: We found that two of the mandated cigar warnings were less discouraging and less likely to make people think about the risks compared to the other warnings, and findings mostly held for both current and lifetime LCC users. The four warnings that were more effective stated a specific health effect, such as lung cancer and heart disease. Future research should assess the impact of warning content on behavior.

FUNDING: Federal

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## POS1-129

### NOTICING HEALTH WARNINGS ON E-CIGARETTES AND PERCEIVED IMPACT OF HEALTH WARNINGS: FINDINGS FROM THE 2016 INTERNATIONAL TOBACCO CONTROL FOUR COUNTRY E-CIGARETTE SURVEY

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SIGNIFICANCE: Health warning label (HWL) policies for e-cigarettes (EC) vary across countries: at the time of this study, warnings were only required in England (European Union chemical labelling). Voluntary HWL could be displayed by manufacturers in all countries. METHODS: Adult smokers, ex-smokers, and EC users from Australia (AU), Canada (CA), England (EN), and the United States (US) from the 2016 International Tobacco Control E-Cigarette Online Survey ( $N = 11938$ ). Key outcomes included noticing HWL on EC in the last 30 days (EC, cartridges, and e-liquid) and perceived effect of EC HWL on thoughts about using EC. Analyses adjusted for demographics, and smoking and EC status (dual use, daily smoker, non-daily smoker, daily EC user, weekly EC user, quitter of both products/less than weekly EC user),  $p$ -values after multiple comparison correction. RESULTS: There were no country differences in noticing EC HWL (AU=5.8%, CA=5.5%, EN=4.4%, US=5.5%,  $p = 0.13$ ). Compared to dual users (17.5%), daily (3.2%) and non-daily smokers (6.3%), and quitters (3.4%) had lower odds of noticing EC HWL, all  $p < 0.0001$ . There were no differences in noticing when comparing dual users to daily (17.4%) or weekly EC users (13.1%). Among those who noticed EC HWL ( $N = 1085$ ), respondents in CA (37.7%) had higher odds of perceiving that the HWL made them concerned about using EC than respondents in AU (15%),  $p = 0.024$ . Respondents in CA were no more or less likely to perceive that the EC HWL made them concerned than respondents in the US (33.1%) or EN (21.8%). Compared to dual users (39.2%), daily EC users (4.2%),  $p = 0.0007$ , and non-daily smokers (23.8%),  $p = 0.03$ , had lower odds of perceiving that the HWL made them concerned about using EC. There were no differences in perceived effect of EC HWL when comparing dual users to weekly vapers (17.2%), daily smokers (31.4%), or quitters (42%). The most recalled HWL ( $n = 942$ ) were about nicotine and its addictiveness (78.2%), keeping out of reach of children (74.4%), and not selling to minors (65.7%). CONCLUSIONS: EC HWL are mainly noticed by EC users. A significant proportion said HWL made them concerned about using EC, this differed widely by EC/smoking status.

FUNDING: Federal

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## POS1-130

### ELECTRONIC CIGARETTE USERS' CONCERNS ABOUT REGULATION

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INTRODUCTION: Part of public health framework for regulating bodies such as The Food and Drug Administration's (FDA), is to educate the community about their regulatory actions. In doing this it may be helpful to understand e-cig user's current knowledge of regulations. This qualitative analysis aimed to better understand e-cig user's understanding, perceptions and expectations, of the regulators regarding the regulation of e-cigs. METHODS: E-cig users completed an online survey including demographics and details of e-cig use. Embedded in the survey were, 4 opened ended questions regarding differences in e-cig and cigarette use, side effects of e-cigs, desirable characteristics of e-cigs, and additional information participants felt was important for researchers to understand. Participants were selected for analysis if they provided least one comment pertaining to regulation. Themes were identified using the constant comparative method and data was coded in NVIVO 10. RESULTS: Participants ( $n = 354$ ) were 76% ( $n = 271$ ) male, had a mean age of 39.6 years, and 91.2% ( $n = 323$ ) used their e-cig every day the past 28 days. Themes that emerged from the analysis were, Suspicion of Ulterior Motives to Regulation (e.g. "Companies will try to have e-cigs banned or over-regulated, because they are going to lose some serious profits"; "I suspect it has more to do with money than public health"), Consequences of Decreased Availability (e.g. "I'd go back to smoking"; "Banning...[would] create another black market"). An encouraging theme of Suggestions for More Research (e.g. "Real research needs



to be done before banning, taxing or regulating these products"; "to find out if it is healthier than using tobacco") also emerged during the analysis. **CONCLUSION:** Experienced e-cig users are skeptical about whether public health will be improved through regulation and are unaware of e-cig research currently being conducted. This study suggests that it may be helpful for regulators to educate the public about ongoing research efforts in order to garner public support for regulatory actions.

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## POS1-131

### USING DATA TO DRIVE CHANGE: A SURVEY OF TOBACCO USE PREVALENCE AND PHARMACOTHERAPY PRESCRIPTION PATTERNS AMONG HOSPITALIZED PATIENTS BY MEDICAL SPECIALTY

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**SIGNIFICANCE:** Tobacco use cessation pharmacotherapy is underutilized during hospitalization and prescription rates vary greatly across medical specialties and patient characteristics. Hospitals may benefit from implementing policies and practices that standardize and automate the offer of smoking pharmacotherapy for all hospitalized patients who use tobacco. **METHODS:** Using electronic health records at Barnes Jewish Hospital (BJH), we gathered demographic data, admission route, length of stay, self-reported tobacco use, and smoking cessation prescriptions over a 6-year period, from 2010 to 2016. We then compared tobacco use prevalence and smoking cessation prescriptions across medical specialties using a retrospective cohort design. **RESULTS:** Over 28% of patients reported using tobacco products in the past 12 months, yet only 23% of these patients were prescribed pharmacotherapy for smoking cessation. Psychiatry patients had the highest tobacco use prevalence (56.4%) and orthopedic surgery patients had the lowest tobacco use prevalence (16.4%). Psychiatric patients who smoked were most likely to receive pharmacotherapy (72.7%) and obstetric patients were least likely (6.0%). Compared with Caucasian tobacco users, African American patients who used tobacco products were less likely to receive smoking cessation medications (aOR=0.60; 95% CI=0.57-0.63). **CONCLUSIONS:** Among hospitalized tobacco users, safe and cost-effective pharmacotherapies are underutilized. We identified substantial variation in prescribing practices across different medical specialties and demographic groups, suggesting the need for an electronic medical record protocol that facilitates consistent tobacco use cessation pharmacotherapy treatment.

FUNDING: Academic Institution; Federal

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## POS1-132

### SMOKING POLICY AND SUPPORT FOR SMOKING CESSATION OFFERED AT WORK: RECENT TRENDS IN THE UNITED STATES

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**SIGNIFICANCE:** Smoking restrictions at workplace are the primary means for controlling tobacco consumption and exposure to second-hand smoking for employed adults. The study aimed to evaluate improvements in workplace smoking policies and support for smoking cessation offered to employees who smoke in the US regions, and overall. **METHODS:** We used data from the 2010-11 and 2014-15 Tobacco Use Supplement to the Current Population Survey (CPS). The two cohorts of adults who worked and resided in the same state were merged. The overall sample (size=112,008) was used to assess smoking restrictions at workplace. Another cohort of INCLUDE smokers (size=16,456) was used to assess workplace support for smoking cessation. Statistical methods incorporated the balanced repeated replications for variance estimation to adjust for complex design of the CPS. Multiple logistic regressions were fitted to control for sociodemographic characteristics of employees (age, gender, race/ethnicity, marital status, education, and metropolitan status), smoking status, as well as the survey mode

(phone, in-person). Bonferroni adjustments were used for multiple comparisons. **RESULTS:** The overall rate of workplaces with smoking restrictions decreased from 93.6% in 2010-11 to 92.9% in 2014-15 ( $p = 0.001$ ). Among individual regions, the decrease was significant only in Northeast, where the rate decreased from 92.7% to 89.9% (adjusted  $p = 0.001$ ). The overall rate of workplaces offering smoking cessation support increased from 23.7% in 2010-11 to 29.4% in 2014-15 ( $p < 0.001$ ). Improvements were significant within all four US regions (all adjusted  $p$ 's  $< 0.001$ ): the overall rates of workplaces offering support for smoking cessation was 15.7% in the Southern, 19.0% in the Western and 20.4% in the Northeastern and Midwestern regions. **CONCLUSIONS:** While there were no improvements in the rates of workplaces with smoking restrictions, the rates remain high. There were substantial improvements in the support for smoking cessation offered at workplace.

FUNDING: Federal

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## POS1-133

### THE DIFFERENTIAL IMPACT OF STATE TOBACCO CONTROL POLICIES ON CESSATION TREATMENT UTILIZATION ACROSS ESTABLISHED TOBACCO DISPARITIES GROUPS

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**SIGNIFICANCE:** Tobacco control policies promote quit attempts and increase the likelihood that smokers use evidence-based cessation treatments (e.g., nicotine replacement therapies (NRT), non-NRT medications, behavioral treatment, and/or quitlines). However, what is less clear is how these policies might differentially impact different groups of smokers, perhaps in some cases even widening disparities in the use of tobacco dependence treatments. This study examined how different state-level tobacco control policies impact the use of evidence-based cessation treatments by race/ethnicity, gender, socio-economic status (SES), age, and smoking history. **METHODS:** Participants included 9,110 adult smokers reporting a past-year quit attempt within the 2010-2011 Tobacco Use Supplement to the Current Population Survey. Lasso regression modeling was used to identify a subset of interactions between tobacco policies and individual smoker characteristics that predicted cessation treatment use. Significant interactions were fitted via participant-weighted generalized linear models to determine effect sizes and relations to each cessation treatment outcome. **RESULTS:** Various state-level tobacco control policies differentially impacted the reported use stop smoking medications by race/ethnicity, age, and SES. For promoting use of NRT, higher taxation was most effective for non-Hispanic non-White smokers, higher appropriations were most effective for Hispanic smokers, and state quitline provision of free cessation medications was most effective for older smokers. For promoting use of non-NRT prescription medications, taxation was most effective for high SES smokers and comprehensive smoke-free laws were most effective for Hispanic smokers. The relationship between state tobacco control policies and the use of behavioral treatments and quitlines did not differ by smoker characteristics. **CONCLUSIONS:** Tobacco control policies differentially impact the use of FDA approved stop smoking medications across different race/ethnicity, age, and SES groups. Understanding such effects can help to target interventions to ensure equal access to evidence-based tobacco dependence treatments.

FUNDING: Federal

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## POS1-134

### TWO BRIEF VALID MEASURES OF THERAPEUTIC ALLIANCE IN COUNSELING FOR TOBACCO DEPENDENCE

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Behavioral counseling is effective for cessation and the psychotherapy literature indicates therapeutic alliance is key to counseling effectiveness. However, no tobacco-counseling specific measures of alliance exist that are suitable in most to-





tobacco counseling contexts, thus hindering assessment of counseling components in research and clinical practice. Based on the *Working Alliance Inventory*, and external expert review, we developed two alliance instruments: the 12- and 3-item *Working Alliance Inventory for Tobacco* (WAIT-12 and WAIT-3). We validated them using two samples of 226 daily smokers via Amazon Mechanical Turk. Measures included demographics, tobacco characteristics, working alliance scales, and quit attempts. Cronbach's alpha assessed internal consistency; confirmatory factor analysis assessed model fit, and logistic and Poisson regressions evaluated how both new measures related to smoking and quit attempts. Both WAIT-12 and WAIT-3 had good to excellent internal consistency (0.92 and 0.88 for the WAIT-3 and 0.96 for the WAIT-12). The WAIT-3 1-factor model indicated perfect fit (CFI = 1.0, TLI = 1.0, RMSEA = .00). The WAIT-12 1-factor model indicated poor fit (CFI = 0.83, TLI = 0.79, RMSEA = .19, SRMR = 0.09). The WAIT-12 3-factor model (CFI = 0.94, TLI = 0.93, RMSEA = .11, SRMR = 0.04) was indicative of acceptable fit. Both the WAIT-12 and the WAIT-3 were significantly associated with participants' self-reported cigarettes per day, quit attempts, and cessation. Initial validation of the WAIT-12 and WAIT-3 indicates they are psychometrically sound measures of tobacco dependence counseling alliance. The WAIT-3 provides brevity; it can be administered in under 1 minute. The WAIT-12 allows for assessment specific components of therapeutic alliance. The WAIT-3 may allow quitlines and tobacco treatment services to monitor counselor performance for quality improvement and research. Overall, these instruments should allow for better measurement of alliance in clinical services and research.

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## POS1-135

### AN EXPERIMENTAL STUDY OF WATERPIPE WARNING STATEMENT AMONG A NATIONAL SAMPLE OF US YOUNG ADULTS

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**BACKGROUND:** Waterpipe tobacco smoking (WTS) by young adults remains high. The FDA mandated a single text warning on waterpipe packaging and advertising beginning mid-2018. The goal of this study was to test five different warnings, including the mandated one, on young adults' thinking about the risks of WTS and discouragement from WTS. **METHODS:** We conducted a between subjects experiment in a national telephone survey of 791 young adults ages 18-25. Participants were randomly assigned to hear one of the following: (1) Warning: Hookah smoke contains nicotine. Nicotine is an addictive chemical (mandated warning); (2) Warning: Hookah smoke contains more carbon monoxide than cigarette smoke; (3) Warning: Hookah smoking causes cancer; (4) Warning: The water in a hookah does not filter out the toxic chemicals; or (5) Warning: One hour of hookah smoking is about the same amount of smoke as 100 cigarettes. Participants reported how much the warning made them think about WTS risks and how much the warning discouraged them from WTS, both on a 4-point scale. **RESULTS:** The sample was 50.1% female, 59.4% White, 24.7% African American, and 14.7% Hispanic, with a mean age of 21.3 years ( $SD=2.4$ ). Forty-three percent had ever smoked tobacco in a waterpipe. The mandated warning was the least discouraging ( $M=2.93$ ,  $SD=1.17$ ), while the "100 cigarettes" warning was the most discouraging ( $M=3.50$ ,  $SD=0.90$ ),  $F=6.69$ ,  $p<0.001$ . The mandated warning led to less thinking about WTS risks ( $M=2.86$ ,  $SD=1.14$ ), while the "100 cigarettes" warning resulted in the greatest thinking about risks ( $M=3.59$ ,  $SD=0.80$ ),  $F=13.4$ ,  $p<.0001$ . The "100 cigarettes" warning was more discouraging than warning #4 and resulted in more thinking about the risks than either warning #3 or #4. **CONCLUSION:** FDA's mandated nicotine warning resulted in the lowest levels of thinking about risks and discouragement from WTS, suggesting limited impact. However, a warning focused on comparing smoke inhalation from WTS to an equivalent amount of cigarettes seems promising. The FDA should consider requiring additional WTS warnings to cover a broad range of health effects, and possibly comparisons to cigarettes.

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## POS1-136

### FORMER DEPENDENT SMOKERS DISPLAY INCREASED RESTING-STATE FUNCTIONAL CONNECTIVITY BETWEEN THE INSULA AND ANTERIOR CINGULATE CORTEX RELATIVE TO CURRENT DEPENDENT SMOKERS

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**SIGNIFICANCE:** Tobacco dependence is believed to be associated with alterations in the neural connectivity between regions involved in motivation and reward, but little is currently known about the extent to which any such changes persist following successful smoking cessation. **METHODS:** The present study, compared current and former smokers using functional magnetic resonance imaging (fMRI) to explore potential differences in brain activity and network organization using the anterior and posterior insula as a-priori selected 'seeds'. Participants were 10 current dependent smokers and 10 formerly dependent smokers (abstinent for an average of 2.2 years) who were matched based on current and past FTND scores (mean=5.4). **RESULTS:** Relative to current smokers, former smokers exhibited greater functional connectivity between the right posterior insula and the right and left anterior cingulate cortex (ACC), as well as between the left anterior insula and the right ACC. **CONCLUSIONS:** Findings suggest that current and former smokers exhibit different patterns of functional connectivity in an addiction related pathway and raise the possibility that long-term tobacco abstinence may be associated with adaptations to brain networks that are involved with regulating cigarette smoking.

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## POS1-142

### MULTI-DIMENSIONAL TIPPING POINT ANALYSES: ASSESSING SIMULTANEOUS SHIFTS IN TOBACCO USE PATTERNS FROM A HIGHER TO A LOWER RISK PRODUCT

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**SIGNIFICANCE:** Regulators evaluating tobacco control policies must assess the potential for beneficial and harmful consequences associated with those policies; the Dynamic Population Modeler (DPM(+1)) was developed to address this regulatory need. **METHODS:** DPM(+1) employs a birth cohort framework to estimate the effects on all-cause mortality if tobacco use patterns in a population shift from a higher- to lower-risk product in specified ways. It allows for the evaluation of changes in tobacco use patterns within the context of 'tipping point' analyses, which estimate the magnitude of a beneficial use pattern needed to offset the population health effect of one or more harmful use patterns, or vice versa. **RESULTS:** In a birth cohort followed from age 13 to age 72, in 5-year age intervals, we specified transition probabilities for a counterfactual scenario where 3% of those who would have never used tobacco (base case) instead initiate modified-risk tobacco product (MRTP) use (up to age 27; *additional initiation*), and 25% of those MRTP initiators subsequently transition to cigarette use (in next age interval; *gateway effect*). Assuming a 92% reduction in excess all-cause mortality risk for the MRTP (relative to cigarettes), the resulting population harm was offset if at least 1.6% of base case smokers who would have continued to smoke instead switched completely to MRTP use (in each age interval, for ages 18+ years; *switching*). Ranges of probabilities for three transitions were assessed simultaneously. Assuming 1-10%, 0-50% and 0-10% for *additional initiation*, *gateway effect* and *switching*, respectively, 2% *switching* offset the population harm resulting from, for example, 4% *additional initiation* with 20% *gateway effect*, 5% *additional initiation* with 10% *gateway effect*, and 6% *additional initiation* with 4% *gateway effect*. **CONCLUSIONS:** Tipping point analyses allow regulators to assess the magnitude of simultaneous changes in tobacco use patterns likely to result in an overall population health benefit or harm. Such analyses may reduce the immediate need for empirically based projections of beneficial or harmful changes in use patterns during regulatory decision making.

FUNDING: Tobacco Industry

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## POS1-143

### USE OF SOCIAL MEDIA TO ESTABLISH VAPERS PUFFING BEHAVIOUR: FINDINGS AND IMPLICATIONS FOR LABORATORY EVALUATION OF E-CIGARETTE EMISSIONS

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**SIGNIFICANCE:** The recent growth in ENDS use has presented many challenges to Public Health research, including understanding the potential for ENDS to generate toxic aerosol constituents during use. Recent research has established that the way ENDS are puffed influences the magnitude of emissions from these devices, with puff duration the dominant puffing parameter. Standardised puffing-machine methods are being developed to harmonise testing approaches across laboratories, but critical to their success is the degree with which they accurately reflect vapers real-world puffing behaviours. Relatively limited data is available examining the way vapers puff, with significant inconsistencies between studies. Here we report the creation and analysis of a large database of public-domain vaping videos to establish ENDS puffing behaviour in natural settings. **METHODS:** Internet searches were conducted using vaping relevant keywords. Several hundred videos were identified in which vaping behaviours were clearly shown. Videos were categorised by device type ("Cigalike", "Ego-style", and "Tank" products), and analysed using video analysis software that provided accurate time-frame information with 0.01 s resolution. Data was excluded if video effects, or any ambiguity in puffing behaviour, were observed. Parameters examined included use of pre-puff heating steps, puff duration, puffing angle, inhalation pattern (direct to lung, or mouth-to-lung), product name, ENDS type and reported coil resistance. **RESULTS:** 350-500 puffing events were analysed for each ENDS type. Significant use of pre-heating steps was observed with button-actuated devices. Similar mean puff durations were found for all three ENDS types, cigalikes = 2.8 s, Ego devices = 3.3 s and tank systems = 2.7 s. Significant spread in puffing durations were observed within each product category. **CONCLUSIONS:** Public-domain video records of vapers provides valuable insights into real-world use behaviours of vapers. However, the diversity of puffing durations observed within an ENDS category means it may be challenging to identify a wholly representative machine-puffing duration for laboratory studies.

**FUNDING:** Tobacco Industry

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the US, JP, UK, CA, and AU express support for mandated reduction of nicotine levels in cigarettes. However, fewer than half of adults in the US, UK, and CA, and only a slight majority in AU and JP, agree this would prevent teenagers who experiment with cigarettes from becoming smokers.

**FUNDING:** Tobacco Industry

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## POS1-144

### MANDATED REDUCTION OF NICOTINE IN CIGARETTES: LEVEL OF AGREEMENT OF ADULTS IN THE UNITED STATES, JAPAN, UNITED KINGDOM, CANADA, AND AUSTRALIA

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**SIGNIFICANCE:** In July 2017, the US FDA announced plans to identify issues involved in regulating nicotine in cigarettes to render them minimally or non-addictive. Two months earlier, we conducted a survey in 5 countries with questions regarding level of agreement with mandates that cigarettes have very low levels of nicotine. **METHODS:** The survey was conducted online by Harris Poll on behalf of 22nd Century May 24-28, 2017 among adults 18+ who had agreed to participate in online surveys, n=2148 in the US, 1056 in Japan (JP), 1014 in the UK, 1050 in Canada (CA), and 1033 in Australia (AU). The survey is not based on a probability sample; no estimate of theoretical sampling error can be calculated. Raw data were weighted by the demographic variables to reflect the general adult (or online adult) population in each country: AU (age within gender, education, region, income); CA (age within gender, education, race/ethnicity, region, income, language); JP (age within gender, education, income, region, marital status); UK (age within gender, education, region, internet usage); US (age within gender, education, race/ethnicity, region, income). Participants were asked about their history of cigarette use. **RESULTS:** Adults identifying as never smokers ranged from 39% in AU to 43% in CA; persons who had tried smoking but never considered themselves a smoker, 8% in AU to 10% in the US and UK; former smokers, 21% in the UK to 27% in the US; and current smokers, 18% in the US to 26% in JP. In all five countries, a majority of adults (68% in the US to 77% in AU) strongly or somewhat agreed the government should mandate very low levels of nicotine in cigarettes. A smaller proportion, 39% in the US to 54% in JP, strongly or somewhat agreed that very low levels of nicotine in cigarettes would prevent teenagers who experiment from becoming regular smokers. **CONCLUSIONS:** A large proportion of adults in











## POSTER SESSION 2

## POS2-1

## HINTS-FDA 2015 AND 2017: RATIONALE, METHODS, RESPONSE RATES, AND CHALLENGES OVERSAMPLING SMOKERS IN NATIONAL SURVEYS

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**BACKGROUND:** The National Cancer Institute (NCI) developed the Health Information National Trends Survey (HINTS) in 2003 to monitor trends in cancer communication practices, information preferences, health risk behaviors, attitudes, awareness, and knowledge. The US Food and Drug Administration (FDA) recognized HINTS as a unique data source for informing its tobacco-related communication endeavors, and partnered with NCI to field HINTS-FDA 2015, with an abbreviated follow-up administration in 2017. **METHODS:** HINTS-FDA 2015 and 2017 were self-administered paper instruments sent by mail using a random probability-based sample of US postal addresses. To increase the yield of current smokers responding to the surveys, sampling strategies were employed to stratify by county-level smoking rates from the 2003 BRFSS and the 2010-2011 TUS-CPS small area estimates, and oversample high and medium-high smoking strata using a proportional design with an equal-probability of addresses selected from each stratum. **RESULTS:** The response rate for HINTS-FDA 2015 was 33% (N=3738) and for 2017 was 34.05% (N=1736). The overall yield of smokers was lower than expected (N=496 in 2015, N=205 in 2017). The weighted proportion of current smokers represented about 14% of the total samples, similar to the proportion of smokers in previous iterations of HINTS where oversampling was not employed. **CONCLUSION:** Sample stratification by county-level smoking rates does not appear to increase the number of smokers in national surveys. Explanations include estimated smoking prevalence being lower than the projected smoking rate in several strata and higher in the low smoking stratum, and design effects such as differential non-response and coverage in groups at high risk for smoking. Despite this, HINTS and HINTS-FDA contain adequate numbers of smokers for statistical comparisons to former and never smokers on a variety of measures. The public-use HINTS-FDA 2015 and 2017 data and supporting documentation will be available for secondary data analyses at <http://hints.cancer.gov>. NCI and FDA encourage the use of HINTS-FDA for health communication research and practice related to tobacco control.

FUNDING: Federal

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## POS2-2

## ITEM DEVELOPMENT FOR HINTS-FDA QUESTIONS RELATED TO PERCEPTIONS ABOUT REGULATION, HEALTH INFORMATION, AND TOBACCO PRODUCT IMAGES

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**SIGNIFICANCE:** Emerging tobacco products have become increasingly popular, and the FDA was recently granted increased regulatory authority over all tobacco products. These changes may lead to shifts in public perceptions about tobacco products and government regulation, and national surveys have grappled with how best to assess these constructs. This study describes the cognitive interviewing process that led to new tobacco and regulation perception items fielded on two tobacco-focused cycles of the National Cancer Institute's Health Information National Trends Survey (HINTS), referred to as HINTS-FDA. **METHODS:** Cognitive interviewing was used to investigate how respondents comprehend, recall, and respond to the evaluated items. Adult participants (n=20) were selected purposively to oversample current tobacco users and were interviewed in two iterative testing rounds. Trained interviewers utilized think-aloud and retrospective probing to obtain participants' feedback on items that had not been previously fielded in national surveys, including tobacco and regulation perception and health information source items and tobacco product images. Results were analyzed using Tourangeau's cognitive model. **RESULTS:** Overall, the items were generally interpreted as intended. Comprehension issues included not accurately identifying

products in the snus and e-cigarette images and confusion between the question stem and response category for source information items. Response issues involved inconsistent reporting among participants with little knowledge or ambivalent opinions about a particular item or product. **Conclusions:** This study provides insights into the formative development of items for a nationally-representative survey focused on tobacco products. The issues identified by participants highlight the need for easily-identifiable images and clear response options. A "don't know" response option is necessary for many emerging tobacco-related items but presents several analytic issues that should be carefully considered. The HINTS-FDA cognitive interviewing findings can serve as a foundation for future surveys that assess constructs related to emerging tobacco products.

FUNDING: Federal

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## POS2-3

## DOES THE FOOD AND DRUG ADMINISTRATION REGULATE TOBACCO PRODUCTS? US ADULT AWARENESS 2012-2017

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The Family Smoking Prevention and Tobacco Control Act was passed in 2009 giving the Food and Drug Administration (FDA) regulatory authority over tobacco product in the U.S. Prior studies have shown variation in U.S. adults' perceptions of regulation, with many people unaware that the FDA regulates tobacco. No studies have examined how these perceptions may be changing over time. The aims of this project are to describe awareness of the FDA's regulation of tobacco products and examine if there have been changes in these perceptions over time. Data were from the Health Information National Trends Survey (HINTS) 4 cycles 2 (2012) and 3 (2013), HINTS-FDA 1 (2015), and HINTS-FDA 2 (2017; N=12,258). Measures included sociodemographics (sex, age, education, income, race, marital status), cigarette smoking status (current, former, never), and awareness of FDA tobacco regulation (Do you believe that the United States Food and Drug Administration (FDA) regulates tobacco products in the U.S.? [yes/no/don't know]). All sociodemographic variables were significantly associated with FDA regulation awareness. Cigarette smoking status was significantly associated with FDA regulation awareness in 2012 (ChiSq(12)=1.55, p=.01) and 2013 (ChiSq(12)=5.12, p<.0001), but not in 2015 and 2017. A greater proportion of current smokers acknowledged FDA regulation than never and former smokers in these earlier surveys. Overall, the distribution of FDA regulation awareness differed by survey (ChiSq(6)=3.31, p<.05). Post-hoc tests with Bonferroni correction revealed that FDA regulation awareness differed significantly between 2012 and 2015 (ChiSq(2)=5.76, p<.01). About 41% of the population reported the FDA regulates tobacco in 2012 (23.6% 'no', 35.4% 'don't know') versus 45% in 2015 (18.2% 'no', 36.8% 'don't know'). These results suggest that the U.S. adult population's awareness of FDA regulation of tobacco has changed. This study also shows that more than half of the population does not know that the FDA regulates tobacco products in the U.S. Careful communication regarding tobacco regulation and what this means may benefit public health.

FUNDING: Federal

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## POS2-4

## PERCEPTIONS OF E-CIGARETTE ADDICTIVENESS AND CONCERN FOR NICOTINE ADDICTION: ASSOCIATIONS WITH CIGARETTE SMOKING QUIT INTENTION

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**SIGNIFICANCE:** Past research found that perceiving e-cigarettes as less harmful than combustible cigarettes is associated with past-year quit attempts but not quit intentions. Less is known about how perceptions about the addictiveness of e-cigarettes and nicotine in general are associated with cigarette smoking quit intentions. This analysis examines whether perceived addictiveness of e-cigarettes relative to cigarettes is associated with intentions to quit cigarette smoking, and whether general concern about nicotine addiction is associated with quit intentions. **METHODS:** We analyzed data from the 2017 Health Information National Trends Survey – FDA (HINTS-FDA 2017) (N=1,736) to assess the independent



associations of (1) perceived e-cigarette addictiveness and (2) nicotine addiction concern on intending to quit smoking cigarettes in the next six months, controlling for harm perceptions, tobacco product use, tobacco dependence, and demographics. Our analytic sample was restricted to current cigarette smokers. RESULTS: Among current smokers, a greater proportion of those reporting that cigarettes were more addictive than e-cigarettes intended to quit smoking cigarettes (84.5%; 95% CI: 70.9, 92.4) compared to those who believed the products were similarly addictive (45.3%; 95% CI: 26.2, 65.9) or those that answered "don't know" about either product (65.3%; 95% CI: 38.4, 85.1) ( $p=0.04$ ). A greater proportion of current smokers concerned about nicotine addiction intended to quit (74.8%; 95% CI: 62.5, 84.1) compared to those that were not concerned (43.8%; 95% CI: 24.5, 65.2) or that answered "don't know" (31.9%; 95% CI: 0.8, 96.3) ( $p=0.02$ ). Only the relationship between concern for nicotine and quit intentions remained after adjusting for covariates. Smokers concerned about nicotine had greater odds of quit intention compared to those not concerned (AOR: 7.02; 95% CI: 1.23, 40.2;  $p=0.03$ ). CONCLUSIONS: Similar to prior research on perceptions of harm, perceptions of the addictiveness of e-cigarettes relative to cigarettes was not associated with quit intentions. However, general concern for addiction to nicotine may influence smokers' intentions to quit cigarettes.

FUNDING: Federal

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## POS2-5

### HIGHER LEVELS OF TOXICANT EXPOSURE IN CIGARETTE SMOKERS OF DISCOUNT COMPARED TO PREMIUM BRANDS

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BACKGROUND: Increased cigarette costs have inadvertently strengthened the appeal of discounted brands to price-sensitive users. While smokers perceive discounted brands as having poorer quality, little is known about their delivery of toxic tobacco smoke constituents compared to premium-branded tobacco products. METHODS: We investigated the differences between discount and premium brand smokers using the National Health and Nutrition Examination Survey (NHANES) 2011-2012 Special Smoker Sample. Discounted and premium cigarette brands were defined by their marketing. Our analyses focused on demographic differences among these two types of cigarette smokers, and 11 biomarkers of harmful and potentially harmful constituents (HPHCs) listed by the FDA. All urinary biomarker concentrations were corrected for dilution by creatinine. Data were analyzed using linear regression models adjusting for potential confounders. All analyses accounted for the complex survey sampling weights and sampling design. RESULTS: A total of 990 non-tobacco users and 594 recent cigarette smokers were eligible for analysis, of which 142 (24.38% weighted) smoked discount brand cigarettes and 452 (75.62% weighted) smoked premium. Discount brand smokers had significantly higher levels of 9 of the 11 biomarkers examined, including NNAL, compared to premium brand smokers. CONCLUSIONS: These findings suggest that discount cigarette use may be associated with higher exposure to several carcinogenic and toxic HPHCs. These results may have important regulatory implications for product standards, as higher exposures could lead to a greater degree of harm. SIGNIFICANCE: The higher observed BOE levels in discounted brand smokers are suggestive of an increase in potential harm, relative to premium brand smokers. Our results provide a platform for the FDA to begin establishing product standards that could help lower BOEs and reduce the potential harm that all smokers are at risk for when smoking cigarettes.

FUNDING: Federal

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## POS2-6

### POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY BIOSPECIMEN COLLECTION AND BIOMARKER ANALYSES

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BACKGROUND: The Population Assessment of Tobacco and Health (PATH) Study is a longitudinal cohort study initiated in 2011 with the goal of comprehensively assessing tobacco use behavior, attitudes, beliefs, exposures and tobacco-related health outcomes in order to inform FDA-CTP regulatory research and activities. Biomarker data on tobacco exposures for non-cigarette tobacco products are limited in the current literature. The biospecimens collected during the PATH Study provide a valuable resource for characterizing tobacco exposures across different types of products. METHODS: Wave 1 (baseline, W1) was fielded between September 2013 and December 2014 and included 13,651 youth (12-17yr) and 32,320 adults ( $\geq 18$ yr). For W1, a subgroup of consenting adults provided up to three biospecimens. Urine biospecimens were collected by field interviewers and blood biospecimens by a phlebotomist. Each biospecimen was shipped overnight to the PATH Study biorepository for processing and long-term storage. Analyses were performed on 11,522 W1 urine specimens and 7,159 blood specimens selected based on tobacco use status, including never, current, and former users of cigarettes, smokeless tobacco including snus pouches, traditional cigars, cigarillos, filtered cigars, pipe tobacco, hookah, and electronic cigarettes. Biomarkers associated with tobacco exposure and potential harm measured included: nicotine metabolites, tobacco specific nitrosamines, polycyclic aromatic hydrocarbons, volatile organic compounds, heavy metals, and inflammatory and oxidative stress markers. Access to the PATH Study Biomarker Restricted-Use Files data is available via the National Addiction & HIV Data Archive Program (NAHDAP) site at: <https://doi.org/10.3886/ICPSR36840> Regulatory Significance: PATH Study data, from both the questionnaire and the biomarker analyses, will help to better understand a broad range of research questions, such as changes in tobacco exposure over time, and provide scientific evidence to inform FDA's regulatory mission under the Family Smoking Prevention and Tobacco Control Act (2009).

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## POS2-7

### CIGARILLO SALES IN LEGALIZED MARIJUANA MARKETS IN THE US

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SIGNIFICANCE: Nearly half of marijuana users in the United States also use cigarillos, with many using the products as "blunts" to smoke marijuana. A concern within the tobacco control community is the impact that marijuana legalization may have on tobacco use behaviors, given the high prevalence of co-use between the two products. This study uses regional and national tobacco sales data to characterize the cigarillo marketplace in states with legalized recreational marijuana in 2016. METHODS: Cigarillo sales data from 2016 were obtained from the Nielsen Research Company in the following market regions: Denver, CO; Seattle, WA; Portland, OR; and the overall U.S. Sales data were unavailable in Alaska, the only other state where the sale of recreational marijuana was legal in 2016. Descriptive statistics highlighted differences in the market share of various product features (e.g., flavor, packaging style, brand) between each region and the national marketplace. RESULTS: Product features such as fruit flavors, single sticks, and 2-3 packs were more popular in legal marijuana regions compared to the overall U.S. Black & Mild, a brand not traditionally used for blunts, was the top brand nationally (32.8% of the market share), but Swisher, more commonly used for blunts, was the most popular brand in the three market regions. In Seattle and Portland, for example, over half of all cigarillo sales were for Swisher products (59.1% and 52.1%, respectively). Cigarillo wraps (i.e., no tobacco filler) were particularly common in Denver, constituting 11.4% all cigarillo sales versus 2.8% nationally. Per capita cigarillo sales, however, were considerably lower in regions where marijuana



na is recreationally legal (range: 3.02-5.02) compared to the national marketplace (7.98). CONCLUSIONS: Cigarillo product characteristics traditionally associated with blunt use may shape the tobacco market in legal marijuana regions. Cigarillo consumption however, does not appear elevated in these regions, possibly due to local tobacco control policies, local cultural attitudes toward smoking tobacco, or preference for alternative forms of marijuana consumption.

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## POS2-8

### THE IMPACT OF TOBACCO USE HISTORY ON E-CIGARETTE AND CIGARETTE TRANSITION PATTERNS: A LONGITUDINAL ANALYSIS OF POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY

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The Population Health Standard employed by the FDA in the evaluation of pre-market tobacco product applications and modified risk tobacco product applications requires evaluating risks and benefits to the population as a whole. We have developed computational models to assess the overall population level impact of new tobacco products. To simulate the changes in tobacco use behaviors leading to mortality and prevalence projections, established tobacco user transitions are needed as input parameters for computational models. In 2011, the PATH study funded by the FDA Center for Tobacco Products was established to generate longitudinal epidemiologic data on tobacco-use behavior and health in the U.S. population. The longitudinal and comprehensive nature of the PATH dataset provides tobacco use transition patterns between cigarette and other tobacco products for computational models. To date, very few published scientific studies using PATH data have taken into account tobacco use history of the survey respondents to determine the transitions between tobacco products. Based on two waves of publicly available PATH datasets, we conducted a case study of transitions between Wave 1 and Wave 2 among six distinct groups: (1) never users of tobacco, (2) e-cigarette experimenters, (3) exclusive e-cigarette established users, (4) cigarette user currently experimenting with e-cigarettes, (5) dual user of cigarettes and e-cigarettes, (6) exclusive cigarette smokers. Groups (2) through (6) are broken down further based on history of cigarette and e-cigarette use at Wave 1. Different transitional use patterns emerged among those groups. As an example, while 62.2% of exclusive e-cigarette established users (Group 3) with a history of cigarette use continued to use e-cigarettes exclusively at Wave 2, only 32.1% of e-cigarette experimenters (Group 2) with a history of cigarette use continued to use e-cigarettes exclusively at Wave 2. The direct implications of such observations in determining the appropriate inputs into population models will be discussed.

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## POS2-9

### WEIGHT MANAGEMENT AND ELECTRONIC VAPOR PRODUCT (EVP) USE AMONG YOUTH

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BACKGROUND: Nicotine is an appetite suppressant, which is often viewed as a benefit of cigarette smoking. Adolescents, particularly females, report initiating and continuing cigarette smoking to control their weight. The goal of the current study, was to examine the association between weight management goals and current electronic vapor product (EVP) use among youth. METHODS: Middle and high school students (aged 11-17 years) who reported not smoking cigarettes in the past 30 days in the 2016 Florida Youth Tobacco Survey (n=54,069) were included in this analysis. Only non-cigarette smokers were included. Weighted multiple logistic regression models were used to assess the association between weight management goals and current EVP use (Using EVPs 3+ days in the past 30 days). Covariates included age, gender, race/ethnicity, and perceived weight status. RESULTS: Prevalence of current EVP use varied by weight management

goals with 3% of those trying to lose weight reporting EVP use, 4% of youth trying to stay the same weight, 5% of those trying to gain weight, and 2% of those not trying to do anything about their weight. After controlling for potential covariates, current EVP use was more common among those who were trying to lose weight (AOR=1.42), those who were trying to stay the same weight (AOR=1.58), and those who were trying to gain weight (AOR=1.65) compared to youth who were not trying to do anything with their weight. These associations varied significantly across genders (gender\*weight management interaction  $p<0.01$ ). Among female youth nonsmokers, while those who were trying to control their weight were more likely to reported current EVP use, with the odds of EVP use highest among those who were trying to gain weight (AOR=1.92). Among male youth nonsmokers, the odds of current EVP use were the highest among those who were trying to stay the same weight (AOR=1.74). CONCLUSIONS: Youth nonsmokers who are trying to control their weight are more likely to use EVPs. Future studies need to investigate if youth who use EVPs for weight management would subsequently start smoking cigarettes.

FUNDING: Federal

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## POS2-10

### CANNABIS USE AMONG NATIONALLY REPRESENTATIVE SAMPLES OF TOBACCO SMOKERS FROM FOUR HIGH-INCOME COUNTRIES

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SIGNIFICANCE: Cannabis use is more common among current tobacco users than non-users. As jurisdictions legalize medical and recreational use, it is necessary to assess whether use becomes more common among tobacco smokers. This study assessed the prevalence of cannabis use among nationally representative samples of smokers from four high-income countries as well as differences in health problems between cannabis users and non-users. METHODS: Data came from the ITC Four-Country E-cigarette Project (2016), a web-based cohort survey of current smokers aged 18+ from Canada (CA; n=3216), the US (n=2327), England (EN; n=3886) and Australia (AU; n=1339). Using SAS Version 9.4, the weighted prevalence of past 30-day cannabis use was estimated by country. Weighted multiple logistic regression assessed predictors of current use (country, sex, age, income, education, prompt bill payment, daily smoker (vs. non-daily) and alcohol use) and whether use was associated with depression, anxiety, alcohol problems, chronic pain and cancer. RESULTS: The adjusted prevalence of past 30-day cannabis use was similar between countries (CA=17.8%, US=20.3%, EN=10.9%, AU=9.8%;  $p=0.15$ ). Smokers who were male (OR=1.66), younger (18-30 vs. 31+; OR=2.70), low income (vs. high; OR=1.46) and heavy drinkers (vs. abstains; OR=2.32) had significantly greater odds of 30-day cannabis use (all  $p<0.05$ ). Overall, 30-day cannabis use was associated with greater odds of being diagnosed/treated for depression (OR=1.87), anxiety (OR=1.72), alcohol problems (OR=2.00) and chronic pain (OR=1.81) after controlling for socio-demographic factors, smoking status and alcohol use (all  $p<0.01$ ). CONCLUSIONS: 30-day cannabis use did not differ by country when controlling for other predictors, but was associated with health problems. Relationships between cannabis use and mental health diagnoses are complex; plausibly, some smokers use cannabis to self-medicate, but cannabis can also exacerbate underlying susceptibility to psychoses. Future research should assess whether use increases in Canada following legalization of recreational cannabis in 2018 and whether cannabis use inhibits successful smoking cessation.

FUNDING: Federal; Nonprofit grant funding entity

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## POS2-11

### SEX AND RACE DIFFERENCES IN PSYCHOMETRIC PROPERTIES OF THE FAGERSTROM TEST FOR NICOTINE DEPENDENCE

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**SIGNIFICANCE:** The Fagerstrom Test for Nicotine Dependence (FTND), comprised of four dichotomous and two multi-response items, is the most commonly used measure of nicotine dependence. It is calculated by adding scores from the six items, total scores range from 0 to 10. A score of 4 or greater is typically indicative of nicotine dependence. However, factor analyses of FTND items have yielded inconsistent results with respect to the uni-dimensionality of the measure. Some studies indicate the items load on one factor, others have identified two. Previous studies also suggest that the psychometric properties of these items may differ by sex and race/ethnicity. For this study, we compared responses to FTND items across sex and race (African (AA) and Caucasian (CA) American) and investigated the psychometric properties of FTND across these groups. **METHODS:** Data were obtained through Spit for Science, a longitudinal study of college students' emotional and mental health, who reported ever using tobacco in their lifetime. Item-by-item responses and exploratory factor analyses were compared by sex and race. Promax rotation was selected based on previous findings, suggesting the presence of two correlated factors. Confirmatory factor analysis (CFA) was conducted to determine if the same factor structure was found across the four sex by age groups. **RESULTS:** Some FTND items showed differences in response rates by sex and race. A two-factor model fitted the data well in each group; however, factor loadings across groups differed. CFA was used to provide evidence for these findings using a correlated, two-factor solution, with a general dependence and a morning factor. **CONCLUSIONS:** Sex and race differences existed in responses to FTND items, and their psychometric properties. Replication is needed across sex, race/ethnicity and age in other populations to assess the generalizability of the two-factor structure of FTND. This raises concerns that a sum score lacks the sensitivity to identify differences in dependence profiles, which could limit the potential for tailoring interventions and have implications for genetic epidemiological and genomic studies of nicotine dependence.

**FUNDING:** Federal

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## POS2-12

### NICOTINE DEPENDENCE AND INTENT TO QUIT SMOKING AMONG CIGARETTE SMOKERS AND DUAL USERS OF CONVENTIONAL AND ELECTRONIC CIGARETTES: RESULTS FROM WAVE 1 AND WAVE 2 OF THE PATH STUDY

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**SIGNIFICANCE:** Electronic cigarettes (EC) continue to grow in popularity among conventional cigarette (CC) smokers, therefore associations between nicotine dependence, plans to quit smoking, and EC use require further investigation. **METHODS:** This study relied on data from Wave 1 (2013-2014) and Wave 2 (2014-2015) of the Population Assessment of Tobacco and Health (PATH) study. The study population was 2,232 current, established, CC smokers; 2,001 of whom remained established CC users alone across waves, 354 "current dual users" who used both CC and EC during both waves, and 247 "new dual users" who remained CC users but began regularly using EC between Waves 1 and 2. Weighted, multinomial logistic regression models offered relative risk ratios (RRR) assessing statistically significant differences in group membership (CC use alone, current dual use, and new dual use), adjusted for nicotine dependence in Wave 1, plans to quit smoking within the next 12 months (based on Wave 1 quit intent), sex, age, race, and educational attainment. **RESULTS:** Compared to CC-only users, plans to quit smoking (RRR=1.64,  $p<0.05$ ) and higher nicotine dependence (RRR=1.93,  $p<0.01$ ) were associated with higher likelihood of current dual use. There was no association between nicotine dependence or intent to quit and group membership for new dual use ( $p>0.05$ ). Age was associated with variation in group status, as participants older than ages 18-25 were less likely to be current dual users or new dual users (RRR=0.03-0.34,  $p<0.01$ ). Black and Hispanic participants were also less likely to be current or dual users (RRR=0.17-0.29,  $p<0.01$ ), and higher educational attainment was associated with higher likelihood of current or new dual use (RRR=1.6-20.5,  $p<0.05$ ). **CONCLUSIONS:** Smoking remains a leading cause of preventable morbidity and mortality in the U.S., so understanding the likelihood of

poly-use and/or product substitution is critical to implement successful anti-tobacco policies. Established dual users appear more dependent and also more motivated to quit conventional cigarettes entirely, and thus are an important subgroup to target via public health efforts to mitigate the harm from tobacco.

**FUNDING:** None

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## POS2-13

### LESSONS LEARNED FROM THE SRNT WIKIPEDIA UPDATE PROJECT

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**SIGNIFICANCE:** Dissemination of scientific findings is a goal of SRNT. "Like it or not," many members of the public get health and scientific information from Wikipedia, the 5th most popular website in the world (18.2 million views daily). In a preliminary review of tobacco- and nicotine-related Wikipedia entries, we found that many important entries were outdated, incomplete, or had factually-incorrect information. We set out to correct this misinformation. **METHODS:** Starting in mid-2014, we began by compiling a list of nicotine- and tobacco-related Wikipedia entries, ranked by popularity. We selected high-priority articles and assessed them for scientific accuracy and public health information. We then contacted subject-matter experts within SRNT to ask for their participation in editing text versions of the entries. Next, we applied these edits to the online system, working within Wikipedia's framework and writing style. We monitored entries to see if the edits would be accepted. **RESULTS:** To date, the group has created, updated, or revised 13 Wikipedia entries (with 4 more in progress), prioritizing those critical to public health, such as "smoking cessation," "nicotine dependence," and "safety of electronic cigarettes." We found that subject-matter experts were generous in volunteering their time and that the majority of our edits were accepted by Wikipedia. The two-step approach—separating the tasks of editing entries and uploading the edits—was successful. We learned that there are substantial differences in format, style, and philosophy between Wikipedia and other scientific writing. We will present "before" and "after" examples of how we corrected misinformation and improved entries. **CONCLUSIONS:** Wikipedia offers a powerful tool for researchers and practitioners to communicate scientific and health information to the public. Aside from the investment of time, this approach is low cost and it allows for dissemination with wide reach and enduring impact. We encourage SRNT members to participate in this process, meeting our ethical obligation as scientists to ensure our research is disseminated accurately to those who need it most.

**FUNDING:** Federal; Academic Institution

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## POS2-14

### REASONS FOR USING AND STOPPING E-CIGARETTE USE AMONG CURRENT AND FORMER CIGARETTE SMOKERS: FINDINGS FROM THE 2016 ITC FOUR COUNTRY TOBACCO AND E-CIGARETTE SURVEY

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**BACKGROUND:** E-cigarette (EC) use globally has increased rapidly in recent years, almost exclusively in current and former smokers. Understanding the reasons for vaping and discontinuing vaping may help inform EC policies. **Aim:** To examine current and former smokers' reasons for using or stopping ECs. **METHODS:** Data for this study come from the 2016 ITC survey conducted in Australia, Canada, England, and the United States. These analyses involved responses from adult current and former at least weekly EC users who were either current ( $n=3054$ ) or former cigarette smokers ( $n=436$ ). Current vapers ( $n=2381$ ) were asked about their use reasons: harm to others, social acceptance, enjoyment, use in smoke-free areas, affordability, and managing smoking behaviour. Ex-vapers ( $n=1109$ ) were asked reasons they stopped using ECs: addiction/safety concern, costs, inconvenience, negative experiences, not satisfying or helpful for managing





smoking. **RESULTS:** For *current smokers*, the most common reasons given for vaping at least weekly were: helpful for cutting down smoking (78%), less harmful to others (77%) and helpful for quitting smoking (73%); the most common reasons for stopping vaping were: lack of satisfaction (81%), no help with cravings (65%), and no help with quitting smoking (54%). For *ex-smokers*, the most common reasons for vaping were: help stay quit (93%), less harmful to others (86%) and for enjoyment (85%); the most common reasons for stopping vaping were: ECs were not needed to stay quit (68%), not satisfying (53%) and safety concerns (42%). More smokers aged 40+ (vs 18-39) reported vaping to cut down (86% vs 73%,  $p < .001$ ) or to quit smoking (77% vs 70%,  $p < .001$ ). More ex-smokers aged 18-39 (vs 40+) reported vaping for enjoyment (88% vs 77%,  $p < .05$ ) but fewer reported stopping because ECs were no longer needed to stay quit (59% vs 74%,  $p < .05$ ). There were few differences between countries in reasons for using and stopping vaping. **CONCLUSIONS:** Reasons for both using ECs and for stopping use of ECs fall into two broad categories: 1) the perceived benefits of ECs for controlling one's smoking behaviour; and 2) use satisfaction and/or concerns about the safety of using ECs.

**FUNDING:** Federal

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## POS2-15

### HOW DO YOU LIKE THEM APPLES? A COMPARATIVE ANALYSIS OF NICOTINE CONTENT IN POPULAR FLAVORED SHISHA PRODUCTS

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**SIGNIFICANCE:** While several studies quantify the harmful substances found in "popular" flavors of hookah tobacco, previously, there has not been a standard for understanding which products are most popular. This study aimed to: 1) determine the most popular brands and flavors of hookah tobacco products, as reported by adults in a) the Population Assessment of Tobacco and Health (PATH) Study, which is a large U.S. based longitudinal study with nearly 46,000 participants ages twelve and older, b) local hookah retailers in Buffalo, NY, and c) online hookah forums; and 2) determine the nicotine content of these products. **METHODS:** Wave 2 public-use PATH data were analyzed using Stata v. 14. Popular brands and flavors were defined as those listed with the greatest frequency amongst PATH participants when asked their last or usual hookah tobacco product used. Suggestions of popular products from local retailers and online forums were also analyzed. Identified flavors were then purchased in different brands, and determination of nicotine content was performed using Gas-Chromatography Mass Spectrometry (GC/MS) on 22 different products. Nicotine concentration was measured prior to smoking for all products and before and after smoking for products suggested by online hookah forums. **RESULTS:** The most popular hookah tobacco brands according to adult PATH participants were Starbuzz and Fantasia, while the most popular flavors were all fruit flavors, according to PATH and local retailers. Brands and flavors suggested by online hookah forums varied but included products such as Al Fakher Mint and Nakhla Two Apples. The mean nicotine content was 2.2mg nicotine/g product, and the lowest nicotine concentration prior to smoking was 1.5mg nicotine/g product. **CONCLUSIONS:** Typically, warning labels on shisha products indicate a nicotine concentration of 0.05% (0.5mg nicotine/g); for all products tested, mean nicotine levels prior to smoking were higher than the label suggested. Future studies may wish to continue investigating the change in nicotine concentration that occurs in hookah tobacco before and after a smoking session, in order to better understand changes in nicotine content.

**FUNDING:** Federal

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## POS2-16

### LESSONS ON THE PROCESS OF DEVELOPING A BEHAVIOURAL SUPPORT INTERVENTION ON TOBACCO CESSATION FOR INTEGRATION IN ROUTINE TB CARE IN BANGLADESH, NEPAL, AND PAKISTAN

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**SIGNIFICANCE:** There is a paucity of tobacco behavioural support interventions in low/middle income countries. Previous research emphasises a need for context-specific interventions for delivery in routine care. As part of the TB and Tobacco project, we followed UK Medical Research Council (MRC) guidance to develop a behavioural support (BS) intervention engaging relevant stakeholders and including appropriate behaviour change techniques (BCTs). Here we present our findings on the process of intervention development. **METHODS:** BS materials and health worker training programmes were developed using a mixed-method approach. Data were collected through 4 expert group meetings, 25 health worker interviews, 11 patient focus group discussions (FGDs), and a questionnaire with 34 health workers on confidence in delivering tobacco cessation. This information was analysed in two rounds, initially to develop and adapt BS materials to the national context and then to apply the COM-B framework to understand needs for patient and health worker behaviour change. **RESULTS:** A BS intervention was developed to include a flipbook and leaflet with TB management and tobacco cessation messages and posters advertising and encouraging tobacco cessation services. Patient and health worker responses highlighted several issues shared across all countries including social stigma around TB, gender differences and unawareness of dangers of smokeless tobacco. Health worker responses guided the development of a training programme focussed on TB and tobacco awareness, patient rapport-building, and BS material use. **CONCLUSIONS:** This thorough and multi-faceted approach facilitated the development of a BS intervention appropriate to the health worker and patient contexts that could be integrated into existing national TB control services in the three countries. The approach required an interrogation of tensions between healthcare system constraints, patient perspectives and BCT application. Despite this thorough approach and significant investment of time and resources, we recommend ongoing monitoring to enable adaptation of the intervention to optimise effectiveness and feasible delivery in routine TB care.

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## POS2-17

### EXAMINING THE INFLUENCE AND APPEAL OF ADVERTISING FOR CLOVE CIGARETTES AMONG INDONESIAN YOUTH

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**BACKGROUND:** As the fourth largest consumer of tobacco globally, Indonesia is a key market for tobacco companies. Among the country's smokers, cigarettes blended with cloves (kreteks) are the most popular product. In 2016, Indonesian tobacco companies invested approximately \$474 million on television advertising, with Djarum – a local kretek company – as the lead spender. In 2017, Philip Morris International spent nearly \$619,000 in just seven days to promote its clove cigarette: Marlboro Filter Black. Advertising can be a powerful tool to promote tobacco initiation. This mixed-methods study examined the influence of cigarette marketing on youth intentions to smoke. **Method:** 762 adolescents ages 13-17 years old in Jakarta, Indonesia participated in a survey featuring two televised cigarette ads: one for Djarum and one for Marlboro Filter Black. Parametric tests evaluated differences between the brands on perceived appeal (i.e., identification, likeability, and perceived effectiveness (PE)). Multivariable logistic regression assessed associations between these attitudes and intention to smoke among non-smoking youth. Additionally, seven focus group discussions explored responses to campaign messaging. **RESULTS:** 43% of respondents reported intention to smoke in the next 12 months. Djarum was rated higher on all measures of appeal among non-smokers and current smokers. Among non-smokers, increased likeability and PE of the

Marlboro ad, and increased identification with, likeability and PE of the Djarum ad were associated with higher intention to smoke. Findings from the focus group discussions reveal that adolescents view Djarum and Marlboro similarly, recognizing consistency in the advertising and branding strategies; however, Djarum was viewed as more accessible while Marlboro was perceived to be a luxury brand. **CONCLUSION:** Non-smoking Indonesian youth who identify with, like, and perceive tobacco ads to be effective have increased intention to smoke. This research supports efforts to place stronger restrictions on the advertising, promotion, and sale of tobacco products in Indonesia.

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## POS2-18

### SMOKELESS TOBACCO USE AND CIGARETTE SMOKING CESSATION IN THE 2010 NATIONAL HEALTH INTERVIEW SURVEY (NHIS)

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**SIGNIFICANCE:** Cigarette smoking is associated with increased morbidity and mortality for cancer and cardiovascular diseases. Even though the prevalence of cigarette smoking has decreased since the 1980s, the CDC has estimated that over 36 million adults continue to smoke. Alternative nicotine delivery systems, including smokeless tobacco (SLT) may be used to encourage cigarette smoking cessation. Our objective was to examine the association between SLT use and successful cigarette smoking cessation. **METHODS:** We used data from 8,562 adults who tried to quit (5,072 former cigarette smokers and 3,490 current cigarette smokers who reported ever trying to quit) who participated in the 2010 National Health Interview Survey. Using logistic regression models, we estimated the odds ratio (OR) of successfully quitting smoking cigarettes comparing ever SLT users to never SLT users. **RESULTS:** 10% of participants reported ever use of SLT. After adjustment for age, sex, cigarettes smoked per day, race/ethnicity, education and household income, the OR (95% confidence interval [CI]) for successful cigarette smoking cessation was 1.28 (1.09, 1.52) for ever SLT users compared to participants that never used SLT. The association between successful cigarette cessation and SLT use was greater for females vs. males (OR: 2.10 vs. 1.23) and for <high school vs. ≥high school (OR: 1.98 vs. 1.10). The association between successful cigarette smoking cessation and SLT use also varied by race/ethnicity with a negative association among Hispanic participants (OR: 0.48, 95% CI: 0.23, 0.97) and a positive association for non-Hispanic White (OR: 1.36, 95% CI: 1.13, 1.64), non-Hispanic Black (OR: 1.50, 95% CI: 0.82, 2.74) and other race/ethnicities (OR: 1.84, 95% CI: 0.78, 4.30). This association did not differ by age or income. **CONCLUSIONS:** SLT use was associated with higher cigarette smoking cessation among women, non-Hispanic White participants and participants with less than high school education. SLT use was associated with lower cessation among Hispanic participants. These findings encourage further investigation of SLT use as a cigarette smoking cessation aid for some subpopulations.

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## POS2-19

### FAGERSTRÖM HEAVY SMOKING INDEX OUTPERFORMS DSM-IV-TR NICOTINE DEPENDENCE DIAGNOSIS IN PREDICTING FUTURE SMOKING DURING PREGNANCY IN A SAMPLE OF FEMALE LIKE-SEX TWIN PAIRS

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**SIGNIFICANCE:** Smoking during pregnancy (SDP) is associated with negative health outcomes, both proximal (e.g. preterm labor, cardiovascular changes, low birth weight) and distal (e.g. increased externalizing behaviors, associations with ADHD, increased risk of smoking in offspring). As pregnancy provides a unique, strong incentive to quit smoking, investigating SDP allows analysis of individual predictive factors of recalcitrant smoking behaviors. Utilizing a female twin-pair cohort provides a model system for characterizing genotype x environment inter-

actions using statistical approaches. **METHODS:** Using the Missouri Adolescent Female Twin Study, smoking data (Fagerström Heavy Smoking Index [HSI], DSM-IV-TR diagnosis of Nicotine Dependence [ND]), collected at median age 22, were merged with Missouri birth record data for enrolled twins, leading to 1,548 individuals of European ancestry included in final analyses. A propensity score was calculated from sociodemographic variables (maternal age, marital status, educational attainment, first born child) and used as a continuous covariate in subsequent logistic regressions. **RESULTS:** This analysis showed a significant relationship between SDP and HSI (OR = 1.63, 95% CI [1.48, 1.79], p<0.001) and between SDP and ND (OR = 1.68, 95% CI [1.27, 2.21], p<0.001). These relationships were further interrogated using a multivariate model of smoking characteristic (HSI, ND), propensity score, and SDP. Multivariate analyses showed that the HSI predicts future SDP, while ND does not. **CONCLUSIONS:** Understanding this relationship of risk-mechanisms is important for clinical understanding of early predictors of SDP and tailoring interventions to at risk individuals. Ultimately, the focus of this research is to mitigate risk to pregnant smokers and their children. Additionally, the cohort-ecological approach informs how well research and administrative (vital record) data agree. This allows evaluation of whether administrative data improve prediction in research cohorts, and conversely if research data improve prediction from standard sociodemographic variables available in administrative data.

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## POS2-20

### VALIDATION OF QUESTIONS ASSESSING SECONDHAND SMOKE EXPOSURE IN CHILDREN

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**SIGNIFICANCE:** Secondhand smoke exposure (SHSe) in children is associated with adverse health consequences, and reducing SHSe is of high public health significance. Thus, it is critical for practitioners to be able to accurately assess whether children are indeed exposed to SHS. Current practice assesses SHSe in children by ascertaining the smoking patterns of parents (i.e., asking if they or a partner smoke, where smoking is allowed in the home, etc.). However, guidance on the best method for accurately assessing the likelihood of SHSe is limited. The purpose of this study was to evaluate the predictive power of questions assessing SHSe in children by comparing responses to a gold standard of exposure – cotinine. **METHODS:** We assayed saliva cotinine among 285 children, whose mothers answered 15 self-administered questions assessing smoking patterns. SHSe was defined as having a cotinine concentration of ≥1 ng/ml. To assess the internal validity of the questions, we evaluated sensitivity and specificity for each question. Among high performing questions, we selected the best set and evaluated the predictive power of this set for accurately assessing SHSe in children, as defined by salivary cotinine levels. **RESULTS:** 26.3% (n=75) of children had SHSe. Individual questions with the highest sensitivity and specificity were: "Did you smoke cigarettes during past 30 days?", "Does your child live in the same household with someone, including yourself, who smokes?" and "Has anyone (including yourself) smoked at home in past 7 days?" Together, answering in the affirmative to one or more of these questions resulted in high sensitivity (80.0%) and specificity (81.0%). Supporting high validity, we found significant agreement between the total score of this set of questions to SHSe as determined from salivary cotinine (Cohen's Kappa, z=8.64, p<0.001). **CONCLUSIONS:** It is critical to know what to ask parents in order to accurately determine the likelihood of SHSe in their children. Our results provide useful information regarding the best questions to ask, which has both practical implications for clinical care and assessing SHSe in research when biomarker data is not available.

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## POS2-21

### ONSET OF TOBACCO AND MARIJUANA USE IN US STATES WITH MARIJUANA DECRIMINALIZATION LAWS: AN OPPORTUNITY FOR TOBACCO PREVENTION?

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**BACKGROUND:** The majority of adults who use marijuana also smoke cigarettes. The historical "Gateway" theory (i.e., tobacco use precedes onset of marijuana use) and more recent "Reverse Gateway" theory (i.e., marijuana use precedes onset of tobacco use) provide potential explanations for the temporal relationship. The purpose of this study was to provide preliminary evidence on the relationship between US state marijuana decriminalization laws and age of tobacco and marijuana initiation. **METHODS:** US adults (N=95) ages  $\geq 18$  years who smoked cigarettes daily and used marijuana  $> 20$  of the past 30 days were recruited via Amazon Mechanical Turk to complete a web-based survey in April 2016. Participants were asked when they first started smoking cigarettes fairly regularly, when they first used marijuana, and which substance (tobacco or marijuana) they used first. Participants were dichotomized based on state marijuana decriminalization laws as of April 2016 (i.e., having laws enacted with the purpose of reducing or eliminating arrest criteria and prison time for possession of marijuana for personal consumption (Young, 2016)). Independent sample t-tests or non-parametric equivalent compared continuous variables; chi-square tests compared categorical variables. **RESULTS:** Of 95 US adults, 42 resided in 12 decriminalized states and 53 in 18 states without such laws. State decriminalization status was not related to age of initiation of tobacco (17.4 vs 16.7 years) or marijuana (16.8 vs. 16.7 years). A significantly greater proportion of participants from states with vs. without marijuana decriminalization laws reported using marijuana before tobacco (50.0% vs. 24.5%;  $p < 0.01$ ). **CONCLUSION:** Participants in US states with current marijuana decriminalization laws were more likely to have reported using marijuana before tobacco, supporting the "Reverse Gateway" theory of marijuana and tobacco use onset. However, it is unknown what, if any, marijuana decriminalization laws were in effect at the time participants started using tobacco and marijuana. **RESULTS:** may underscore the need for tobacco prevention efforts in the context of state-based marijuana policy changes.

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## POS2-22

### RELIABILITY AND CONCURRENT VALIDITY OF SEVERSON SMOKELESS TOBACCO DEPENDENCE SCALE (SSTDs)

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**INTRODUCTION:** Despite a decrease in cigarette smoking prevalence, no significant change has been observed in the use of smokeless tobacco (ST) among US adults in the recent years. Tobacco dependence contributes to the maintenance of tobacco use and difficulty with cessation. Valid and reliable tobacco dependence scales are critically important to study dependence among ST users. The objective of the study was to assess the psychometric properties of the Severson Smokeless Tobacco Dependence Scale (SSTDs). **METHODS:** Data from 95 exclusive smokeless tobacco users living in Oklahoma were obtained through a mail survey. In addition to completing ST dependence measures, participants provided a saliva sample for cotinine concentration and completed other questionnaires. Reliability of the SSTDs was assessed by Cronbach's coefficient alpha and item-total correlation. Concurrent validity was evaluated by examining its association with cotinine concentration and other ST dependence measures. **RESULTS:** The SSTDs demonstrated acceptable reliability as assessed by the internal consistency coefficient (Cronbach's  $\alpha = 0.78$ ) and significant item-total correlations. SSTDs was significantly correlated with Fagerström Test for Nicotine Dependence-ST ( $r = 0.42$ ), Tobacco Dependence Screener-ST ( $r = 0.52$ ), and Oklahoma Scale for ST Dependence ( $r = 0.78$ ). With reference to TDS-ST based dependence diagnosis, SSTDs had better diagnostic accuracy (AUC 0.82, 95%CI: 0.74-0.90) than that of the FTND-ST (AUC 0.73, 95%CI: 0.62-0.83). Salivary cotinine concentration was not associated with the total score of the SSTDs; however, at an optimal cutoff score of 8, SSTDs had a significant association. **CONCLUSION:** The SSTDs as a continuous dependence measure was significantly associated with other ST dependence measures but not with cotinine concentration. Theoretical and analytical evaluation of the items indicates that SSTDs is a multidimensional scale which

measures multiple facets of dependence. Further research is needed using a larger and diverse sample of ST users to establish the validity of the scale.

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## POS2-23

### CONTEMPORARY PATTERNS OF NICOTINE PRODUCT USE IN HIGH SCHOOL AGED ADOLESCENTS

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**SIGNIFICANCE:** Rapid increases in use of alternative nicotine delivery systems and multiple nicotine products have been documented during adolescence. However, little is known about potential disparities in patterns of nicotine product use based on sex or race/ethnicity among this population. Here, we examine patterns of adolescent cigarette, cigar, cigarillo, little cigar, bidi, e-cigarette, hookah, and smokeless tobacco use to better characterize such disparities. **METHODS:** Data are from the 2014 National Youth Tobacco Survey. Lifetime and past 30 day use of products were examined in a sample of high school-aged adolescents non-naïve to nicotine (ages 14-19; N=3,174). Latent class analysis is used to identify underlying patterns of use; models were estimated separately for females and males of varying racial/ethnic backgrounds to allow unique patterns of use to emerge across groups. **RESULTS:** Three latent classes were identified for females. *Hookah experimenters* reported lifetime-only use of hookah. *Traditional experimenters* reported lifetime-only use of cigarettes, cigars, cigarillos, little cigars, and bidis. *Multi-product users* reported past 30 day use of most products. Class membership probabilities varied significantly for Non-Hispanic (NH) White, Hispanic, and NH Black females. Five classes were identified for NH White and Hispanic males. *Multi-product users* reported past 30 day use of most products. *Emerging users* reported past 30 day use of e-cigarettes and hookah. *Multi-product experimenters* reported lifetime use of cigarettes and never tried e-cigarettes or hookah. Classes of *hookah experimenters* and *traditional experimenters* also emerged, similar to the female model. NH Black males were best described by four classes: *multi-product users*, *multi-product experimenters*, *hookah experimenters*, and a unique class of *smokeless/combustible users*, recent use of smokeless tobacco and other combustibles. **CONCLUSIONS:** Females and males of varying racial/ethnic backgrounds are fundamentally different in their patterns of use. Such differences have important implications for developing sustainable and targeted prevention, intervention, and health promotion efforts.

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## POS2-24

### ADOLESCENTS USE E-CIGARETTES TO DO VAPE TRICKS

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**INTRODUCTION:** Vape tricks are behaviors that allow e-cigarette users to blow large, thick vapor clouds or create shapes out of the exhaled vapor. Adolescents report that the ability to do vape tricks is an appealing aspect of e-cigarette use, however the prevalence of this behavior and the product features used during this behavior is largely unknown. **METHODS:** We surveyed students from four high schools in Southeastern Connecticut in May-June 2017 (N=2945) about their e-cigarette use behaviors, including having tried vape tricks. We assessed frequency of doing vape tricks (# days/past 30), nicotine levels and flavors used for doing vape tricks, and how adolescents learned to do vape tricks. We also assessed differences in e-cigarette use behaviors among adolescents based on whether or not they had tried vape-tricks. **RESULTS:** 32.6% of youth reported ever trying e-cigarettes. Among ever users, 56.5% reported having tried vape tricks (20.2% of the total sample; average age 16.3 years (SD=1.2), 51.3% male, 81.5% White). Among adolescents who had ever tried vape tricks, frequency of doing vape tricks in the past 30 days was: 0 days (34.5%), 1-3 days (21.7%), 4-14 days (23.4%), and 15-30 days (23.4%). When doing vape tricks, 24.2% of e-cigarette users reported using 0mg of nicotine, 26.7% 3-6 mg of nicotine, 4.2% 12-18mg of nicotine, 6.8% 24 mg of nicotine, and 38.1% did not know. The top sources for





learning how to do vape tricks were from friends (61.4%) and YouTube (26.2%). The top flavors used for vape tricks were fruit (51.1%), mint (31.9%), and candy (27.5%). Relative to those who had never tried vape tricks, e-cigarette users who had tried vape tricks initiated e-cigarettes at a younger age ( $p<.001$ ), were more likely to identify as daily e-cigarette users (80.7% vs. 19.2%,  $p<.001$ ), to own their own e-cigarette (57% vs. 43%,  $p<.001$ ), and to use nicotine e-liquid (41.9%, vs. 24.1%,  $p<.001$ ). DISCUSSION: Doing vape tricks is associated with more frequent e-cigarette use and use of nicotine e-liquid. Future research should examine the health effects of vape tricks.

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## POS2-25

### A QUALITY ASSESSMENT OF THE EVIDENCE FOR THE ASSOCIATION BETWEEN TOBACCO OUTLET DENSITY AND SMOKING AMONG YOUNG PEOPLE: A SYSTEMATIC REVIEW

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BACKGROUND: Evidence on the association between tobacco outlet density (TOD) and smoking behaviour among youth is inconclusive, which may be due to differences in methodological quality. The aim of this study was to investigate the association between tobacco outlet density and smoking among young people by assessing the methodological quality of the current evidence. METHODS: MEDLINE, EMBASE and Google Scholar were systematically searched for studies on TOD and current and ever-smoking among young people published between 1997 and 2017. The methodological quality of the included studies was evaluated independently by two reviewers using the NIH Study Quality Assessment Tool for observational studies and the Cochrane Collaboration Risk of Bias assessment. Data synthesis: Fifteen studies were included in the review. Ten papers studied current smoking, and ten studied ever-smoking. The quality assessment pointed to large methodological heterogeneity between studies and identified several main methodological issues: the reliability or validity of exposure measures ( $n=5$ ), under-powered analyses ( $n=3$ ), and potential over-adjustment for potential confounders ( $n=9$ ). Studies that found higher TOD to be associated with either higher likelihood of current ( $n=4$ ) or ever-smoking ( $n=4$ ) have substantially less methodological limitations compared to studies that did not identify significant associations ( $n=10$ ). Studies with a positive association are therefore considered unlikely to have overestimated the association, whereas studies with insignificant associations are likely to be an underestimation. We identified only one study that found an inverse association between TOD and current smoking. CONCLUSION: Based on the quality assessment, studies of the highest quality show that higher TOD is associated with higher smoking rates. Future research should establish the causality of this association in order to identify whether removing tobacco outlets would lead to lower smoking rates.

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## POS2-26

### DISCRIMINATION IS ASSOCIATED WITH MENTHOL CIGARETTE USE AMONG YOUNG ADULT SMOKERS ABOVE AND BEYOND RACE/ETHNICITY AND DEMOGRAPHIC FACTORS

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SIGNIFICANCE: Perceived discrimination leads to adverse health outcomes and higher risk of tobacco use among various racial/ethnic minority groups. Menthol cigarette use is more prevalent in racial/ethnic minority groups as well as among young adults. Yet, the relationship of discrimination in menthol cigarette use has been understudied. The aim of this exploratory study was to determine whether perceived experiences of discrimination are related to past 30-day menthol smoking status among young adults. METHODS: A multiethnic convenience sample of young adults ( $n=599$ , aged 18-24) were surveyed online via Amazon Mechanical

Turk. Analyses included a subset of participants ( $n=177$ ) who reported cigarette use in the past 30-days (current smokers). Participants were asked whether they typically used menthol or non-menthol-flavored cigarettes. Exposure to lifetime discrimination was assessed using the Brief Perceived Ethnic Discrimination Questionnaire-Community Version scale. Differences in experiences of racial/ethnic discrimination were assessed between menthol and non-menthol smokers in bivariate analyses and adjusted models controlling for demographics, perceived stress, and smoking-related correlates. RESULTS: Preliminary results suggest that non-Hispanic Black and female smokers were more likely to report current use of menthol cigarettes than non-Hispanic White and male smokers, respectively. Discrimination scores for menthol compared to non-menthol smokers were significantly higher (1.19 vs. 0.71,  $p<.001$ ; mean total sample 0.99, SD=0.88). In adjusted logistic regression analyses, the odds of being a menthol smoker were 2.2 greater for every unit increase in perceived discrimination, after controlling for race/ethnicity, gender, education, and perceived stress ( $p=.001$ ). CONCLUSIONS: This study is suggestive that vulnerability characteristics, such as discrimination, may influence menthol cigarette use over and above demographics associated with increased use and race/ethnicity. Additional research can determine how experiences of discrimination may influence communication of policy efforts around menthol for young adults who may be most at-risk of tobacco use.

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## POS2-27

### REACHING TOBACCO USERS ACROSS PRODUCTS: WHICH NEW MEDIA CHANNELS MAKE SENSE?

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SIGNIFICANCE: In the US, tobacco use includes a variety of products which have different cultural norms, purchasing and use patterns. Distributing anti-tobacco messaging via the internet and social media (new media) may be a cost-effective and scalable approach to encouraging cessation across products but channel must be matched to product. We describe which online health information channels (OHIC) users of smokeless tobacco, hookah, cigars, e-cigarettes and traditional cigarettes use (smokers) to obtain health information. METHODS: Using the 2015 National Health Interview Survey (NHIS), we examined the relationship between use of specific tobacco products and the use of online OHIC in the US adult population ( $n=29,346$ ). Controlling for demographics and geographic region, we completed a series of logistic regression analyses (reference category non-tobacco users (non-users)) predicting internet use, looking up health information, filling a prescription online, scheduling a healthcare appointment online (appointment online), communicating with a health provider via email (provider emailing), and using a chat group to learn about health topics. RESULTS: Compared to non-users, smokers had lower odds of internet use ( $OR=.80$ ,  $p=.001$ ), filling a prescription online ( $OR=.77$ ,  $p=.013$ ), appointment online ( $OR=.77$ ,  $p=.012$ ) and provider emailing ( $OR=.72$ ,  $p<.001$ ). As compared to non-users, e-cigarette users had higher odds of internet use ( $OR=1.90$ ,  $p<.001$ ), looking up health information ( $OR=1.53$ ,  $p<.001$ ) and using a chat room ( $OR=1.86$ ,  $p=.008$ ). Compared to non-users, people who used hookah had greater odds of internet use ( $OR=2.41$ ,  $p=.001$ ) and provider emailing ( $OR=1.67$ ,  $p=.028$ ). Compared to non-users, smokeless tobacco users had lower odds of, looking up health information ( $OR=.68$ ,  $p=.001$ ), filling a prescription online ( $OR=.57$ ,  $p=.034$ ), appointment online ( $OR=.47$ ,  $p=.011$ ) and provider emailing ( $OR=.46$ ,  $p=.006$ ). There were no significant differences between cigar smokers and non-users. CONCLUSIONS: Though OHIC may not reach users of traditional cigarettes or chew, they may be effective to reach e-cigarette users and hookah users.

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## POS2-28

### TOBACCO ON TELEVISION: A CONTENT ANALYSIS OF MALE ADOLESCENTS' FAVORITE SHOWS

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**SIGNIFICANCE:** Media tobacco portrayals affect adolescent tobacco susceptibility and use. Studies analyzing tobacco content in television (TV) typically sampled shows based on adolescent ratings of shows currently airing on broadcast TV. Analyzing shows that adolescents are actually watching, regardless of where or when they aired, is necessary to better describe their exposure to tobacco on TV. This study analyzes tobacco portrayals on adolescents' favorite TV shows and evaluates the rate of tobacco incidents by TV rating. **METHODS** Males ages 11-16 (n=1221) from Ohio listed three favorite TV shows and reported how many episodes of each show they watch in a typical week. Shows were weighted by how often youth watch them, and nine episodes of the 20 most-watched shows were randomly selected and double-coded for visual and verbal tobacco incidents. Demographics of characters who used or interacted with tobacco were recorded and summarized. Negative binomial regression was used to model rates of tobacco incidents per hour by TV rating (TV-Y7/TV-PG, TV-14, and TV-MA). **RESULTS:** There were 49 visual or verbal tobacco incidents in the 180 coded episodes. Most visual incidents showed a character using a tobacco product (69.4%). Characters using or handling tobacco were usually male (96.4% of users), white (64.3%), and adult (89.3%). The estimated rate of tobacco incidents per hour was 0.28 for shows rated TV-Y7/TV-PG (95% CI: 0.11, 0.68), 1.17 for shows rated TV-14 (95% CI: 0.38, 3.57), and 1.09 for shows rated TV-MA (95% CI: 0.26, 4.47). While the rate of tobacco incidents per hour was greater for shows rated TV-14 vs. TV-Y7/TV-PG, there was no difference between shows rated TV-14 and TV-MA. **CONCLUSIONS:** Adolescent males' favorite TV shows rated TV-14 or TV-MA expose them to at least one tobacco incident per hour on average. Though the TV-14 rating identifies shows that may be unsuitable for youth under 14, the estimated rate of tobacco incidents was nearly the same as that for shows rated TV-MA (unsuitable for children under 17). Adolescents watch two hours of TV per day on average; limiting tobacco incidents to shows rated TV-MA would reduce their exposure to tobacco on TV.

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## POS2-29

### SERUM CONCENTRATIONS OF COTININE AND TRANS-3'-HYDROXYCOTININE IN US ADULTS: RESULTS FROM WAVE 1 (2013-2014) OF THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY

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**BACKGROUND:** The Population Assessment of Tobacco and Health (PATH) Study is a nationally representative, longitudinal study of 45,971 individuals that was designed to inform FDA's regulatory mission to reduce the burden of tobacco-related death and disease. Extensive information on tobacco-use patterns and biospecimens are collected from participants. Wave 1 (W1) of the PATH Study included the measurements in serum of cotinine (COT) and *trans*-3'-hydroxycotinine (HC), the two predominant nicotine metabolites, in a subset of the study cohort. These W1 measurements form part of the baseline PATH dataset and can be used to inform FDA's regulatory actions. **METHODS:** We compared: A) geometric mean (GM) of COT and HC among daily tobacco users of any product (N=3693) and never users (N=907) overall and by major demographic variables; B) COT GM between nonusers (including former users and never users) and daily users of different tobacco products (cigarette, smokeless, e-cigarette, cigar, pipe, hookah, and multiple products); and C) GM of the nicotine metabolite ratio (NMR) among daily users overall and by sex, age, and race/ethnicity. **RESULTS:** A) The serum COT and HC GMs in daily tobacco users were 195 and 72.3 ng/mL respectively.

In never users they were 0.027 and 0.018 ng/mL. B) Among daily exclusive users of tobacco products, COT GM varied by tobacco product category: exclusive smokeless tobacco users had the highest COT GM, followed by exclusive users of cigarette, pipe, e-cigarette, cigar, and hookah. Among nonusers, former users had higher COT GM than never users (0.087 vs. 0.027 ng/mL), and never users with self-reported secondhand smoke exposure had higher COT GM than those without (0.064 vs. 0.020 ng/mL). C) Among daily users, females had higher NMR GM than males (0.379 vs. 0.313), and non-Hispanic whites had higher NMR GM than non-Hispanic blacks (0.362 vs. 0.272). **CONCLUSIONS:** Among the PATH W1 sample we observed that nicotine biomarker levels varied across tobacco user groups and demographic background. Longitudinal data from future waves of the PATH Study can provide information on biomarker levels over time in relation to changes in tobacco product use.

**FUNDING:** Federal

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## POS2-30

### PATTERNS OF NICOTINE USE AND SUSCEPTIBILITY TO USE AND OTHER SUBSTANCE USE AMONG ADOLESCENTS

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**INTRODUCTION:** Latent class analysis (LCA) is a useful statistical method to understand polysubstance experimentation and use. Susceptibility, an important predictor of future use in youth, is rarely included in LCA models. **METHODS:** Weighted latent class analysis, conducted separately for 7<sup>th</sup>, 9<sup>th</sup>, and 11<sup>th</sup> graders, assessed patterns of combustible tobacco and e-cigarette susceptibility, ever and current use, and other substance use (i.e., current alcohol, binge drinking, and marijuana). Data is from the 2015 Texas Adolescent Tobacco and Marketing Surveillance System survey and includes participants (n=2,733; N=461,069) from four major Texas metropolitan areas. After identifying latent classes, weighted multinomial regression examined the relationship between demographics (sex, race/ethnicity, socioeconomic status, age) and class membership. **RESULTS:** The optimal latent class solution for 7<sup>th</sup> grade had 2 classes: 1) low use/susceptibility (LUS, 77.3%) and 2) susceptible to tobacco and e-cigarette use (STEU, 22.4%). The 9<sup>th</sup> grade solution had 3 classes: 1) LUS (48.3%), 2) STEU (37.8%), and 3) tobacco and e-cigarette experimenters (TEE, 13.9%). The 11<sup>th</sup> grade solution had 4 classes: 1) LUS (39.5%), 2) STEU (26.1%), 3) TEE (24.4%) and 4) alcohol and TEE (ATEE, 9.9%). In 7<sup>th</sup> and 9<sup>th</sup> grade models, when compared to the LUS class, male and Hispanic students, compared to female and White/Other students, were significantly more likely to belong to the STEU class (p<0.05). For 11<sup>th</sup> grade students, when compared to the LUS class, males were more likely to belong to the STEU and TEE class than females and black students were less likely to belong to the ATEE class than White/Other students (p<0.01). **CONCLUSION:** Among this adolescent population, additional and distinct patterns of polysubstance use emerged as grade level increased, with gender and racial/ethnic differences in class membership and clear delineations of susceptible and non-susceptible non-users across all grades. As susceptible youth are twice as likely to initiate cigarette use, distinguishing the characteristics of these classes is important to developing prevention efforts across a range of developmental stages.

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## POS2-31

### TOBACCO USE PATTERNS AMONG WOMEN FIREFIGHTERS

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**SIGNIFICANCE:** Firefighters' tobacco use is of great concern given their critical public safety role and their risks for cancer and cardiovascular disease. Despite a desire for a tobacco-free fire service, previous research found high rates of tobacco use among male firefighters. There have been no studies of tobacco use among women firefighters. **METHODS:** Data were collected in a national online survey of women career firefighters. A total of 1,901 women firefighters completed questions regarding tobacco use, demographics, psychosocial, and health char-



acteristics. Age-standardized prevalence rates for tobacco use were computed to facilitate comparison with national estimates. Independent associations between tobacco use status and health characteristics also were modeled. RESULTS: The prevalence of any tobacco use was 6.6% (n=125), with 80.2% smokers, 17.3% smokeless tobacco use, and 2.5% dual users. Age-standardized prevalence of smoking was substantially lower than for U.S. adult females (2.0% vs 19.3%). However, the age-standardized rate of smokeless tobacco use was comparable to women in general population (0.5% vs. 0.4%). Adjusted analyses showed significant differences between current and non-smokers. Compared to non-smokers, current smokers were more likely to be racial/ethnic minorities (Odd Ratio (OR) = 2.5, 95% Confidence Interval (CI) = 1.2-5.2); have less education (OR = 5.8, 95% CI = 2.5-13.5); binge drink (OR = 1.9, 95% CI = 1.2-3.4); and report depressive symptoms (OR = 2.7, 95% CI = 1.5-4.8). There were no significant differences among smokeless tobacco use status groups on health characteristics in adjusted analyses. CONCLUSIONS: This study is the first to examine tobacco use in a national sample of women firefighters. Results suggest women firefighters smoke at rates substantially lower than women in the general population or their male colleagues and that their smokeless use is substantially lower than their male counterparts. Given the high rates of smokeless tobacco use and late initiation found among male firefighters, it would be useful to better understand how women firefighters are not affected by this aspect of fire service culture.

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## POS2-32

### REGIONAL RURAL ADULT CIGARETTE SMOKING DISPARITIES IN THE US

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OBJECTIVE: The current study examines rural cigarette smoking prevalence across 10 Health and Human Services (HHS) regions in the U.S., compared to urban, and by socioeconomic and demographic characteristics for the purposes of understanding vulnerable populations. METHODS: Data: adult population from the Tobacco Use Supplement to the Current Population Survey (TUS-CPS), July 2014 to May 2015 waves (n=456,682). Analysis: Age-adjusted, bivariate by geographic, socioeconomic, and demographic characteristics. Multivariate logistic regression of current, former, and "heavy" cigarette smokers adjusting for rural/urban status, region, age, income, education, race-ethnicity, and gender. RESULTS: Nationwide, current smoking prevalence in rural America (19.5%) exceeds their urban counterparts (12.3%, p<0.001). Regionally, rural HHS Regions 1 (CT, MA, ME, NH, RI, VT) and 6 (AK, LA, NM, OK, TX) still outpace urban current smokers (OR: 1.3, 1.3 respectively, p<0.01) due in part to higher than average "wealthy" (Region 1: 13.2%) and Hispanic (Region 6: 14.4%) rural rates. Compared to urban, rural HHS regions 3 (DE, MD, PA, VA, WV), 4 (AL, FL, GA, KY, MS, NC, SC, TN), and 6 are more likely to be heavy smokers (OR: 1.4, 1.7, 1.4, respectively p<0.001), whereas rural respondents in HHS regions 8 (CO, MT, ND, SD, UT, WY), 9 (AZ, CA, NV), and 10 (ID, OR, WA) are less likely to be heavy smokers (OR: 0.9, OR: 0.6, 0.8, p: 0.03, <0.01, =0.01). CONCLUSION: Although the prevalence of smoking has declined among US adults, there are opportunities to further reduce smoking among rural Americans. By understanding these differences, resources may be better appropriated to comprehensively target at-risk populations. For example, public health media campaigns may be more equipped to target their smoking cessation messages and clinicians may tailor their message to better serve their patients.

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## POS2-33

### VARIATIONS IN SUPPORT FOR SHS RESTRICTIONS AMONG DIVERSE RURAL REGIONS

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OBJECTIVE: Significant disparities exist between rural and urban regions of the U.S. Besides higher smoking rates, rural Americans are less likely to be protected from secondhand smoke (SHS). Few studies have focused across all regions in the U.S. possibly obscuring marked regional-level differences that exist. This presentation compares rural/urban disparities across 10 regions of the country as to attitudinal support for SHS restrictions. METHODS: Data are from the 2014/15 Tobacco Use Supplement-Current Population Survey (TUS-CPS). Sub-sample respondents n=158,997; of which 124,311 were urban and 34,686 rural. We compared each region to national-level data as well as differences among and within each rural region. *Smoking rules inside the home* were assessed along with 5 questions reflecting attitudes towards smoking in public places specifically: *bars, casinos, playgrounds, cars, and cars where children are present*. RESULTS: Overall, rural regions were significantly less supportive of all SHS measures when compared to urban regions. For example, national urban vs. rural support for *banning smoking in cars* differed (74.1% vs. 69.1%, respectively, p<.001). *Smoking in bars* had the least support in both rural and urban regions. *Smoking bans in bars* ranged from a high level of support (69%) in Region 2 (NJ, NY) to the lowest level (44%) in Region 6 (AK, LA, NM, OK, TX). Rural residents were significantly less likely to have a *home smoking ban* when compared to urban residents; this relationship was found in 7/10 regions even when controlling for age, education, gender, income and smoking status. Rural residents in Region 6 were significantly less likely to have a *home ban* (OR=.83, p=.005); *ban smoking in cars with kids* (OR=.75, p=.045); *ban on playgrounds* (OR=.68, p<.052); *ban in bars* (OR=.83, p<.001) and *ban in casinos* (OR=.86, p=.002). CONCLUSIONS: Significant differences exist as to support for SHS restrictions between rural and urban areas as well as across the 10 HHS regions. Understanding these differences are important to be able to target interventions to improve tobacco control.

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## POS2-34

### REGIONAL RURAL/URBAN DIFFERENCES IN E-CIGARETTE USE BEHAVIOR AND RATIONALE IN A NATIONALLY REPRESENTATIVE SAMPLE

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OBJECTIVE: The current study examines regional differences in rural/urban disparities and rationale for e-cigarette use across 10 U.S. regions. METHODS: Study participants were ever e-cigarette users (n=16,023) drawn from the 2014/15 Tobacco Use Supplement-Current Population Survey (TUS-CPS). One in four respondents in the study sample were rural residents. Across 10 regions defined by the U.S. Department of Health and Human Services (HHS), we compared rural/urban estimates of ever e-cigarette use, and four reasons why respondents would choose to use e-cigarettes. RESULTS: At the national level, ever e-cigarette use was significantly higher among rural residents (9.4%) than among urban residents (7.0%, p<0.001), but there were no rural/urban differences in any of the four reasons given for use. Bivariate analyses showed significant regional rural/urban differences in ever e-cigarette use as well as all four reasons for use. Multivariable logistic models adjusting for individual characteristics and smoking status indicated few rural/urban differences in most regions in ever use of e-cigarettes, with the exception of Regions 4 (KY, MS, NC, SC, TN.) and 7 (NE, MO, KS, IA), in which rural residents were less likely to report ever using e-cigarettes than urban residents. Regarding regional differences in the rationale for use, Region 2 (NY, NJ) rural residents were more likely to endorse use when smoking was not allowed, because e-cigarettes could help people quit smoking, and because e-cigarettes might be less harmful to the respondent's own health than urban residents endorsed. In Regions 7, 8 (CO, MT, ND, SD, UT, WY), and 9 (CA, AZ, NM), rural residents were less likely than urban residents to endorse the belief that e-cigarettes might be less harmful to the respondent's own health. CONCLUSION: Rural areas have higher e-cigarette use and some regional differences were found in rationale for using this product. Understanding regional differences could be useful for planning state



and regional public health and media campaigns as well as serve as constructive inputs for tailoring messages consistent with health promotion efforts.

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## POS2-35

### MEASURING RURAL AREAS ACCORDING TO THEIR DEGREE OF ISOLATION FROM RESOURCES

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**OBJECTIVE:** Commonly used U.S. measures of rural/urban vary in their classifications and in how much of the nation is classified as rural. Some measures give little attention to heterogeneity among rural areas, while others focus on variability that may be irrelevant to health related research questions. New measures are warranted to enhance the study of geographic health disparities. Our goal was to develop a measure—the *Isolation score*—that complements existing rural measures by offering a unique characterization of areas by their isolation from resources that are necessary for humans to survive and thrive. **METHODS:** Using population density and the distances among census tracts, we devised a measure that is theoretically correlated with (1) the propensity for resources to be available within the tract, and (2) the approximate distance a resident would have to travel to obtain resources from a relatively resource-rich tract. Once developed, we evaluated the convergent validity with respect to other rural measures, and criterion validity with respect to outcome measures of actual resources (internet, physicians, hospital, and food). We also compared the ability of each rural measure to explain these outcome measures of resource availability using an index of information loss. **RESULTS:** The Isolation score was significantly associated with all other measures of rural and the measures of resource availability. The Isolation score resulted in the lowest loss of information among all compared rural measures when used to explain resource availability. Finally, numeric and visual summaries suggest the Isolation score can characterize heterogeneity across rural regions. **CONCLUSIONS:** Overall, the Isolation score appears to have convergent and criterion validity, and offers the most nuance with respect to describing the resource isolation of a census tract, compared with the other measures included in our study. It also appears to satisfy the goal of distinguishing rural areas from one another due to its continuous nature and sensitivity to remoteness, which is an important feature for recognizing heterogeneity among rural regions of America.

FUNDING: Federal

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## POS2-36

### RURAL AND URBAN DIFFERENCES IN TOBACCO USE IN ADOLESCENCE

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**SIGNIFICANCE:** Emerging evidence suggests that youth residing in rural areas have a greater likelihood of using tobacco products compared to those living in urban areas. Little work is available, however, on rural and urban differences on the use of electronic cigarettes (ECIGs). The purpose of this study was to examine whether rural and urban youth differed in their use of cigarettes, ECIGs, and/or both, as well as trait differences in impulsivity, self-control, and neuroticism — factors known to be associated with cigarette use. **METHODS:** Data derive from a longitudinal study of 580 youth during their transition into a large Mid-Atlantic University in the greater Appalachia region. Rurality was defined as being raised in an area with 2500 or less individuals (13% rural). At baseline, respondents reported on impulsive-related traits, and on whether they had ever used cigarettes or ECIGs. Logistic regression methods were estimated such that rural versus urban region predicted the odds of membership in four groups: never use, cigarette-only use, ECIG-only use, and dual ECIG-cigarette use. **RESULTS:** No significant differences were observed between regions for the odds of ever use versus never use of products. However, urban youth had an increased odds of being a dual ECIG-cigarette user (Odds Ratio = 2.70;  $p < .05$ ), or an ECIG-only user (Odds Ratio = 3.42;  $p < .05$ ) compared to rural youth. Differences between groups on

trait impulsiveness, levels of self-control, or neuroticism were not observed. However, urban youth did report trying ECIGs at an earlier age and also reported a higher socioeconomic status. **CONCLUSIONS:** Our data suggest that youth from urban areas are more likely than their rural counterparts to use ECIGs alone or in combination with cigarettes. Findings parallel recent national reports in that, rural youth are more likely than are urban youth to use cigarettes, whereas urban youth are more likely to use ECIGs or be dual users. This pattern of results may be related to regional differences in marketing and advertising, availability, and/or cultural norms.

FUNDING: Academic Institution; Federal

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## POS2-37

### COVERAGE OF TOBACCO-FREE POLICIES IN A NATIONAL SAMPLE OF US POST-SECONDARY EDUCATIONAL INSTITUTIONS

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**BACKGROUND:** Young adulthood is a critical development period for tobacco use behaviors. While many young adults enroll in post-secondary educational institutions, little is known about the institutional coverage of tobacco-free policies. We examined the prevalence of tobacco-free policies in U.S. post-secondary educational institutions, and the characteristics associated with having these policies. **METHODS:** We examined a national sample of U.S. post-secondary educational institutions (N=602) attended by the participants of a nationally representative cohort study of young adults. Bivariate analyses and multiple logistic regression models were used to examine the relationship between tobacco policy (100% tobacco-free, 100% smoke-free, and not 100%) and institutional characteristics (institutional control, program type, census region, metropolitan status, Historically Black College or University status and student population demographics). **RESULTS:** Overall, 37% of the institutions had 100% tobacco-free policies (i.e., prohibit all tobacco use on campus), 11% had 100% smoke-free policies (prohibit only smoking on campus), and 52% did not have 100% smoke-free policies. Compared to public institutions, private and proprietary institutions were less likely to have 100% tobacco-free (Private: AOR=0.47; Proprietary: AOR=0.01). Compared to the institutions in the West, institutions in the South were likely to have 100% tobacco-free policies (AOR=4.36). Similar patterns were observed for having at least 100% smoke-free policies. It is noteworthy that proprietary institutions had higher proportion of female students compared to public institutions (66% vs. 54%) as well as proportion of minority students (66% vs. 45%). Likewise, institutions located in the West had high proportion of minority students (69%). **CONCLUSIONS:** Less than half of the sampled post-secondary educational institutions have some type of tobacco restriction, and these are unevenly distributed by census region and institutional control. Given the high minority and female representation in proprietary institutions, improving their tobacco-free policies might in turn reduce tobacco-related health disparities.

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## POS2-38

### RELATIONSHIP BETWEEN ESTIMATION OF PEER E-CIGARETTE USE AND CURRENT USE OF NON-E-CIGARETTE TOBACCO PRODUCTS, US YOUTH, 2016

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**SIGNIFICANCE:** Electronic cigarettes (e-cigarettes) are currently the most common tobacco product used among U.S. youth. It is not known how peer norms regarding e-cigarettes influence use of other tobacco products. This study measured the relationship between estimation of peer e-cigarette use and current use of other tobacco products. **METHODS:** Data were from the 2016 National





Youth Tobacco Survey of U.S. 6<sup>th</sup>–12<sup>th</sup> graders (n=20,675), a nationally representative, cross-sectional survey. Respondents were asked how many students in their grade they thought used e-cigarettes out of 10 (perceived prevalence). The difference between this estimate and grade-specific actual prevalence (past-30-day use) was used to determine overestimation of peer e-cigarette use. Logistic regression was used to measure the effect of perceived prevalence and overestimation of peer e-cigarette use on current (past 30-day) use of cigarettes, cigars, hookahs, and smokeless tobacco. Models were adjusted for sex, grade level, race/ethnicity, tobacco product use status, exposure to e-cigarette advertising, and tobacco use by a household member. RESULTS: Overall, 65.2% of U.S. 6<sup>th</sup>–12<sup>th</sup> grade students overestimated e-cigarette prevalence. Students who overestimated peer e-cigarette use had higher odds of reporting current use of cigarettes (adjusted odds ratio [AOR]=2.00; 95% confidence interval [CI]=1.51–2.66) and hookahs (AOR=2.44; 95% CI=1.65–3.61) than those who did not overestimate prevalence. Furthermore, for every unit increase in the number of students out of 10 perceived to use e-cigarettes, the odds of being a current cigarette smoker increased by 13% (AOR=1.13; 95% CI=1.08–1.18), while the odds of being a current hookah smoker increased by 17% (AOR=1.17; 95% CI=1.13–1.22). Overestimation of peer e-cigarette use was not associated with current cigar smoking or smokeless tobacco use. CONCLUSION: Social norms regarding e-cigarettes had a cross-over effect on cigarette and hookah smoking, but not smokeless tobacco use or cigar smoking. This finding suggests variations in social rating of different tobacco products among U.S. youth.

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## POS2-39

### EVALUATING POLICIES FOR INTEGRATING SMOKING CESSATION INTO LUNG CANCER SCREENING DELIVERY

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SIGNIFICANCE: Medicare's coverage policy decision for lung cancer screening requires that providers certify they conducted tobacco counseling as part of a decision-making visit prior to screening. Assessing how screening programs have implemented this requirement and the value of this policy decision may be facilitated by longitudinal administrative tobacco use data collected routinely in electronic health records (EHR). METHODS: We examined EHR data for 6,874 patients who were current smokers at the time of their initial lung cancer screening test at 9 VA Medical Centers who screened at least 100 current smokers between 20013–2016. We examined subsequent updates to tobacco use data 1 year following their index exam through March 2017 to identify the frequency of documented cessation. RESULTS: Most patients (80.8%) had updated tobacco use information recorded in the EHR over the year period following their baseline screen. Overall, 11.3% of current smokers had updated data indicating they had quit smoking in the year after their baseline screening test, which is lower than the quit rate of 23.5% at 3 years reported in the National Lung Screening Trial. Quit rates varied considerably across the 9 screening centers ranging from 19.3% and 18.2% at the two sites with the highest quit rates to 2.5% and 0.4% at the screening centers with the lowest quit rates. The screening centers with the highest quit rates reported conducting activities to actively promote smoking cessation including enrolling patients in a clinical trial, while the centers with the lowest cessation rates reported relying on providers to individually integrate cessation into lung cancer screening care delivery. CONCLUSIONS: These data suggest that reimbursement policies relying on process measures, such as indicating yes/no whether a clinical activity was conducted, are likely to be ineffective implementation strategies. Novel approaches to using longitudinal EHR data to quantify the outcomes of an intended policy can serve as a valuable measure of implementation quality.

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## POS2-40

### VIEWER RECALL OF TOBACCO IN TV SHOWS ON STREAMING PLATFORMS AND BROADCAST/CABLE TV

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The relationship between exposure to tobacco in movies and smoking initiation is well established while less is known about the impact of exposure to tobacco in TV shows. The objective of this study was to: 1) assess the prevalence of tobacco in TV shows popular among youth/young adults, and 2) identify predictors of recalling tobacco in these shows. To achieve objective 1, a nationally representative sample of 15–24-year-olds (N=750) was surveyed to identify shows most popular among this age group. Netflix was the most commonly watched streaming platform, and 7 Netflix-original shows were identified as being the most commonly watched. The top 7 most watched shows on broadcast/cable TV were also included in the sample. Two trained coders watched the entire 2015/2016 season of all 14 shows and recorded the number of tobacco incidents. OBJECTIVE: 2 surveyed a nationally representative sample of 15–24-year-olds (N=1000) to assess recall of tobacco in the 14 shows, as well as demographic characteristics and tobacco use behavior. Logistic regressions assessed predictors of correct recall. Seventy-nine percent of shows included at least 1 tobacco incident. A total of 319 tobacco incidents were identified in the 7 Netflix shows (range: 9–182), and there were 139 incidents in the 7 broadcast/cable TV shows (range: 1–94). Cigarettes were the most common tobacco incident across all shows. Seventy percent of the sample correctly recalled tobacco in at least 1 show. Significant predictors of correct recall included age, race/ethnicity, and financial situation. Compared with those who reported never smoking/not at-risk for smoking, those who were at-risk for smoking (OR=0.57, 95% CI=0.34–0.94), ever/not current smokers (OR=0.44, 95% CI=0.27–0.72), and current smokers (OR=0.41, 95% CI=0.25–0.68) were less likely to correctly recall tobacco. Given the high prevalence of tobacco use and the high recall of tobacco in these shows, more research is needed to better understand how exposure to tobacco in TV may influence smoking behavior. Ongoing monitoring of TV shows on streaming platforms is needed as the number of platforms and original shows on these platforms continue to grow.

FUNDING: Truth Initiative internal funding

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## POS2-41

### ASSOCIATION BETWEEN SMOKING INITIATION BEFORE AGE 21 AND SMOKING CESSATION BEHAVIORS AND NICOTINE DEPENDENCE AMONG ADULTS, UNITED STATES, 2014–2015

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SIGNIFICANCE: About 4 out of 5 U.S. adult smokers first started smoking cigarettes daily by age 21 years. This study assessed the relationship between starting smoking fairly regularly before age 21 years and cessation behaviors and nicotine dependence among U.S. adult cigarette smokers. METHODS: Data came from the 2014–2015 Tobacco Use Supplement to the Current Population Survey, a nationally representative household-based survey of U.S. adults aged ≥18 years. The primary exposure was age when respondents started smoking fairly regularly, dichotomized as <21 years (n=45,838) or ≥21 (n=9,139). Three outcomes were assessed: nicotine dependence based on the Heaviness of Smoking Index (HSI; low, moderate, and high); quit attempts (stopped smoking for >1 day in past 12 months); and quit intention (seriously considering quitting smoking in the next 6 months). The HSI was calculated using the time to first cigarette upon waking and number of cigarettes smoked per day. Binary and ordered logistic regression models were used to assess the association between starting smoking fairly regularly at age <21 years and each outcome. Covariates were age, race/ethnicity, sex, education, employment, marital status, annual family income, and state fixed effects. RESULTS: Among current and former cigarette smokers, 83.5% initiated smoking fairly regularly before age 21 years, 49.8% made a quit attempt in the past year, and 46.0% seriously considered quitting in the next six months. Among current smokers, prevalence of moderate or high nicotine dependence was 69.6%. Those who started smoking fairly regularly at age <21 years had lower odds of making a quit attempt (adjusted odds ratio [aOR]=0.8, 95% confidence interval [CI]=0.7–0.8) and intending to quit (aOR=0.7, 0.6–0.8), and had higher odds of being nicotine dependent (aOR=1.8, 1.6–1.9) than those who started at ≥21 years of age. CONCLUSION: Adult smokers who start smoking fairly regularly before age 21 years





have lower odds of intending and attempting to quit, and higher odds of nicotine dependence. Efforts to prohibit smoking initiation before age 21 could help reduce smoking among young adults.

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## POS2-42

### MULTI-ITEM MEASURES OF TOBACCO HEALTH BELIEFS: A REVIEW IDENTIFYING FUTURE RESEARCH NEEDS

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**SIGNIFICANCE:** Policy makers and tobacco researchers are interested in tobacco health beliefs, as they affect tobacco use. Tobacco research would benefit from having valid, comprehensive, widely-used measures of tobacco health beliefs (cf. Fagerstrom's Test to measure cigarette dependence). We reviewed the content and quality of existing multi-item measures of tobacco health beliefs to identify future measure development research needs. **METHODS:** We searched PsycInfo and PubMed and identified 92 articles using multiple items combined into a composite score to assess perceived health impact of tobacco use on users. We coded the measure in each article for: source (i.e., newly developed vs. built on prior measures); content (e.g., health harms assessed); ability to meet design needs (e.g., assessed beliefs about one product relative to another, specified frequency/duration of use); samples (e.g., testing on vulnerable subpopulations); and reliability and validity. **RESULTS:** Of the multi-item measures identified, most were either newly developed or built on the Smoking Consequences Questionnaire (Brandon & Baker, 1991). Few assessed health effects for non-cigarette tobacco products. Measures assessed a variety of health harms, though some were rarely assessed (e.g., risk of addiction). None assessed beliefs about one product relative to another, and few specified use conditions. Samples included few vulnerable subpopulations. More than half of studies assessed reliability, and most assessed validity, usually only by comparing scores between tobacco users and non-users. **CONCLUSIONS:** Researchers could help address gaps in the measurement of tobacco health beliefs by developing new measures that: assess health beliefs for non-cigarette products, ask about a full range of health effects, assess beliefs relative to other products, specify frequency or duration of use, are tested on diverse subpopulations, and demonstrate multiple types of validity. Developing valid consensus measures of tobacco health beliefs will advance the fields of public health and regulatory science.

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## POS2-43

### NON-CIGARETTE TOBACCO PRODUCT SUSCEPTIBILITY AS A PREDICTOR OF UPTAKE IN A NATIONAL SAMPLE OF ADOLESCENTS AND YOUNG ADULTS, 2014-2016

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**SIGNIFICANCE:** While cigarette smoking has declined among adolescents and young adults, rates of use of some non-cigarette tobacco products (NCTPs) including waterpipe, e-cigarettes, little cigars/cigarillos (LCC) and have increased among these populations. Identifying those susceptible to tobacco use can help identify target populations most in need of preventive strategies to decrease tobacco initiation. **METHODS:** Data from a nationally representative phone survey of 1305 adolescents and young adults (13-25) were used to identify current nonusers of each of the three NCTP. Respondents reported their susceptibility to NCTPs using the following item: "If one of your best friends were to offer you [tobacco product], would you use it?" Participants were deemed susceptible if they responded anything other than "definitely no". A follow-up Internet survey reassessed tobacco use behaviors several months to one year later. We examined whether those susceptible to NCTPs went on to use an NCTP by follow-up. **RESULTS:** Adolescents and young adults who were susceptible nonusers at baseline had higher odds of using an NCTP by follow up than non-susceptibles, controlling for demographic factors and susceptibility to other NCTP. The odds of participants smoking water-

pipe at follow-up were over 3 times higher for those who were susceptible to using waterpipe at baseline compared to those who were not (OR= 3.6, 95% CI: 1.4, 9.0). The odds of using e-cigarettes at follow-up among those susceptible to e-cigarettes were over 2 times the odds (OR= 2.8, 95% CI: 1.5, 5.1) of those who were not susceptible. Those susceptible to smoking LCCs had 2 times the odds (OR= 2.4, 95% CI: 1.1, 5.4) of using LCCs compared to those who were not susceptible. **CONCLUSIONS:** We measured susceptibility using the 'best friend' measure and demonstrated that it was a robust predictor of future NCTP use. Further research should address the impact of interventions targeted to these susceptible groups, such as media campaigns and policies to ensure adolescents and young adults do not initiate NCTP use.

FUNDING: Federal

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## POS2-44

### DO YOU VAPE? TRENDS IN CLINICIAN DOCUMENTATION OF ELECTRONIC NICOTINE DELIVERY SYSTEM USE AND ASSOCIATIONS WITH SMOKING

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**SIGNIFICANCE:** Electronic health records (EHRs) provide a unique opportunity to examine clinicians' documentation of patients' use of electronic nicotine delivery systems (ENDS) over time and to test whether patients' documented ENDS use is associated with changes in smoking. **METHODS:** Data were gathered from patients 12 and older (N = 9,119; 55% male) treated in a large, integrated healthcare system. We used natural language processing to assess the incidence rates of clinician documentation of patients' ENDS use in unstructured tobacco comments in the EHR from 2006-2015. Further, we tested whether documented ENDS use was associated with 12-month changes in smoking status using a matched retrospective cohort design. **RESULTS:** ENDS documentation in the EHR significantly increased over time, from 0.01 to 9.5 per 10,000 patients,  $p < 0.0001$ , particularly among young adults. Most prevalent terms were variations of "e-cig" and "electronic cigarettes" for adults and "vape" for adolescents and young adults ( $ps < 0.0001$ ). At first documentation, ENDS users were 57% current smokers, 35% former smokers, and 8% never-smokers. Overtime, documented ENDS use was associated with greater odds of quitting smoking among current smokers (OR=1.17, 95%CI=1.05-1.31), greater odds of relapsing to smoking among former smokers (OR=1.53, 95%CI=1.22-1.92), and greater odds of initiating smoking among never-smokers (OR=7.41, 95%CI=3.14-17.5). **CONCLUSIONS:** Documentation of ENDS use in the EHR was low overall, though it increased significantly from 2006-2015. At first documentation, most ENDS users also smoked cigarettes (i.e., dual-users). Overtime, the patterns of association between ENDS and smoking indicated the potential for harm reduction among current smokers (who later quit combustibles), but also the potential for created harm among former smokers (who relapsed) and never-smokers (who initiated cigarette use). Research is needed to test whether these associations are causal. Discrete EHR fields for standard ENDS screening would provide more complete surveillance of ENDS use and its association with smoking and health outcomes.

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## POS2-45

### FACTORS PREDICTING THE TRANSITION FROM SUSCEPTIBLE TO NON-SUSCEPTIBLE TO E-CIGARETTES AMONG TEXAS YOUTH

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**SIGNIFICANCE:** Many tobacco prevention programs target susceptibility, a strong modifiable risk factor for cigarette use, but limited information about this construct is available to inform e-cigarette prevention programs. This study aims to identify



factors associated with transitioning "backwards" from susceptible to non-susceptible to e-cigarettes among Texas youth. **METHODS:** Self-report data from the Texas Adolescent Tobacco and Marketing Surveillance System, a representative sample of grade 8 and 10 students in five counties surrounding the four largest Texas cities, were collected in 2014-15 with follow-up at 18 months. Analyses included youth with complete data that were susceptible to e-cigarettes and had never used any tobacco product at baseline ( $n=607$ ,  $N=67835$ ). Weighted logistic regression, stratified by grade, identified factors associated with becoming non-susceptible to e-cigarettes at 18 months, controlling for gender, race, family SES, school performance, and family and friend influences. **RESULTS:** Overall, 31% and 25% of susceptible 8<sup>th</sup> and 10<sup>th</sup> graders, respectively, became non-susceptible by 18 months. For 8<sup>th</sup> graders, perceived addictiveness ( $OR=0.50$ , 95% CI: 0.26-0.95) and approving dating e-cigarette users ( $OR=0.58$ , 95% CI: 0.43-0.79) predicted lower odds of transitioning to non-susceptible, while believing e-cigarette use is common ( $OR=1.54$ , 95% CI: 1.09-2.17) predicted higher odds. For 10<sup>th</sup> graders, perceived harm ( $OR=1.46$ , 95% CI: 1.04-2.05) predicted higher odds of transitioning to non-susceptible, while lower negative affect ( $OR=0.86$ , 95% CI: 0.76-0.96) predicted lower odds. **CONCLUSIONS:** Differences among 8<sup>th</sup> and 10<sup>th</sup> graders in factors predicting the transition to non-susceptible to e-cigarettes suggest targeting risk perceptions and social norms among younger youth and affective factors among older youth in prevention programs may serve to reduce the progression across stages of e-cigarette use onset.

**FUNDING:** Federal

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## POS2-46

### THE IMPACT OF E-CIGARETTE PRICE CHANGES ON VAPING AND SMOKING BEHAVIORS AMONG E-CIGARETTE USERS BY SMOKING STATUS AND E-CIGARETTE TYPE

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**SIGNIFICANCE:** As the prevalence of e-cigarette use is on the rise, understanding how changes in e-cigarette price affect e-cigarette and cigarette use may shed light on the possible impact of e-cigarette regulations on public health. This study aimed to assess the potential impact of price changes in e-cigarettes on vaping and smoking behavior by smoking status (i.e., current, former, and never smokers) and e-cigarette types (pre-filled vs. refillable). **METHODS:** A total of 918 US-based adult e-cigarette users completed an online survey designed to assess behavioral intention of e-cigarette/cigarette use in hypothetical situations with varying prices of e-cigarettes, in 2017. **RESULTS:** Reduction in e-cigarette prices prompts a majority of current smokers to reduce or quit smoking while more expensive e-cigarettes see higher rates of both quitting and increasing smoking. Current smokers (vs. former or never) are more likely to increase e-cigarette use at reduced e-cigarette prices, and less likely to reduce/quit e-cigarettes at increased e-cigarette prices. Whether e-cigarettes become cheaper or more expensive, pre-filled only users (vs. refillable) are more likely to start smoking (among never smokers), and less likely to quit smoking (among current smokers). Among former smokers, recent quitters are more likely to restart smoking regardless of e-cigarette price, indicating that they are more vulnerable to smoking relapse. **CONCLUSIONS:** Both smoking and e-cigarette use are sensitive to e-cigarette price changes. Increases in e-cigarette price may have both positive and negative effects on smoking behavior, and e-cigarette price changes may disproportionately affect pre-filled users and recent quitters.

**FUNDING:** Academic Institution

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## POS2-47

### AN INVESTIGATION INTO THE PRACTICE OF DIY E-LIQUID: MOTIVATIONS, PRACTICE, NICOTINE AND TOXICANT ANALYSIS

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**SIGNIFICANCE:** E-cigarettes are a less harmful way to use nicotine than combustible tobacco products but they are not risk free. The rapid growth of the e-cigarette markets means that recommendations do not always match current trends. One example is that of DIY home mixed e-liquid, this method allows users to make their own e-liquid according to personal preferences. To date, there is no published research on this practice, yet it is becoming increasingly popular. **METHODS:** A mixed method cross-sectional design was implemented. Forty-one European, UK and US based exclusive vapers were interviewed by Skype. Interviews focused on motivations for home-mixing, practices, buying habits and broader themes around reasons for long-term vaping. A sample of DIY liquid ( $n=31$ ) was collected from participants and analysed for nicotine concentration, as well as flavourings and potential respiratory toxicants. **RESULTS:** 39 vapers (Mean age 57.8 years) exclusively made DIY e-liquid, with 2 still purchasing shop bought liquids. There were three main reasons for home-mixing, 1) financial savings, 2) quality control 3) novelty, fun. The most commonly used flavourings were dessert, e.g., vanilla, caramel. For UK vapers ( $n=31$ ), avoiding the TPD upper limit of nicotine concentration (2.0%) was also a motivating factor and 'stock-piling' of ingredients was common. Laboratory analysis revealed a variance of between no less or greater than 10% between intended nicotine and actual nicotine levels, except in one case where the difference was +38%. **CONCLUSION:** This is the first study to present findings on home-mixed e-liquid. This method offers vapers a long-term affordable practical method of receiving nicotine. Conservative regulation may result in this practice becoming riskier if products are not easily available (black market). However, recommended safety advice needs to reflect actual and fast moving user behaviour.

**FUNDING:** None

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## POS2-48

### PATTERNS OF ENDS USE AMONG SUSTAINED YOUNG ADULT ENDS USERS

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**SIGNIFICANCE:** Few studies have characterized young adult ENDS users, and how their use changes over an extended time period. The purpose of this study is to describe the patterns of use and demographic characteristics of a group of young adult ENDS users who report current and sustained use of ENDS over a two-year period. **METHODS:** Participants in this study were drawn from a large cohort study of young adult two-year or four-year college students in the four major metropolitan areas of Texas. Those included in this analysis ( $n=75$ ) reported past 30-day use of ENDS products at each of five waves of data collection, collected at 6-month intervals, 2014-2016. Mixed effects regression models tested over time to see if there were significant changes in device type, use of combustible tobacco (cigarettes, cigars and hookah), number of days ENDS were used, and symptoms of nicotine dependence, and were adjusted for demographic characteristics (sex, race/ethnicity, and type of school). **RESULTS:** Among those reporting past-30 day ENDS use at all five waves, 55% were male; 40% were white, non-Hispanic; and 28% were Hispanic. At each wave, the majority of users reported using a rechargeable rather than a disposable, but there was no change in device type over time ( $p=.22$ ). Over time, the odds of using a combustible tobacco product decreased 29% ( $AOR=0.71$ , 95% CI 0.57, 0.88). Further, the number of symptoms of nicotine dependence reported increased over time ( $p=0.024$ ) from 1.04 symptoms at wave 1 to 1.28 symptoms at wave 5. However, the number of days users reporting using devices did not significantly change between wave 1 and wave 5. **CONCLUSION:** While the intensity of ENDS use did not change between 2014 and 2016 among sustained ENDS users, the reported number of nicotine dependence symptoms increased and the prevalence of other combustible tobacco product use decreased. This suggests young adults who report sustained ENDS use over time may be successfully using ENDS for cessation of combustible tobacco. However, results highlight the need to monitor the potential of increasing nicotine dependence among sustained ENDS users.



FUNDING: Federal

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## POS2-49

### TV AND ONLINE ELECTRONIC CIGARETTE VIDEO ADVERTISING: THEMATIC CONTENT AND SPEND CHARACTERISTICS

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**SIGNIFICANCE:** Electronic cigarette (EC) advertising contributes to increased EC use in the United States (US). Unlike combustible cigarettes, there are no current restrictions on the methods and types of EC advertisements (ads) except for the use of health claims. The purpose of the current content analysis was to characterize the content and spend characteristics of EC video ads in the US during 2015-2016. **METHODS:** EC ads were identified by Competitrack, an ad tracking firm that monitors 21 media sources. Only EC video ads (obtained from TV and online display) with a run date between 1/1/2015-8/30/2016 (n=46) were included. Nine content areas were assessed: ad location (i.e., program/website), primary product, health themes, technology themes, youth themes, subjective themes, selling characteristics, people present, and setting. Two individuals independently coded all ads, and a third coder resolved differences. Interrater agreement was measured using Cohen's kappa coefficient (>0.69 cutoff). Spend data was provided by Competitrack. **RESULTS:** Most EC video ads identified were TV (65%) vs. online (35%). VUSE (33%) and Blu Cigs (24%) were the most prevalent brands. TV ads were more likely to feature health disclaimers and age restrictions, and utilize settings (e.g., bar) relative to online ads (70-97% of TV ads vs. 38-44% of online ads;  $p < 0.05$ ). Online ads were more likely to contain visible smoke/vapor than TV ads (56% vs. 20%;  $p < 0.05$ ). Websites featuring online ads were typically news-based (65%) and cost a total of \$683,204. TV ads were played primarily during "Prime Time" (7:01pm-11:30pm; 22%) or "Late Night" (11:31pm-4:59am; 39%) and cost a total of \$19,651,100. VUSE spent the highest amount for TV and video ads. **CONCLUSIONS:** TV-based video EC ads were more prevalent and were more likely to contain text warning consumers. Results suggest that other ad content and spend characteristics differed by brand and media source targeted. Future research should investigate the impact of ads/sources on EC use susceptibility and how advertising regulation or other preventative measures can decrease the risk for populations that may be particularly vulnerable to EC use.

FUNDING: State; Federal

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## POS2-50

### UNDERSTANDING THE ASSOCIATION BETWEEN OPINIONS TOWARDS TOBACCO AND CURRENT POLYTOBACCO USE

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**SIGNIFICANCE:** Polytabacco use in adults has increased in recent years. Further, individual- as well as population- level opinions on tobacco use have been associated with tobacco use. However, the degree to which marketing influences the relationship between opinions toward tobacco use and polytabacco use is unclear. **METHODS:** A sample of adults ages 18-90 from the Population Assessment of Tobacco Health (N=32,320) was assessed for polytabacco use. Individual-level functional belief towards tobacco was measured as an individual's opinion toward tobacco. Population-level functional belief towards tobacco was measured as an individual's perception of the general public's view of tobacco. Exposure to marketing was measured as a five-item scale score indicating whether an individual had seen a tobacco advertisement or received promotional material. Multivariable logistic regression tested associations between functional beliefs towards tobacco and polytabacco use while adjusting for the influence of exposure to advertising. **RESULTS:** There was a significant association between polytabacco use and a favorable personal opinion towards tobacco (OR = 2.78, 95% CI = 2.51; 3.08). There was also a significant positive association between polytabacco use and the belief that the general population has favorable opinions towards tobacco (OR = 1.21, 95% CI = 1.06; 1.37). Increasing exposure to advertising was associated with polytabacco use (AOR = 1.12-5.49). After adjusting for the influence of exposure to advertising, the association between functional beliefs toward tobacco and

increasing polytabacco use remained significant for both personal beliefs (AOR = 2.93, 95% CI = 2.66; 3.23) as well as perceived population opinions. However, belief that the general population had favorable opinions towards tobacco was associated with reduced polytabacco use (AOR = 0.84; 95% CI = 0.73; 0.96). **CONCLUSION:** Exposure to tobacco marketing influences the relationship between population-related beliefs of opinions on tobacco use and polytabacco use. However, such marketing may not influence the relationship between personal opinions towards tobacco and polytabacco use in the same way.

FUNDING: Federal

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## POS2-51

### ASSOCIATION BETWEEN SMOKING STATUS AND ILLICIT AND PRESCRIPTION DRUG USE AMONG PREGNANT WOMEN

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**SIGNIFICANCE:** Substance use during pregnancy is a significant public health issue. Research has shown a substantial increase in prenatal prescription and illicit drug use in the past decade while prenatal tobacco use has remained fairly stable. Co-use of tobacco and other drugs is emerging as a concern because of potential additive risks. The purpose of this study is to describe the prevalence rates of illicit and prescription drug use among pregnant women, and examine the association between smoking status (never, recent quitter, and current smoker) and other drug use. **METHODS:** Pregnant women (n=348) were recruited from two community prenatal clinics to complete three substance use screeners (4 P's Plus; SURP-P; NIDA ASSIST) and have their urine tested for 12 different drug classes (Cocaine, Marijuana, Opiates, Amphetamines/Methamphetamines, Phencyclidine, Benzodiazepines, Barbiturates, Methadone, Tricyclic Antidepressants, Oxycodone, Propoxyphene, and Buprenorphine). Participants were divided into three groups based on survey response: never smokers, recent quitters (smoked in the month prior to pregnancy but not past month), and current smokers (past-month). **RESULTS:** Approximately 26% of participants reported smoking in the month before pregnancy. During pregnancy, 13%, 12% and 75% were current smokers, recent quitters, and never smokers respectively. Overall prevalence of illicit or prescription drug use in pregnancy was 25%. Smoking in pregnancy was associated with a positive drug screen; with odds ratios (OR) = 6.3 (95% CI: 3.2-12.4) for current smokers and OR = 2.0 (0.9-4.2) for recent quitters. Marijuana was the most common drug used in pregnancy (18%), followed by opiates (3%), Tricyclic Antidepressants (1%) and Amphetamines (1%); another 3% tested positive for multiple substances. **CONCLUSIONS:** Co-use of tobacco and illicit drugs, particularly marijuana, is relatively high during pregnancy. Additional research is needed to understand the health implications of co-use versus use of tobacco only. Given the strong association between smoking and other drug use, clinicians should routinely assess for illicit drug use in women who smoke during pregnancy.

FUNDING: Federal

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## POS2-52

### E-CIGARETTE USE AND CIGARETTE SMOKING AMONG ADOLESCENTS: EARLY VS. LATE E-CIGARETTE ONSET, EXPERIMENTAL VS. REGULAR E-CIGARETTE USE, AND TEMPORAL ORDERING OF OTHER DRUG USE

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**SIGNIFICANCE:** While several prospective studies have examined e-cigarette use and cigarette smoking among youth, no studies have adequately assessed (1) early vs. late e-cigarette onset, (2) experimental vs. regular e-cigarette use, and (3) temporal ordering of e-cigarette use and other drug use. **METHODS:** Data were collected via self-administered questionnaires from a nationally representative sample of 2,299 U.S. high school seniors in 2015. **RESULTS:** The odds of cigarette smoking among early onset e-cigarette users were significantly greater than those for late onset e-cigarette users, after controlling for relevant covariates. In addition, the estimated increases in the odds of cigarette smoking were



much larger for more regular e-cigarette users than experimental e-cigarette users (1-2 times). E-cigarette users who also reported cigarette smoking, alcohol use, marijuana use, nonmedical prescription stimulant use, or nonmedical prescription opioid use were more likely to initiate each of these substances before e-cigarettes relative to after e-cigarettes. In contrast, e-cigarette users who also reported cocaine use, LSD use or other hallucinogen use were more likely to initiate each of these drugs after e-cigarettes. **CONCLUSIONS:** To date, studies have not carefully examined the associations among age of onset, frequency or temporal ordering of e-cigarette use, cigarette smoking, and other substance use behaviors among adolescents. We found that early onset e-cigarette use was significantly associated with increased odds of cigarette smoking and other substance use behaviors, especially for more regular e-cigarette users. The temporal ordering of e-cigarette onset and other substance onset varied greatly across different drug classes. The findings of this study clearly indicate the need for more long-term prospective and multi-cohort studies examining the role that e-cigarette onset plays in the onset of other substance use in youth.

FUNDING: Federal

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## POS2-53

### QUIT4HLTH: ENHANCING TOBACCO AND CANCER CONTROL THROUGH FRAMED TEXT MESSAGES

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**BACKGROUND:** Free, accessible, evidence-based treatment for tobacco dependence is available by telephone through state-funded Quitlines in every state in the US. Evidence suggests that gain-framed messages are more effective than loss-framed messages in supporting smoking cessation. Recent evidence also suggests that text messaging is an effective support for smoking cessation, but little is known about the relative effectiveness of the content of the text messages. **Study Objective:** To compare the effects of gain-framed versus loss-framed text messages among smokers contacting the New York State Smokers' Quitline (NYSSQL). **METHODS:** All participants received standard NYSSQL treatment which included counseling sessions and 2 weeks of NRT. Participants were randomized to receive tailored Loss-Framed (LF; N=300) or Gain-Framed (GF; N=300) text messages for 30 weeks. Texts were delivered 5 times per day for 8 weeks then 3 times per week for 12 weeks. Messages were tailored to the participant according to demographic and other variables (e.g., name, heaviness of smoking) collected at baseline. Gain-framed messages focused on the benefits of quitting, as opposed to the costs of continued smoking. Follow-up interviews were administered at Week 30 to assess self-reported 7-day point prevalence abstinence. **RESULTS:** Preliminary intention to treat analyses observed that 14% of the GF group (43/300) were abstinent at follow-up, while 10% (29/300) of the LF group were abstinent [ $\chi^2$  (1, N=600)=3.09,  $p=.08$ ]. Responder analyses observed that 51% of the GF group (43/85) were abstinent at follow-up, while 32% (29/91) of the LF group were abstinent [ $\chi^2$  (1, N=176)=6.37,  $p=.01$ ]. **CONCLUSIONS:** The interim analysis suggests increased cessation rates for those receiving gain-framed messages compared to those receiving loss-framed messaging. In addition to the interim analysis data presented in this abstract, the final analysis including all follow-up data will be reported at the time of the conference. Gain-framed messaging is highly scalable within the large network of Quitlines and has the potential to cost-effectively improve treatment outcomes for many who smoke.

FUNDING: Federal

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## POS2-54

### HIGH SCHOOL ADOLESCENTS USE SEVERAL TYPES OF E-CIGARETTE DEVICES

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E-cigarettes have gained popularity among adolescents. E-cigarette designs have advanced rapidly from first generation "cig-a-likes" to more complex, modifiable devices. Adolescents primarily use later generation devices. In the current study, we evaluated adolescents' use of several types of e-cigarette devices and also examined whether adolescents used nicotine in each type of device. We surveyed four high schools from different District Reference Groups in Southeastern Connecticut (n=2945) during May-June 2017. Youth were asked if they had ever tried e-cigarettes. We also presented youth with pictures and descriptions of different devices and assessed whether they had ever tried each device, how frequently they had used each device (number of days in past 30), and whether they had used nicotine in each device. Youth who reported ever use of e-cigarettes had used different types of devices: disposable cig-a-like or e-hookah (shaped like a cigarette; 8.8%), hookah pen/vape pen/EGO (e-liquid tank and larger, rechargeable batteries; 21.6%), JUUL e-cigarette (USB charger and pre-filled e-liquid cartridges; 22.4%), and mods/advanced personal vaporizers (customizable battery and tank; 24.4%). Among all youth, 64.2% reported that they had not used any of the devices, while 11.4% reported use of 1 device, 12.1% reported use of two devices, 8.5% reported use of three devices, and 3.8% reported use of 4 devices. Among those who reported using each device, many used them with nicotine: disposable cig-a-like or e-hookah (50.6%), hookah pen/vape pen/EGO (45.0%), JUUL e-cigarette (77.9%), and mods/advanced personal vaporizers (55.1%). Rates of past-30-day use of these devices were as follows: disposable cig-a-like or e-hookah (M=13.9 [SD=12.3] days); hookah pen/vape pen/EGO, (M=8.9[SD=10.0] days); JUUL e-cigarette (M=9.7[SD=11.2] days); and mods/advanced personal vaporizers (M=11.0[SD=11.2] days). These findings suggest that adolescents are using different types of e-cigarette devices, in some cases multiple devices, and using them with nicotine. Further research should investigate potential differences in nicotine delivery and health risks associated with each device.

FUNDING: Federal

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## POS2-55

### ADOLESCENTS' UNDERSTANDING AND USE OF NICOTINE IN E-CIGARETTES

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**SIGNIFICANCE:** Nicotine exposure can harm adolescent brain development and cause addiction. In the 2015 Monitoring the Future study, two-thirds of students said their last e-cigarette contained "just flavoring," not nicotine or other drugs; the accuracy of their reporting is unclear. We explored adolescents' self-reported use of nicotine-free e-cigarettes and understanding of nicotine and other chemicals in e-cigarettes. **METHODS:** We used social media to recruit an online sample of 1,589 US adolescents (aged 15-17) who reported past 30-day use of e-cigarettes. We assessed tobacco and e-cigarette use, as well as knowledge of the source of nicotine in e-liquid and whether e-cigarette aerosol is just "water vapor." We examined use of nicotine and then explored differences between adolescents who usually used e-cigarettes with versus without nicotine (n=896 in subsample). We used weights to calibrate our sample to e-cigarette users aged 15-17 from the Youth Risk Behavior Survey. **RESULTS:** Twenty-nine percent usually used e-cigarettes without nicotine, 28% with nicotine, 39% "both," and 5% "not sure." Few participants (17% of non-nicotine users vs. 34% of nicotine users,  $p<.001$ ) understood that the nicotine in e-liquid was derived from tobacco. Most believed the nicotine was made artificially from chemicals. Youth who thought e-cigarette aerosol was just water vapor were more likely to usually use without nicotine. Older adolescents, current tobacco users, and less frequent e-cigarette users were less likely to usually use without nicotine. **CONCLUSIONS:** Less than one-third of adolescents reported usually using non-nicotine e-cigarettes, but these respondents had poorer knowledge of e-cigarettes. Their lack of understanding could contribute to inaccurate reporting of nicotine use. The majority of youth thought the nicotine in e-cigarettes was artificial and made by scientists, potentially indicating a belief that this nicotine is safer than nicotine in other tobacco products. As FDA begins mandating nicotine warnings on e-cigarettes, it could consider a complementary





educational campaign addressing misperceptions about nicotine and other chemicals in e-cigarette aerosol.

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## POS2-56

### RISK PERCEPTIONS, SOCIAL NORMS, AND SUSCEPTIBILITY TO ELECTRONIC CIGARETTES AND CONVENTIONAL CIGARETTES AMONG ADOLESCENTS

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**BACKGROUND:** Studies suggest that adolescents perceive e-cigarettes to be more socially acceptable and less risky than conventional cigarettes. It is possible that favorable social norms and low risk perception for e-cigarettes may be associated with e-cigarette use and the renormalization of smoking. This study aimed to examine how risk perceptions and social norms around e-cigarettes were associated with susceptibility to e-cigarettes and cigarettes among adolescents. **METHODS:** We analyzed data from a 2016 survey of 8747 middle school students in Mexico. Participants reported on the risks of e-cigarettes compared to cigarettes, and product-specific norms were measured by assessing current use by a family member, a close friend, and, for e-cigarettes, by perceived social acceptability of use. Adjusted GEE models regressed susceptibility to e-cigarettes and separately to cigarettes (among adolescents who had tried neither e-cigarettes nor cigarettes, n=4526) on e-cigarette social norms and relative risk perceptions. Models were adjusted for sex, age, socioeconomic status, sensation seeking, alcohol use and exposure to online advertisement. **RESULTS:** The prevalence of family (65%) and friend (54%) use of cigarettes was higher than the prevalence of family (12%) and friend (36%) use of e-cigarettes. Only 10% of the students believed that society approved of the use of e-cigarettes and 44% of adolescents perceived e-cigarettes to be less risky than cigarettes. E-cigarette and cigarette susceptibility was 20% and 21% respectively. In adjusted GEE models, higher prevalence of friend e-cigarette use was associated with e-cigarette susceptibility (PR=2.14). Stronger perceived social approval of e-cigarettes was associated with susceptibility to use both e-cigarettes (PR=2.13) and cigarettes (PR=1.45). Students who reported that e-cigarettes were less risky than cigarettes were more likely to be susceptible to e-cigarette use (PR=2.03), but this was unrelated to cigarette use. **CONCLUSIONS:** This study suggests that interventions and policies to change social norms around e-cigarettes and inform youth about the dangers of use may help decrease youth e-cigarette uptake.

FUNDING: Federal

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## POS2-57

### THE POWER OF PEERS: EXAMINING MEASURES OF SUSCEPTIBILITY AS PREDICTORS OF ALTERNATIVE TOBACCO/ NICOTINE PRODUCT USE

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**SIGNIFICANCE:** Secondary school is a time when many adolescents begin to experiment with a variety of tobacco and nicotine products. The validated measures of susceptibility to future smoking can identify students who are less committed to remaining smoke-free in the future. However, studies examining these measures as predictors of alternative tobacco/nicotine product use are lacking. This study examined the predictive ability of measures of susceptibility to future smoking for the use of 6 tobacco/nicotine products: tobacco cigarettes, e-cigarettes, cigarillos or little cigars, cigars, hookah, smokeless tobacco. **METHODS:** A sample of 9th grade never-smoking students (n=3867) was identified at baseline. The predictive ability of measures of susceptibility to future smoking for the use of each tobacco/nicotine product in the last 30 days at 1- and 2-year follow-up was examined using generalized linear mixed models. **RESULTS:** Baseline susceptibility to future smoking was strongly associated with each product use at 1-year follow-up after

controlling for relevant covariates [Odds Ratio (OR) 2.60 to 3.62]. Students that identified they might smoke a cigarette if one of their best friends was to offer one were consistently more likely to report using each tobacco/nicotine product at 1-year follow-up (OR 2.13 to 3.00). Intention to smoke cigarettes in the future was not a significant predictor of alternative tobacco/nicotine product use. Similar findings were identified at 2-year follow-up. **CONCLUSIONS:** Measures of susceptibility to future smoking can be used to identify and predict youth that will use a variety of tobacco/nicotine products, not just tobacco cigarettes. Peer influences appear to play an important role in encouraging experimentation with alternative tobacco/nicotine products. These results could inform the development of policies that restrict use of alternative tobacco/nicotine products by youth and the development of multi-substance use prevention programs. Measures of susceptibility to future smoking continue to be relevant and useful for identifying students with the potential to benefit most from tobacco prevention programs.

FUNDING: Federal

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## POS2-58

### THE IMPACT OF REFERRAL TO INPATIENT TOBACCO COUNSELING ON LIKELIHOOD OF 30-DAY READMISSION

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**SIGNIFICANCE:** Evidence-based inpatient tobacco use treatment (TUT) programs increase cessation rates and improve long-term patient health outcomes [1,2]. Some studies suggest this type of tobacco cessation intervention may reduce later hospital readmissions, potentially making inpatient TUT programs a cost-effective method for improving patient health outcomes [3,4,5]. The current study employed longitudinal data from a large academic hospital to examine whether referral to its inpatient TUT program, which included inpatient counseling and post discharge follow up, predicted odds of hospital readmission within 30 days of hospital discharge. **METHODS:** Medical record data for patients admitted to the hospital between July 1, 2011 and September 30, 2015 were extracted, yielding a total of 130,856 unique hospitalizations. Patients between the ages of 18 and 85 who reported smoking within the last 30 days at the time of the hospital admission were included in analyses (N = 30,620 unique hospitalizations). Given that a person could have multiple hospital visits, a mixed modeling approach was employed to predict odds of a hospital readmission within 30 days of discharge. We examined the association for the entire sample of smokers as well as separately for smokers with a cardiovascular diagnosis. **RESULTS:** Smokers with Medicare and Medicaid as insurance had greater odds of readmission within 30 days of discharge (OR=1.2, p = 0.01) and those without insurance had lower odds of readmission (OR= 0.73, p <0.01). Although the odds of hospital readmission for smokers referred for an inpatient TUT consult did not significantly differ from the odds of smokers who did not receive a consult (OR= 0.95, P=0.43), smokers with a cardiovascular diagnosis referred for a consult did have significantly lower odds of readmission compared to those who did not receive a referral (OR=0.85, p=0.02). **CONCLUSIONS:** These findings suggest that for some hospitalized smokers, particularly those with cardiovascular diagnoses, providing inpatient TUT supports cessation efforts and reduces the likelihood of being readmitted to a hospital within 30 days of discharge.

FUNDING: Academic Institution

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## POS2-59

### APPLYING INTERSECTIONALITY THEORY TO SOCIAL DETERMINANTS OF HEALTH AND CIGARETTE SMOKING USING A DATA MINING TECHNIQUE

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**BACKGROUND:** Intersectionality theory poses that overlapping of social determinants produces compounding effect on health. Few studies have quantitatively

examined combinations of social determinants that produce detrimental behavioral health. We applied a data mining method to explore combinations of social determinants that is associated with higher prevalence of smoking. **METHODS:** We analyzed data from the 1992-2015 Current Population Survey – Tobacco Use Supplement (n=1,593,413, aged 18 years or above). A Classification and Regression Tree model was applied. Current smoking was the dependent variable. Independent variables included survey year, age, gender, ethnicity, race, annual household income, number of people in the household, education, employment, marital status, citizenship status, self and parent region of birth, census region, and metropolitan status. Inclusion of variables in the final model were based on the GINI index. **RESULTS:** Five population segments were identified with varying prevalence of smoking. They are (1) adults with at least an academic associate degree (32% of the population; prevalence of smoking=10%), (2) adults without an academic associate degree and aged 64 years or above (15% of the population; prevalence of smoking=11%), (3) adults without an academic associate degree, aged <64 years, and whose fathers born outside of the US and European countries (7% of the population; prevalence of smoking=14%), (4) adults without an academic associate degree, aged <64 years, with father born in the US and European countries, and annual household income \$35,000 or more (25% of the population; prevalence of smoking=25%), and (5) adults without an academic associate degree, aged <64 years, with father born in the US and European countries and annual household income <\$35,000 (21% of the population; prevalence of smoking=38%). **CONCLUSIONS:** Overlapping of social determinants of health produces higher prevalence of smoking among US adults. Future studies need to examine how smoking behaviors differ between smokers across these segments. Interventions should target individuals with overlapping social determinants to reduce tobacco use disparities.

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## POS2-60

### E-CIGARETTE AND CIGARETTE PRICES AND E-CIGARETTE USE AMONG YOUTH AND YOUNG ADULTS

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**BACKGROUND:** Use of electronic nicotine delivery systems (ENDS) among US youth has been a significant concern in recent years. A substantial body of evidence finds that higher cigarette prices is one of the most effective ways to deter youth cigarette smoking, especially for those progressing from experimentation to regular use. Yet little is known about the impact of ENDS or cigarette prices on youth ENDS use. **OBJECTIVE:** The goal of this study is to examine the impact of ENDS prices and cigarette prices on use of ENDS among US youth and young adults. **METHODS:** This study used data from the first 5 waves of a nationally representative longitudinal cohort survey of 14,000 15-21 year olds (surveyed from 4/2014 to 10/2016). ENDS use in the past 30-days prior to the survey was examined. ENDS and cigarette price data were from Nielsen commercial retail scanner data, representing the average retail price of ENDS and cigarettes in a given retail market. Price data were linked with the TLC data using state and county FIPS and year and interview time. Logistic models and fixed-effects models assessed the impact of prices on ENDS use, controlling for demographics and socioeconomic status. **RESULTS:** Higher reusable ENDS prices were associated with a lower probability of ENDS use. Disposable ENDS prices were negatively associated with ENDS use, but the association was not significant, possibly due to small variations in disposable prices. Cigarette prices were not significantly associated with ENDS use. **CONCLUSION:** To our knowledge, findings provide the first empirical evidence of ENDS and cigarette price impact on youth ENDS use. Results suggest that raising ENDS prices, particularly reusable ENDS price, will likely reduce ENDS use among youth. Cigarette prices do not seem to be an important factor in using ENDS among youth. Results have implications for price- and tax-focused strategies and policies that aim to reduce ENDS use among youth and young adults.

**FUNDING:** Nonprofit grant funding entity

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## POS2-61

### POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY BIOSPECIMEN ACCESS PROGRAM

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**BACKGROUND:** The PATH Study is an ongoing national cohort study designed to generate longitudinal epidemiologic data on tobacco use behaviors, exposures, and related health conditions. Wave 1 (W1) is a nationally representative sample of 13,651 youth (12-17yr) and 32,320 adults (≥18yr) current users of a wide array of tobacco products, former tobacco product users, and nonusers. Biospecimens and questionnaire data are collected from participants in four annual waves with three planned biennial waves. The PATH Study Biospecimen Access Program (BAP) is a resource access award (PAR-17-458) that provides the research community with access to urine, serum and plasma collected from PATH Study participants. Data from these biospecimens can be linked to the questionnaire and biomarker data available at NAHDAP: <https://doi.org/10.3886/Series606> **Methods:** For W1, all consenting adults were asked to provide up to three biospecimens (urine, blood, and buccal cells). Currently, urine from 21,801 participants, and blood (serum and plasma) specimens from 14,520 participants are available to the research community (buccal cells are not available). Investigators can apply for biospecimens by first submitting a concept statement, and if approved, a full application using the NIH X01 grants submission process. Applications are reviewed against similar criteria as NIH grants. There are two review cycles per year, each review cycle takes about eight months. Investigators proposing meritorious and feasible studies consistent with PATH Study objectives and/or research priorities for tobacco regulatory science will be given highest priority for access to these biospecimens. For more information about the application process and submission schedule, please see the BAP webpage: <http://bit.ly/2wBF0tc> **Regulatory Significance:** The PATH Study BAP will provide access to biospecimens that can be linked to questionnaire data, allowing the research community to address a broad range of research questions to inform FDA's regulatory mission under the Family Smoking Prevention and Tobacco Control Act (2009).

**FUNDING:** Federal

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## POS2-62

### CIGARETTE USE AMONG US PERSONS WITH DRUG USE DISORDERS FROM 2002 TO 2014: EMERGING DISPARITIES IN VULNERABLE POPULATIONS

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**SIGNIFICANCE:** Cigarette smoking continues to decline in the United States (US). However, it is not known whether the decline is found among groups with high smoking prevalence, e.g., persons with drug use disorders (DUDs). The present study used epidemiologic data to estimate national trends in cigarette smoking from 2002 to 2014 among US persons with and without DUDs. **METHODS:** Data were drawn from the 2002-2014 National Survey on Drug Use and Health (NSDUH) public use data files (n=723,283). Linear time trends of current smoking prevalence were assessed using logistic regression models for persons with any DUD, DUDs excluding cannabis use disorders (CUDs), CUDs, and without any DUD. **RESULTS:** Among those with DUDs excluding CUD, the prevalence of smoking increased significantly from 2002 to 2014 (p<0.001). There was no change in smoking prevalence among those with any DUD or CUDs. Cigarette smoking prevalence declined from 2002 to 2014 among those without a DUD. In 2014, cigarette use remained significantly more common among those with any DUD (55.5%), DUDs excluding CUDs (63.3%), and CUDs (51.4%) compared with those without the respective disorders (18.2%, 18.6%, and 18.6%). **CONCLUSIONS:** In contrast to declines in the US general population, the prevalence of cigarette smoking increased from 2002 to 2014 among people with non-cannabis DUDs and did not decline among those with CUDs and any DUD. Further, the



smoking prevalence remained multifold higher among those with any DUD compared to no DUD. Persons with DUDs, including cannabis, may need specialized tobacco reduction efforts.

FUNDING: Federal

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## POS2-63

### DEPRESSION MEDIATES THE RELATIONSHIP BETWEEN SUBJECTIVE SOCIAL STATUS AND SMOKING STATUS IN A COMMUNITY SAMPLE OF ADULTS

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**OBJECTIVE:** Although research has shown that individuals of lower socioeconomic status are more likely to smoke, less is known about the relationship between subjective social status (SSS) and smoking. Those who report lower SSS may experience negative affect due to their perceived social status, which may increase symptoms of depression. Previous research has demonstrated strong links between depression and smoking. The purpose of this study was to determine whether depression mediated the relationship between SSS and current smoking. **METHODS:** Adults were recruited from the Dallas metropolitan area. SSS was measured with the MacArthur Scale of Social Status (community and U.S. scales), and depression was measured with the Center for Epidemiological Studies-Depression Scale (CES-D). Smoking status was assessed via self-report and expired carbon monoxide. All measures were collected at a single visit. Correlations among study variables were examined. Mediation analyses were conducted using the PROCESS macro for SPSS (model 4) to evaluate the indirect effects of SSS (community and U.S.) on smoking status through depression symptoms. **RESULTS:** Participants (N = 233) were primarily female (67.8%), non-White or Latino (70.0%), and reported an average age of 43.3 (SD = 13.0) years. A total of 31.3% (n = 73) of participants reported current smoking. SSS-community was inversely related to depression ( $r = -0.26$ ,  $p < .001$ ) but was not related to smoking status. SSS-U.S. was inversely related to depression ( $r = -0.28$ ,  $p < .001$ ) and current smoking ( $r = -0.19$ ,  $p = 0.004$ ). Depression was related to current smoking ( $r = 0.15$ ,  $p = .02$ ). Covariate adjusted mediation analyses revealed significant indirect effects of SSS-community ( $b = -0.0445$ , 95% CI [-0.1116, -0.0056]) and SSS-U.S. ( $b = -0.037$ , 95% CI [-0.0991, -0.0002]) on smoking status via depression. Specifically, lower SSS (relative to the community and U.S.) was associated with greater depression symptoms, which was associated with a greater likelihood of current smoking. **CONCLUSION:** Findings suggest that depression could be an underlying mechanism through which SSS influences smoking status.

FUNDING: Nonprofit grant funding entity; Federal

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## POS2-64

### ELECTRONIC CIGARETTE USE IN CANADA: WHAT WE KNOW SO FAR

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**SIGNIFICANCE:** Since their introduction a decade ago, there has been a rise in the use of electronic cigarettes (e-cigarettes). While initially small in Canada, there has been rapid growth with the e-cigarette market estimated to be \$511M in 2016. The current study examined the prevalence of e-cigarette use among Canadians in 2015 to determine changes since it was first measured in 2013. **METHODS:** Data were from the Canadian, Tobacco, Alcohol and Drugs Survey (CTADS), a biennial, nationally representative cross-sectional survey of Canadians aged 15 years and older, excluding residents of Yukon, Nunavut and the Northwest Territories, and full-time residents of institutions. Telephone interviews were conducted with 15,154 respondents across all ten provinces, representing 27.6 million Canadians. **RESULTS:** Overall in 2015, 13% (3.9 million) of Canadians aged 15 years and older reported having ever tried an e-cigarette, an increase from 9% (2.5 million) reported in 2013. Past-30-day use of e-cigarettes was reported by 3% of Canadians aged 15 years and older (946,000), an increase from 2013 (2%). Six percent

(6% or 131,000) of youth aged 15 to 19, 6% (154,000) of young adults aged 20 to 24 and 3% (661,000) of adults aged 25 years and older had used an e-cigarette in the past 30 days, an increase in each of the age categories compared to 2013. Among Canadians aged 15 years and older who had used an e-cigarette in the past 30 days, 32% reported fruit as their usual flavour, 26% reported tobacco flavour and 24% reported no usual flavour. Half (50% or 893,000) of current or former smokers who had ever tried an e-cigarette reported using it as a cessation aid in the past two years. **CONCLUSION:** This study provides evidence that the use of e-cigarettes has increased since they were first measured in 2013. Moreover, prevalence was highest among certain population subgroups, such as youth and young adults. Health Canada is committed to protecting youth from nicotine addiction and inducements to tobacco and monitoring these trends remains a priority.

FUNDING: Federal

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## POS2-65

### CANADIAN YOUTH AND YOUNG ADULT USE AND PERCEPTIONS OF E-CIGARETTES

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**SIGNIFICANCE:** E-cigarettes have been in the North American market for approximately a decade. With only a few studies available, data are limited on the knowledge, attitudes and beliefs of Canadians as they relate to e-cigarettes. Health Canada is interested in better understanding how Canadians are interacting with e-cigarettes and what the appeal of e-cigarette products is, particularly among Canadian youth and young adults. **METHODS:** A series of in-person focus groups of youth and young adults was conducted in three locations across Canada (qualitative research). Each group included a mix of cigarette smokers and non-smokers. Additionally, a short on-line survey was given to 1,509 Canadians aged 15 to 24 years old (quantitative research). Survey data was weighted by region, age and gender to reflect the demographic composition of the target population. **RESULTS:** Qualitative: Users and non-users of e-cigarettes first learned of them in similar ways. Contexts or situations in which users first tried e-cigarettes varied but the vast majority were offered their first e-cigarette (vs purchase it themselves). Only a few started vaping in order to quit smoking. Most vapers used cig-a-likes, but many had tried an advanced vaping device. Users typically used e-cigarettes for fun/pleasure and/or as a social bonding experience. Both users and non-users tended to have difficulty identifying definite health risks or benefits associated with e-cigarettes. Quantitative: Just over half the respondents (53%) said they have never tried an e-cigarette. Over half (58%) of smokers who vape daily or occasionally have used e-cigarettes as a quitting aide. One-time users of e-cigarettes were divided over whether they would try an e-cigarette again. The most popular flavour among e-cigarette users was fruit. Information on health effects was the most common type of information sought by users of e-cigarettes. **CONCLUSIONS:** These results provide greater insight and understanding into how young Canadians are interacting with e-cigarettes and will help inform future regulation as well as public awareness and education campaigns.

FUNDING: Federal

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## POS2-66

### INTERGENERATIONAL TRANSMISSION OF SOCIAL CLASS AND SMOKING

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**SIGNIFICANCE:** This study examines the associations between parental and adult child smoking and considers how they may be modified by adult child's socioeconomic attainment and mobility. **METHODS:** I use data collected by the Panel Study of Income Dynamics from 1968 to 2011 and employ coarsened exact matching. **RESULTS:** I find that having a smoking parent as a child is associated with a 9 percent to 10 percent increase in the probability of smoking as an adult in 1966 and 2011, respectively. However, the parental treatment effect is attenuated to 7



percent and 5 percent and no longer statistically significant in 2011 after accounting for the adult child's own socioeconomic attainment. Children of 1968 parents interviewed in 1986 are more likely to reproduce their parents' smoking behavior if they maintain their parents' economic position or are downwardly mobile than if they are upwardly mobile. The largest effect of parents' smoking is observed for the 1986 adult children who are intergenerationally downwardly mobile: (1) from the second-lowest to the lowest income tertile, (2) from college to less than college education, and (3) from skilled occupation to unskilled. For children of 1986 parents measured in 2011, the transmission pattern varies less by specific socioeconomic category, but adult children who are downwardly mobile with respect to parental education show a larger effect of parental smoking on their own behavior than those who maintain their parents' education or are upwardly mobile. **CONCLUSION:** The findings highlight the importance of jointly considering individual risk factors and social structural explanations for the persistence of health behavior disparities.

FUNDING: Academic Institution

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## POS2-67

### BATTERY SAFETY INFORMATION AND WARNINGS ON E-CIGARETTE PACKAGES AND ONLINE

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**SIGNIFICANCE:** E-cigarette battery failures can cause explosions and injuries. Most failures result from user behavior, such as improper storage or charging. Little is known about what battery-specific information and warnings are available to consumers on e-cigarette packaging and online. Characterizing existing battery safety information could inform future public education efforts by the US Food and Drug Administration (FDA). **METHODS:** We used Nielsen scanner data to identify top-selling US e-cigarette starter kits with rechargeable batteries (n=24 products to include at least 1 product from the top 20 manufacturers) and purchased them in February/March 2017. Two coders coded battery-related information (e.g., instructions for appropriate charging time) and warnings (text that included the word "warning" or described a negative consequence like injury) that appeared on product packaging and brand webpages for those products. Coders also examined battery information on FDA's website and on the top 30 Google results based on a search with keywords related to batteries, charging, safety, and e-cigarettes. **RESULTS:** Product packaging included information on appropriate charging time (n=13 of 24 products), storage temperature (n=9), and incompatibility with components from other devices (n=8), among other topics. Less than half of products (n=10) included any battery-related warnings, and only 1 of the 10 displayed the battery warning on the external packaging. Product webpages had almost no information or warnings. FDA's webpage had moderately comprehensive information but was not among the top search results. Many of the Google search results had extensive information, but most were associated with vendors and few cited sources for their information or recommended practices. **CONCLUSIONS:** E-cigarette packaging had limited information about battery safety, and the information was usually in dense, small-print interior manuals. Consumers must actively seek out information about battery safety to access it. Most online information was not from scientific or public health sources. With sufficient reach, health messaging from FDA could inform consumers and prevent injuries.

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## POS2-68

### CIGARETTE AND MARIJUANA CO-USE AMONG YOUNG ADULTS: PATTERNS AND PSYCHOSOCIAL CORRELATES

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**SIGNIFICANCE:** The decline in rates of cigarette smoking among young adults has slowed, while rates of marijuana use and co-use with cigarettes are growing.

As two of the most commonly used addictive substances and with the recent legalization of marijuana in many states, it is increasingly important to understand patterns of co-use and psychosocial correlates that might help inform intervention efforts. **METHODS:** In Spring 2017, we conducted an online survey of a cohort of 1893 young adults originally recruited in 2010 from 11 colleges in North Carolina and Virginia to participate in a study to assess tobacco use during emerging adulthood. The associations between co-use of cigarettes and marijuana with patterns of use, smoking cessation, stress, depression, anxiety and sensation seeking were examined. **RESULTS:** The sample was 51.6% female, and 84.4% White with a mean age of 24.7 years. Past 30-day marijuana use was reported by 25.4% and 13.8% reported past 30-day cigarette use. Co-use was reported by 7.0%. More than half (51.2%) of cigarette smokers were current marijuana users compared to 21.2% of non-cigarette smokers while 27.7% of marijuana users were current cigarette smokers compared to 9.0% of non-users. Cigarette smoking frequency and quit attempts did not differ between marijuana users and non-users. Onset of cigarette smoking more often preceded onset of marijuana use among co-users (45.4% vs 25.0%). Levels of stress and sensation seeking were significantly higher among co-users compared to users of either product alone. Levels of depression were significantly higher among co-users compared to marijuana only users and marginally higher than cigarette only users. Anxiety levels did not differ between user groups. **CONCLUSIONS:** Cigarette and marijuana use were related in this young adult sample. Co-users had higher levels of stress, depression and sensation seeking than users of either substance in isolation. This highlights the importance of considering psychosocial profiles while developing interventions to prevent and reduce the use of both substances in young adults.

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## POS2-69

### THE EFFECT OF TOBACCO PRICE CHANGES ON ADOLESCENT SMOKING

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**INTRODUCTION:** Adolescent smoking has declined in many countries in recent years, e.g. in New Zealand (NZ) regular (at least monthly) smoking prevalence fell from 29% in 1999 to 5% in 2015. Possible determinants include individual factors such as peer and parental smoking and population factors such as cigarette price. Increases in price could directly reduce smoking uptake or could act indirectly, for example through reducing peer or parental smoking prevalence. We examined the impact of increases in the price of tobacco (a 10% above inflation annual increase in excise tax from 2010) on adolescent (14-15 year olds) smoking prevalence in NZ. **METHODS:** Using annual nationally representative NZ data in 14-15 year olds from 2002 - 2015 (N=20,443 - 31,833 per year) and logistic regression, we determined the effect of CPI adjusted price of tobacco ("price") and annual change in price ("changeprice") on regular smoking. We added individual predictors (demographic, home exposure, and peer exposure) to the model to determine whether the effects (Odds Ratios, OR) of price and changeprice changed, which would indicate that the individual exposures were confounding or mediating the effect of price/changeprice on regular smoking. **RESULTS:** The crude OR for changeprice was 0.987 (0.982, 0.992), and for price 0.987 (0.986, 0.989). When all individual predictors were in the model, the OR for changeprice became 0.985 (0.979, 0.991) and for price 0.991 (0.990, 0.993). These ORs represent meaningful effects on smoking prevalence. For example, an OR of 0.991 for "price" means that for every 1 unit change in the CPI adjusted price of tobacco between consecutive years the predicted probability of regular smoking decreased by 0.9%. Hence, for the average annual change in CPI price over the study period (6 units), the predicted probability of regular smoking reduced by 5.3%. **CONCLUSION:** The absolute price and increase in price both had significant direct effects on regular smoking, which remained significant even when adjusting for individual predictors. This suggests that ongoing increases in the price of tobacco are effective interventions to reduce smoking among adolescents.

FUNDING: Academic Institution

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## POS2-70

### SMOKING CHARACTERISTICS AND CESSATION AMONG HISPANIC VETERANS PARTICIPATING IN A PROACTIVE TOBACCO TREATMENT TRIAL

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**SIGNIFICANCE:** Hispanic Veterans have smoking characteristics that are less favorable to cessation compared to Hispanic non-Veterans. Little is known about smoking cessation among Hispanic Veterans, along with how they compare to non-Hispanic Veterans in their smoking characteristics and cessation. We aimed to 1) compare smoking characteristics and cessation among Veterans by race/ethnicity and 2) identify predictors of cessation among Hispanic Veterans. **METHODS:** The study sample included participants from the Veterans Victory Over Tobacco Study, a RCT for smoking cessation featuring proactive outreach and offers of counseling and pharmacotherapy (N=4,872). Surveys were completed at baseline and 1-year follow-up. Regression models were used to examine differences in demographics, baseline smoking characteristics, and 6-month prolonged smoking abstinence by race/ethnicity. Logistic regression was used to examine baseline predictors of 6-month prolonged smoking abstinence among Hispanic Veterans. **RESULTS:** The study sample included Hispanic (n=339), White (n=2,970), Black (n=1,418), and Native American (n=145) Veterans. Hispanic Veterans were younger, had a lower proportion of males, and were more likely to be employed. At baseline, Hispanic Veterans were less addicted to smoking, had the oldest age of smoking initiation, were the most likely to not allow smoking at home, but were the least likely to have medication and counseling treatment for smoking cessation in the past year. At follow-up, Hispanic Veterans had the highest rate of 6-month prolonged smoking abstinence (15.9% vs. 10.2% (White), 13.9% (Black), and 14.1% (Native American);  $p=.009$ ). The treatment effect did not vary by race/ethnicity. Hispanic Veterans who were most likely to quit included non-daily smokers and those with lower cigarette consumption, higher emotional self-efficacy to quit, and fewer friends who smoke. **CONCLUSIONS:** At baseline, Hispanic Veterans were the least likely to have treatment for smoking cessation in the past year and they experienced the highest quitting success in this study. Better promotion of tobacco cessation treatment among Hispanic Veterans may yield high quit rates.

**FUNDING:** Federal

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## POS2-71

### ASK-ADVISE-CONNECT: COUSLING TREATMENT ADHERENCE INFLUENCES QUITLINE TREATMENT OUTCOMES AMONG SAFETY NET HEALTHCARE SYSTEM PATIENTS

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Ask-Advice-Connect (AAC) was developed to address clinic and patient level barriers to Quitline treatment enrollment. In two previous trials, AAC resulted in a 13- to 30-fold increase in treatment enrollment compared to Ask Advise Refer. The current study presents data emanating from a 34-month implementation trial evaluating AAC in 13 community health clinics. Associations between counseling treatment adherence and cessation outcomes 6 months following treatment enrollment were examined. Participants were current smokers  $\geq 18$  who presented for care during the implementation period. Quitline treatment consisted of up to 5 proactive, Guideline-based counseling calls. During the study, 218,915 patients visited the clinics, 40,888 reported current smoking (18.68% smoking prevalence), and 3,704 smokers enrolled in treatment and agreed to complete the 6-month follow-up assessment. Those who completed 1 counseling call were no more likely to report abstinence than those who completed no calls (OR: 0.98; 95% CI: 0.76, 1.26). Those who completed 2 calls were 1.83 times more likely to report abstinence compared to those who completed no calls (95% CI: 1.39, 2.41). Those who completed 3 or more calls were 3.70 times more likely to report abstinence compared to those who completed no calls (95% CI: 2.89, 4.72). A similar pattern emerged for biochemically-confirmed outcomes. Specifically, those who completed 1 counseling call were no more likely to be abstinent than those who completed no calls (OR: 1.34; 95% CI: 0.82, 2.20). Those who completed 2 calls (vs. no calls) were 2.19 times more likely to be abstinent (95% CI: 1.29, 3.72). Those who completed 3 or more calls (vs. no calls) were 4.27 times more likely to be abstinent

(95% CI: 2.69, 6.78). **RESULTS:** indicated that individuals who were more adherent to treatment were significantly more likely to be abstinent 6 months following treatment enrollment, and that receipt of at least 2 counseling calls was required to achieve a significant increase in the likelihood of achieving abstinence. Thus, enhancing treatment adherence appears to be critically important among individuals connected with treatment using AAC.

**FUNDING:** Academic Institution; State; Federal

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## POS2-72

### WARNING SIZE AFFECTS ADOLESCENT BOYS' RECOLLECTION OF INFORMATION IN TOBACCO ADVERTISEMENTS

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**SIGNIFICANCE:** Exposure to tobacco advertising increases the likelihood that adolescents will use tobacco. Large, attention-grabbing health warnings may offset the impact of print advertisements on use. In the U.S., print advertisements for smokeless tobacco (SLT) feature a large black-and-white text warning that covers 20% of the advertisement space. Cigarette and e-cigarette advertisements feature a small warning that covers approximately 4% of advertisement space. Across products, we explored how warning size affects adolescents' spontaneous recollection of the warning, brand-relevant advertisement features, and product risks. **METHODS:** 1,221 adolescent males (ages 11-16) viewed SLT, cigarette, and e-cigarette advertisements taken from magazines with a large youth readership. After viewing each advertisement, boys were asked to recall what they remembered most. Coders identified recalls of the warning label, brand-relevant advertisement features, and risks associated with the product in responses. Generalized estimating equation (GEE) models examined the relationship between warning recall and recall of other advertisement features. **RESULTS:** Participants were less likely to recall warnings in the cigarette vs. SLT (OR=0.30,  $p<0.001$ ) and e-cigarette vs. SLT (OR=0.15,  $p<0.001$ ) ads. Separate GEEs revealed that boys who recalled the warnings were less likely to mention brand-relevant advertisement features such as product packaging or the presence of models (OR's<0.32,  $p<0.001$ ). Logistic regressions revealed that boys who recalled the warnings were more likely to mention risks associated with the products (OR's>3.50,  $p<0.001$ ). **CONCLUSIONS:** Youth are more likely to recall large SLT warnings than small cigarette and e-cigarette warnings. Across products, warning recall is associated with lower likelihood of recalling brand-relevant advertisement features and greater likelihood of mentioning product risks. This suggests that, compared to small warnings, large warnings could reduce the appeal of tobacco products to adolescents and increase product risk perceptions.

**FUNDING:** Federal

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## POS2-73

### TOBACCO RETAIL OUTLET DENSITY AND CIGAR USE PATTERNS OVER TIME AMONG YOUTH AND YOUNG ADULTS

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Higher tobacco outlet density is associated with greater youth cigarette use. No studies examine outlet density in relation to cigar/cigarillo (LCC) use, although both traditional and flavored LCCs are highly prevalent and advertised in outlets. This study's aim is to examine the impact of outlet density around the home on number of days smoked between and within current LCC users and flavored users among U.S. youth. A national sample of tobacco retail outlets in 2015 (n=286,599) and 2016 (n=286,741) was linked to 6 waves of a nationally representative longitudinal sample of 15-21 year olds (n=12,087) (surveyed from 4/2014 - 4/2017). Outlets were linked via latitude/longitude and time. A continuous smooth density surface was calculated using kernel density estimation with a bandwidth of 6.5 miles. Density was skewed and thus was dichotomized at the median (1.12 outlets/sq. mi). Among current (past 30-day) LCC users and flavored LCC users, random effects models assessed whether density was associated with number

of days smoked between and within individuals, adjusting for demographics and marijuana use. Univariate models found greater outlet density associated with a higher number of days smoked between individuals ( $B=0.12$ ;  $p<0.01$ -current LCC;  $B=0.13$ ;  $p<0.01$ -current flavored LCC). In adjusted analyses, variation in density between individuals was marginally associated with the number of days smoked for current LCC users ( $B=0.06$ ;  $p=0.06$ ) but not for current flavored LCC users. Within individuals, changes in density were not associated with number of days smoked in any analysis. Findings suggest a weak relationship demonstrating that current LCC users in areas with higher density smoked more frequently than those in lower density areas, but this relationship did not extend to flavored LCC users. Changes in outlet density around an individual's residence over time did not contribute to increased frequency of use. Outlet density may contribute to patterns of LCC use across geographic areas but may not impact individual use over time or flavored LCC use. Further analyses from this study will examine density in relation to youth LCC initiation and smoking progression.

FUNDING: Truth Initiative internal funding

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## POS2-74

### TOBACCO USE AND SECONDHAND SMOKE EXPOSURE IN CHILDREN WITH AND WITHOUT FUNCTIONAL DISABILITIES

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**SIGNIFICANCE:** Secondhand smoke (SHS) exposure causes several respiratory illnesses in children and might exacerbate conditions among those with existing co-morbidities. This study compared tobacco use and SHS exposure between children with and without functional disabilities. **METHODS:** Data were from the 2015 National Youth Tobacco Survey of US students in grades 6-12 ( $n=17,711$ ; response rate=63.4%). Presence of a functional disability was defined as an affirmative response to the question "Because of physical, mental or emotional condition, do you have serious difficulty concentrating, remembering or making decisions?" Current (past 30-day) use of cigarettes, cigars, pipes, bidis, hookahs, e-cigarettes, and smokeless tobacco was assessed. Participants were further asked of their recent ( $\geq 1$  day in past 7 days) and daily (all 7 days) exposure to SHS in a car or their home. Recent ( $\geq 1$  day in past 30 days), as well as daily (all 30 days) SHS exposure in a public place was also determined. Weighted prevalence estimates were computed and compared using chi-squared tests at  $p<0.05$ . **RESULTS:** Current tobacco use was significantly higher among youth with functional disabilities than those with no functional disabilities for all products assessed: any tobacco use (25.0% vs. 13.7%); cigarette smoking (12.3% vs. 4.7%); cigar (10.4% vs. 4.5%); pipe (2.1% vs. 0.5%); bidis (1.1% vs. 0.3%); hookah (9.1% vs. 4.0%); e-cigarettes (18.8% vs. 9.5%); and smokeless tobacco (6.7% vs. 3.4%) (all  $p<0.001$ ). Youth with functional disabilities also reported higher SHS exposure than those without a disability as follows: recent SHS at home (35.5% vs. 20.6%); daily SHS at home (20.2% vs. 11.2%); recent SHS in a car (36.7% vs. 20.8%); daily SHS in a car (14.0% vs. 5.7%); recent SHS in a public place (65.5% vs. 50.1%); daily SHS in a public place (12.5% vs. 4.7%) (all  $p<0.001$ ). **CONCLUSION:** Children with functional disabilities have higher prevalence of tobacco use and SHS exposure. It is imperative that pediatricians and other health care workers recognize this at-risk population, screen for tobacco use, and educate both children and caregivers in order to reduce harm.

FUNDING: None

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## POS2-75

### SMOKING AND PERSONALITY: USING MENDELIAN RANDOMIZATION TO INVESTIGATE CAUSALITY

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Smoking is a leading modifiable risk factor for disability, disease and death. There is a well-documented association between smoking and personality traits, such as neuroticism and extraversion. However, much of this data comes from observational studies and we are unable to make any causal inference regarding these relationships. Mendelian randomization (MR) is a method of assessing causality

from observational data using genetic instrumental variables for modifiable exposures. Recent GWAS have identified variants associated with both smoking phenotypes and personality. This enabled us to use a range of MR methods to unpick these relationships. We use publicly available summary statistics from these studies, in addition to data from UK Biobank, to investigate the link between smoking and personality traits. We found evidence of a modest genetic correlation between smoking initiation and both neuroticism ( $rG=0.124$ ,  $p=0.008$ ) and extraversion ( $rG=0.288$ ,  $p=0.001$ ). However, we found no strong evidence of a causal relationship in either direction with neuroticism when using 2-sample MR or individual level data in UK Biobank. We did find evidence of a causal association from extraversion to increased smoking initiation ( $OR=1.02$ ,  $p<0.001$ ). Within UK Biobank it was possible to stratify on smoking status, enabling us to look at the association between personality and additional smoking phenotypes. We found some evidence of a causal relationship from neuroticism to increased smoking heaviness ( $\beta=0.082$ ,  $p=0.028$ ) and from extraversion to reduced smoking cessation ( $OR=0.979$ ,  $p=0.019$ ). In conclusion, although much of the observed association between smoking and personality appears to be non-causal, we found evidence of a modest genetic correlation with both neuroticism and extraversion, suggesting some shared genetic aetiology. We also found evidence that these personality traits appear to be causally linked to several smoking phenotypes. The association between smoking heaviness and neuroticism lends support to the self-medication hypothesis, while the association between smoking uptake and cessation with extraversion could lead to more targeted smoking interventions.

FUNDING: Academic Institution

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## POS2-76

### EFFECTS OF ANTI-SMOKING MEDIA ON YOUNG ADULTS' SMOKING-RELATED BELIEFS AND INTENTIONS: AN ECOLOGICAL MOMENTARY ASSESSMENT STUDY

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**SIGNIFICANCE:** Anti-smoking media campaigns have been shown to reduce smoking risk and prevalence among young adults. Such campaigns are thought to exert their influence by engaging attitudes and beliefs that affect individuals' decisions to smoke. Experimental studies in which participants are exposed to anti-smoking ads in controlled settings have shown that exposure does, in fact, impact individuals' tobacco-related attitudes and beliefs in a way that reduces their risk for future smoking. Though these studies are valuable for making causal inferences about the relationship between exposure and change in tobacco-related beliefs, they have limited ecological validity. Thus, there is a need for research that uses ecologically valid designs to investigate this relationship. **METHODS:** We used ecological momentary assessment (EMA) to examine immediate changes in college students' smoking-related attitudes, beliefs, and intentions as a function of their exposure to anti-smoking media. In this study, students (52 never smokers, 70 experimenters, and 13 current intermittent smokers) carried handheld data collection devices for three weeks to record naturally-occurring exposures to anti-smoking media and respond to investigator-initiated control prompts. At each reported exposure to anti-smoking media and each control prompt, participants reported smoking-related attitudes, perceived smoking prevalence, resistance self-efficacy, and intentions to smoke. Mixed-effects regression was used to compare responses between anti-smoking media exposures and control prompts. **RESULTS:** Experimenters, but not never smokers or current intermittent smokers, reported weaker intentions to smoke and greater resistance self-efficacy at moments of exposure to anti-smoking media than at control prompts. Regardless of smoking experience, participants reported higher perceived smoking prevalence at times of exposure to anti-smoking media than at control prompts. **CONCLUSIONS:** These findings generally support the value of anti-smoking media messages for shifting the beliefs and intentions of experimenters, a group that is at high risk for becoming committed regular smokers.

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## POS2-77

### ASSOCIATION OF NICOTINE DEPENDENCE WITH GROUPS OF MULTIPLE TOBACCO PRODUCT USE AMONG ADOLESCENT AND YOUNG ADULT CIGARILLO USERS

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Multiple tobacco product (MTP) use is a growing public health concern, particularly among adolescents and young adults. Examination of patterns of use of MTPs is important for understanding development of nicotine dependence. We identify subgroups of cigarillo smokers' use of other tobacco products and test group associations with nicotine dependence. Data from 328 14-28 year-olds who currently smoke cigarillos were collected using a web-based survey between June and August 2017. Study participants were asked detailed questions about current use of cigarillos, little cigars, traditional cigars and other tobacco products (cigarettes, e-cigarettes, chewing tobacco/snuff/snus, kreteks/clove cigarettes, bidis, waterpipes/hookah). Latent class analysis (LCA) was used to identify patterns of product use by type and amount. Multinomial analyses were used to test associations of group status with demographic characteristics and nicotine dependence. A 5-class solution met the fit criteria: 1) Low untipped cigarillo use, no use of Any other product (15.6%); 2) High tipped cigarillo use & use of e-cigs & hookah (11.7%); 3) High use of tipped, untipped, & cigarettes (11.4%); 4) High use of tipped cigarillos and no use of any other product (28.3%); 5) High use of tipped cigarillos and cigarettes, no use of any other product (33.0%). Variables significantly associated with class membership included gender, age group, first product used, and nicotine dependence (ND). Higher ND scores were associated with greater odds of membership in both Class 3 (High users of both types of cigarillos & cigarettes) and Class 4 (High tipped cigarillo use only), relative to the untipped cigarillo use only class (Class 1). Each 1 SD unit change on the ND measure was associated with 1.65 times greater odds of being in Class 3 and 2.10 times greater odds of being in Class 4. In this study of cigarillo users, 56% used multiple tobacco products. ND was associated with greater odds of membership of a MTP class and a high cigarillo use-only class in contrast to other MTP classes. These findings have implications for the need to broaden cessation efforts to address concurrent tobacco products.

FUNDING: Federal

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## POS2-78

### HEALTHCARE PROVIDERS' ADVICE ON QUITTING SMOKING AND INTENTION TO QUIT AMONG CURRENT TOBACCO SMOKERS IN 27 COUNTRIES: RESULTS FROM GLOBAL ADULT TOBACCO SURVEY, 2009-2015

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SIGNIFICANCE: Healthcare providers (HCP) serve a critical role in promoting cessation efforts among tobacco smokers. Intention to quit smoking precedes quit attempts. Previous studies have shown that HCP advice to quit and quit attempts among tobacco smokers vary widely across countries, and that disparities exist across demographic subgroups in receiving advice from a HCP to quit. This study examines the association between HCP cessation advice and intention to quit, among current tobacco smokers. METHODS: Pooled data were used from 27 countries (n=308655) who completed the Global Adult Tobacco Survey (GATS) during 2009-2015. GATS is a nationally representative cross-sectional household survey of adults aged ≥ 15 years. Sample size ranged from n=4260 (Malaysia) to n=69296 (India). Current tobacco smokers who reported they were considering quitting within the next 12 months were categorized as intending to quit. Logistic regression was used to analyze the relationship between HCP advice to quit smoking and intention to quit; odds ratios were adjusted to control for countries, smoking frequency (daily versus non-daily), and demographic factors (sex, age group, education, and urban/rural residence). For all analysis, statistical significance was set at p<0.05. RESULTS: Among current tobacco smokers, HCP cessation advice was associated with greater odds of intention to quit within the next 12 month (adjusted odds ratio [AOR]=1.61, 95% CI: 1.33-1.94, p<0.05). Daily tobacco smokers had lower odds of intending to quit in comparison to non-daily tobacco smoker (AOR=0.55, 95% CI: 0.45-0.66, p<0.05). Intent to quit was also significantly associated with rural residence, higher education level, and country. No association was observed for age and sex. CONCLUSIONS: Smoking cessa-

tion advice from HCP is associated with intention to quit among current tobacco smokers across countries. Opportunities exist globally for HCP to help promote cessation efforts among tobacco smokers by offering them advice to quit smoking.

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## POS2-79

### FINDINGS FROM THE TUS-CPS: COMPARING ATTITUDES TOWARD SMOKING BANS INSIDE APARTMENTS AND COMMON AREAS OF MULTI-UNIT HOUSING, INDOOR WORK AREAS, ENCLOSED AND OPEN AREAS

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SIGNIFICANCE: Public attitudes towards smoking bans have shifted considerably in the past few decades, with growing support for their adoption. During this time, there have also been increases in the implementation of smoking bans, including recent institution by the U.S. Department of Housing and Urban Development of a Smoke-Free Public Housing policy. This presentation will focus on assessing attitudes towards smoking bans in a variety of locations by population subgroups, including Multi-Unit Housing (MUH), Indoor Work Areas (IWA), and Enclosed and Open Spaces (EOS), using Tobacco Use Supplement to the Current Population Survey (TUS-CPS) data. Where available, these findings will include trends over time using pooled, cross-sectional TUS-CPS data. METHODS: The TUS-CPS is an NCI-sponsored, nationally-representative survey of tobacco use administered as a part of the US Census Bureau's CPS. Although some questions on attitudes towards smoking bans in IWA and EOS have been asked dating back to the 1992-1993 cycle (with other questions asked later on), questions on MUH were first asked in 2014-2015, which is the most recent TUS cycle. All analyses were conducted using SAS-callable SUDAAN and accounted for the complex survey design of the TUS-CPS. RESULTS: Support for smoking bans has been increasing over time, with support for banning smoking in IWA nearly doubling between 1992-1993 and 2014-2015. In 2014-2015, there was greater support for banning smoking in areas where children are present, including cars with children in them (94.5%) and outdoor children's playgrounds/sports fields (87.95%) than in areas where children are not permitted such as bars (56.8%) and casinos (55%). These attitudes vary by sex and region. Respondents also supported smoking bans inside apartments of MUH (68%) as well as in common areas (81.6%). CONCLUSIONS: Attitudes towards smoking bans vary considerably by indoor or outdoor location of the ban. It is important for tobacco control researchers to understand population attitudes towards smoking bans in indoor versus outdoor locations and the differences that exist in perceptions of smoking in these distinct locations.

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## POS2-80

### CIGARETTE SMOKING QUIT INTENTION AND BEHAVIOR AMONG US ADULT EXCLUSIVE AND DUAL CIGARETTE SMOKERS: NATIONAL ADULTS TOBACCO SURVEY (NATS) 2012-2014

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SIGNIFICANCE: Dual cigarette use has been increasing among US adults along with a growing debate on the role of e-cigarette use in tobacco control. This study investigates the association of cigarette-quit intention and having a past-year quit attempt with cigarette smoking patterns. METHODS: We merged the data from the 2012-2013 and 2013-2014 National Adults Tobacco Survey (N=135,425). Descriptive analyses and multivariate logistic regression assessed differences in cigarette-quit intentions (Yes/No) and past-year quit attempt (Yes/No) between exclusive cigarette, dual cigarette with e-cigarette, and dual cigarette with another combustible-tobacco product (i.e. dual use with either hookah or cigar or pipe). RESULTS: Among current cigarette smokers (N=15,364), intention to quit cigarette smoking was 77% and past-year quit attempt was 48%. Overall, 72% were





exclusive cigarettes smokers, 15% were dual users of cigarettes and e-cigarettes, and 13% were dual users of cigarettes and another combustible tobacco. After controlling for sociodemographics (age, gender, race, income, education, marital status, and US region) and number of cigarettes smoked per day, the multivariate logistic regression model results revealed that, compared to exclusive cigarette smokers, dual e-cigarette and cigarette smokers were more likely to report having intention to quit cigarette (aOR=1.92; 95% CI=1.10-3.33), and making a quit attempt in the past-year (aOR=1.55; 95% CI=1.08-2.22). On the other hand, dual users of cigarettes and combustible tobacco were less likely to have intention to quit cigarettes (aOR=0.60; 95% CI=0.41-0.89). CONCLUSION: Using combustible tobacco with cigarettes might be posing a barrier, or might reflect an existing lack of motivation to quit cigarette smoking. Controlling for the number of cigarette smoked per day, dual cigarette and e-cigarette use seemed to be associated with higher motivation to quit combustible cigarettes compared to exclusive cigarette smoking. Future studies including longitudinal studies and qualitative studies can ascertain the potential of dual use of cigarettes and e-cigarettes as a possible transitional phase for smoking cessation.

FUNDING: Federal; Academic Institution

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## POS2-81

### TYPE OF FIRST TOBACCO PRODUCT USED AND CURRENT TOBACCO USE AMONG YOUTH: FINDINGS FROM THE NATIONAL YOUTH TOBACCO SURVEY, 2015

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**SIGNIFICANCE:** An understanding of experimental tobacco use and subsequent use of tobacco products is important for youth prevention. This study aims to investigate the association between specific first-time tobacco product and current tobacco use among a nationally representative sample of US students in the 6-12<sup>th</sup> grades. **METHODS:** A total of 17,711 youth from the nationally representative 2015 National Youth Tobacco Survey (NYTS), weighted to account for the complex survey design and adjusted for nonresponse. Multivariable logistic regression analysis was conducted to assess the relationship between first-trying tobacco product and current (past 30 days) tobacco use, including cigarettes, cigars, e-cigarettes, chewing tobacco and hookah. **RESULTS:** Among adolescents, 14.5% reported current use of any tobacco product, 6.1% reported current cigarette use, 11.1% reported current e-cigarette use, and 4.7% reported they smoke hookah in the past 30 days. Cigarettes were most commonly first-used tobacco product (11.9%), followed by e-cigarettes (7.3%). In a multivariate model, individuals who first tried cigarettes were more likely to be current cigarette smokers and current users of any tobacco products (adjusted odds ratio [aOR] =3.89; 95% confidence interval [CI] =3.13-4.83, aOR=1.26; 95% CI=1.07-1.48, respectively). In contrast, adolescents who first used e-cigarettes were less likely to be current users of any tobacco products, as well as current cigarette smokers (aOR= 0.55; 95% CI= 0.43-0.71, aOR=2.00; 95% CI=0.23-0.34, respectively). Those who first tried hookah were more likely to be current cigarette smokers (aOR=3.42; 95% CI=2.71-4.32). **CONCLUSION:** Our study highlights that certain first-trying tobacco was associated with the use of different tobacco products among youth. Given that those who first tried cigarettes were more likely to be current users of any tobacco products, future research needs to focus on preventing the initiation of cigarettes smoking among youth to reduce tobacco use.

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## POS2-82

### IMPACT OF CANNABIS USE ON CIGARETTE SMOKING QUIT RATES IN THE UNITED STATES, 2002-2015

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**SIGNIFICANCE:** Tobacco and cannabis use are intimately intertwined. While the overall cigarette smoking quit rate has increased over time, it is not known whether the quit rate has also increased among persons who use cannabis. The current

study examined cigarette smoking quit rates among adults with any past month cannabis use, daily past month cannabis use, cannabis use disorder (CUD) and no past month cannabis use over a 12-year period in a representative sample of US adults. **METHODS:** Data were drawn from the National Household Survey on Drug Use, an annual cross-sectional study of US persons. Cigarette smoking quit rate (i.e., the rate of former smokers to ever smokers) was calculated annually from 2002 to 2015 among those with any, daily, CUD and no past month cannabis use. Time trends in quit rates by cannabis use status were tested using linear regression. **RESULTS:** In the most recent data year, the quit rate for persons without any cannabis use was more than twice as high as that among those with any cannabis use and daily cannabis use (0.49 vs. 0.20; 0.52 vs. 0.20, respectively). The quit rate for persons without cannabis use was approximately four times higher than that among those with CUD (0.48 vs. 0.13). Over time, the smoking quit rate increased for persons with and without cannabis use and CUD and the rate of increase was greater for persons with any and daily cannabis use and CUD. Yet, quit rates for persons with cannabis use and CUD remain much lower than persons without any cannabis use. **CONCLUSIONS:** It may be beneficial for public health and clinical efforts to incorporate cigarette use screenings and nicotine treatment into programs for adults with cannabis use and cannabis use disorder.

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## POS2-83

### THE PATIENT-REPORTED OUTCOMES MEASUREMENT INFORMATION SYSTEM (PROMIS) NICOTINE DEPENDENCE ITEM BANKS: COMPARING CIGARETTE AND E-CIGARETTE DEPENDENCE AND PREDICTING FREQUENCY OF SMOKING AND VAPING

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**SIGNIFICANCE:** Recent research indicates that The Patient-Reported Outcomes Measurement Information System Nicotine Dependence Item Banks (22-item, 8-item, 4-item) are psychometrically sound measures for assessing cigarette (PROMIS) and e-cigarette dependence (PROMIS-E), respectively. The current study evaluated whether cigarette and e-cigarette dependence can be compared directly and how dependence on these two products is associated with the frequency of using each product in a sample of dual-users of cigarettes and e-cigarettes. **METHODS:** 371 adult dual-users completed an anonymous, online survey in Summer 2017 (49.3% male, 85.2% White, 37.88 [13.00] years). Measurement invariance of the PROMIS and PROMIS-E was evaluated. Mean differences in cigarette and e-cigarette dependence then were examined. Correlations between cigarette and e-cigarette dependence also were examined. Finally, multivariate general linear modeling was used to evaluate how cigarette and e-cigarette dependence jointly relate to vaping and smoking frequency above and beyond demographic covariates (sex, age, race) and nicotine e-liquid use. **RESULTS:** All PROMIS and the PROMIS-E versions were scalar measurement invariant, and dual-users universally reported stronger dependence on cigarettes than e-cigarettes. Relationships between cigarette and e-cigarette dependence were modest (4-item [0.31]; 8-item [0.28], 22-item [0.23]). Stronger cigarette dependence predicted more frequent past-month smoking across all versions. Stronger e-cigarette dependence predicted more frequent past-month vaping but less frequent smoking across all versions. **CONCLUSIONS:** Among dual-users, cigarette and e-cigarette dependence can be compared directly using the PROMIS. On average, dual-users reported stronger dependence on cigarettes than on e-cigarettes. Dependence on both products was associated with increased use of each respective product. However, stronger e-cigarette dependence uniquely was associated with less frequent smoking across all models. Future research using the PROMIS may be able to evaluate how potential FDA regulations could reduce nicotine dependence across different tobacco products.

FUNDING: Federal

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**POS2-84****PROMOTING RECALL OF TOBACCO USE PATTERNS BEFORE, DURING, AND AFTER THE SEPTEMBER 11TH WORLD TRADE CENTER RESCUE AND RECOVERY EFFORTS**

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**SIGNIFICANCE:** Tobacco use is causally associated with head and neck cancers (HNC) and varies over one's lifetime, especially after traumatic events. Excess HNC has been observed among members of the World Trade Center (WTC) Health Program (WTHCP) general responder cohort, suggesting that these cancers are a consequence of exposures incurred during the WTC rescue and recovery efforts ("WTC exposure"). Tobacco use may mediate, modify, or confound the association between WTC exposure and HNC. Accurate reconstruction of tobacco use at times before, during, and after the WTC-RRC effort is needed to understand the effect of WTC exposures on HNC risk. **METHODS:** As part of a larger study of WTC exposure and HNC, we designed a questionnaire to quantify tobacco use and other cancer risk factors at times before, during, and after WTC exposure. We conducted cognitive interviews with WTHCP responders and non-responder cancer survivors during February and March 2017 to assess question comprehension, judgment, retrieval, and response processes. Various methods for improving recall of the specified time periods were assessed. **RESULTS:** Overall, recall was similar for responders and non-responders, but question comprehension and response judgement for some items were inconsistent: e.g., when asked about average smoking frequency before 9/11, some calculated a mathematical average for the entire period, while others referred to a specific instance within that period that did not necessarily represent average use for the period as a whole. Participants had difficulty remembering their age during specified time periods and found the task distracting. Rather, reminding them of their age at that time promoted more confident memory of risk behaviors. **CONCLUSIONS:** Assessing tobacco use relative to 9/11 and the WTC rescue and recovery period is effective for promoting recall, even for those not directly involved. Reminding, rather than asking, respondents of their age at relevant time points promoted memory of tobacco use patterns several decades prior. These findings are relevant to our study and to others about tobacco-related health effects in the context of catastrophic events.

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**POS2-85****VAPING AS AN ALTERNATIVE TO SMOKING RELAPSE FOLLOWING BRIEF LAPSE**

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**SIGNIFICANCE:** E cigarettes are the most popular aid to quitting smoking in the UK (Smoking Toolkit Study). Although many smokers manage to quit, most attempts result in relapse to smoking. Most vapers use e-cigarettes for smoking cessation or to cut down (McNeill et al, 2015), but we still have little understanding of how vapers use e cigarettes to avoid smoking relapse. This presentation draws on qualitative data from a sample of UK vapers to demonstrate how vaping may uniquely support ongoing tobacco smoking abstinence by offering an alternative to relapse following lapse. **METHODS:** A purposive sample of 40 UK vapers were matched to a sampling frame of demographic characteristics from a representative sample of UK quitters. Qualitative thematic analysis of interview transcripts was combined with ethnographic observation. Analysis was triangulated with innovative photo elicitation methodology to examine the social contexts and meaning of e cigarette use in the daily lives of consumers. Data were iteratively analysed to situate experiences of smoking lapse within narrative descriptions of vaping. **RESULTS:** The interview sample included 31 vapers abstinent from smoking, 16 of whom discussed previous occasional tobacco lapses not resulting in full smoking relapse; 6 relapsed smokers (some dual using e cigarettes); and 3 people who had quit both vaping and tobacco. Analysis revealed how smoking lapse may be perceived qualitatively differently when using e cigarettes as compared to past quit attempts. Having the alternative of vaping meant that full relapse to smoking was not perceived as inevitable following a lapse. Instead, it can be perceived as

a 'permissive lapse', intentional and contextualised, or for some as unintentional, with the resulting emotional response negatively reinforcing ongoing tobacco smoking abstinence. **CONCLUSIONS:** We suggest that the role of smoking lapse is theoretically redefined, drawing on novel data from ex-smokers in the context of vaping. These findings theoretically develop our conceptual understanding of smoking lapse in the context of vaping. Vaping offers a viable substitution option for smoking and an alternative to relapse.

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**POS2-86****GLOBAL PATTERNS IN TOBACCO USE AND SELECTED KEY TOBACCO CONTROL INDICATORS: FINDINGS FROM THE GLOBAL YOUTH TOBACCO SURVEY 2000-2015**

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**BACKGROUND:** Approximately 90% of adult tobacco users first initiate tobacco use during adolescence. This study presents estimates of tobacco use and select tobacco control indicators using pooled data from all six World Health Organization (WHO) regions, by selected WHO's MPOWER measures using the Global Youth Tobacco Survey (GYTS). **METHODS:** Data came from GYTS, a nationally representative school-based survey among students aged 13–15 years. Data were pooled from 154 countries that conducted the latest round of GYTS during 2000-2015 (n=520,181 students). Measures assessed in the context of MPOWER included: students' current any tobacco use (monitor); secondhand smoke exposure in enclosed public places (protect); tried to stop smoking (offer); taught about dangers of tobacco use in school (warn); and own a product with tobacco brand logo (enforce). Weighted estimates and 95% confidence intervals were computed overall and by sex. Significant differences between sexes were assessed using a two-sample t-test (p< 0.05). **RESULTS:** Among all assessed countries, current any tobacco use was 15.7% (Boys 20.2%; Girls 10.4%), secondhand smoke exposure in enclosed public places was 45.1% (Boys 47.0%; Girls 43.0%), current tobacco smokers who tried to stop smoking was 69.4% (Boys 70.8%; Girls 65.2%), taught about the dangers of tobacco use in school was 60.5% (Boys 60.3%; Girls 61.1%), and students who own a product with a tobacco brand logo was 10.8% (Boys 12.8%; Girls 8.5%). Differences by sex were significant for all measures with the exception of being taught about the dangers of tobacco use in school. **CONCLUSION:** These findings reinforce the continued importance of MPOWER strategies to reduce the burden of youth tobacco use. Continued monitoring of these measures is critical to evaluate the status and effectiveness of tobacco control efforts globally.

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**POS2-87****AN OVERVIEW ON TOXIC CHEMICAL RELEASES BY TOBACCO FACILITIES AND THEIR POTENTIAL ENVIRONMENTAL RISK TO THEIR SURROUNDING ENVIRONMENT**

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Toxics Release Inventory (TRI) is an EPA-managed dataset that reflects "annual quantities of toxic chemicals released from a facility to the environment, handled by the facility as waste, transferred from the facility to another facility for release or other waste management". Since 1987, all U.S. manufacturing facilities producing more than 500 pounds of each of the 650 listed chemicals and employing a minimum of 10 employees are required to report annually to the EPA an inventory of toxic releases. dataset is compiled by the EPA with reports from more than 21,800 facilities that handle toxic chemicals across the US. Each record contains facility information, chemical information, and columns for amount (in pounds) of chemical releases into air, water, land, and summations of the three, as well as amount of the chemical that was transferred to another facility. According to US EPA, 53 tobacco facilities reported to the database their toxic chemical releases in 2015. This presentation will summarize the characterization of these chemicals as well as their potential environmental risk to the surrounding ecosystems.



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## POS2-88

### USE OF FLAVORED ELECTRONIC CIGARETTE LIQUIDS AMONG ADULTS AND YOUTH IN THE US: RESULTS FROM THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH STUDY (2014-2015)

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**INTRODUCTION:** Flavored e-cigarettes are enticing to new users as well as established cigarette smokers using e-cigarettes to quit smoking. Recently, the FDA gained authority over emerging tobacco products, including e-cigarettes. Although previous research has looked at reasons for using flavored products, the health perceptions of flavored products, and the effects of flavored products on future tobacco use among youth and young adults, less is known about the popularity of specific flavors and flavor combinations among adults and youth. **METHODS:** We analyzed the Population Assessment of Tobacco and Health Study Wave 2 data to assess the prevalence of self-reported flavor categories, individually as well as in combination with other flavor categories, among past 30-day adult and youth refillable e-cigarette users and current adult users of refillable e-cigarettes. **RESULTS:** Most youth and adult participants reported using a flavored refillable e-cigarette (Youth: 91%; Current Adults: 78%; Past 30-day Adult: 79%). Fruit and candy/other sweets were the most common flavor categories reported; tobacco flavor was the least common. Reporting an individual flavor category was more common than reporting a combination of flavor categories. Many of the top flavor category combinations reported were seen among past 30-day adult and youth users as well as current adult users. The top flavor for all three study populations was fruit and candy/other sweets (Youth: 31.5%; Current Adults: 27.3%; Past 30-day Adult: 29.6%). **CONCLUSIONS:** The uses of flavored refillable e-cigarettes are very popular among youth as well as adults, with sweet flavors being the most common. Most consumers reported using a single flavor category, although some consumers did use a combination of flavor categories.

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## POS2-89

### A STUDY ON BETEL QUID USE AMONG 9TH GRADE STUDENT YOUTHS IN MYANMAR

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**BACKGROUND:** Betel quid use is growing in an alarming trend in Myanmar and is prevalent in many different types of products. Smokeless Tobacco use including betel quid use in Myanmar is highest in the South-East Asia Region. Evidence from 2 rounds of national STEP survey in 2009 and 2014 showed that Smokeless Tobacco (SLT) use among Myanmar people has increased in both sexes. Most of current users of SLT(94%) are consuming SLT added to betel quid in various forms. The purpose of the study is to describe prevalence, perceptions and associated risk factors of betel quid use among 9<sup>th</sup> Grade student youths in Myanmar. **METHODS:** A multi-stage, two-cluster survey was conducted in 15 middle and high schools of Myanmar in 2015, using a pre-tested modified questionnaire. A total of 1,446 9<sup>th</sup> Grade student youths, ages 12-17 participated in the study. **RESULTS:** The prevalence of betel quid use is 21.6% (30.4% among male and 12.4% among female). 60.2% of students responded that at least one of their parents/guardians had betel chewing habit. Most of the students(94%) had negative attitude towards betel chewing habit regarding to health aspect. Among betel quid users, students started to use at age less than 10 years old. About 71.6% of non-users and 49% of users believed it was difficult to quit if once initiated. **CONCLUSION:** The use of betel quid was deeply rooted in the Myanmar culture. The cultural and social acceptance and the myths were compounded by lack of specific prevention and control component for betel quid in the existing tobacco control law adopted in 2006. As there was a wide spread myth that betel chewing with tobacco is not as harmful as cigarettes, parents and teachers tend to show less concern on their children's chewing betel quid with tobacco. Enforcement of the national

legislation on tobacco control needs to be strengthened, and the National Tobacco Control Program needs to be more comprehensive incorporating measures to reduce smokeless tobacco use including betel chewing with tobacco. Continued support and close collaboration from WHO and other partners are essential in the struggle against the tobacco epidemic.

FUNDING: WHO

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## POS2-90

### IMPLEMENTATION AND EVALUATION OF A SOCIAL SMOKING DETERRENT CAMPAIGN FOR COLLEGE STUDENTS

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**SIGNIFICANCE:** College students smoking behaviors in cigarette naive individuals vary. Social smokers do not consider themselves to be smokers or having addiction, despite evidence to suggest that some transition into regular smokers after college. We aimed to assess stages of change in smoking behavior of university students after implementation of a social marketing campaign focused on raising awareness of social smoking. **METHODS:** Development of a social marketing campaign based on formative and scholarly research lead to the campaign. Post campaign evaluation utilizing a cross sectional survey was utilized to assess a sample of students (N=1067). **RESULTS:** Over 70% of the respondents indicated they were aware of the campus advertisements to deter social smoking. When the participants were asked about the difference between cigarette and social smoking, 10.4% stated social smoking is safer than cigarette smoking, 28.4% indicated social smoking constitutes the same health risk and 60% responded social smoking is just as harmful as smoking cigarettes. To assess the participant's willingness to change current smoking behaviors as influenced by the campaign, 75% reported no desire to become a social smoker, 11% reported not wanting to smoke socially with friends and 5% reported becoming ready to be a nonsmoker. **CONCLUSION:** Social smoking is not uncommon among college students and may result in continuance of smoking after college. Campaigns can help to inform and deter social smoking in college student populations.

FUNDING: None

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## POS2-92

### FOOD INSECURITY AND PSYCHOLOGICAL DISTRESS AMONG FORMER AND CURRENT SMOKERS WITH LOW INCOME

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Socioeconomically disadvantaged segments of the population have disproportionately high smoking prevalence, partly due to lack of successful quitting. Food insecurity, a stressful condition due to inconsistent food access, is independently associated with higher smoking prevalence. We examined how interactions between food insecurity and psychological distress are associated with smoking status (former vs. current smoking) in a representative sample of ever smokers with low income. In addition, we derived quit ratio estimates to identify groups least likely to have successfully quit. The sample consisted of 3,007 adult respondents from the 2015 California Health Interview Survey who were ever smokers (smoked 100+ cigarettes in lifetime) with low income (<200% of federal poverty level). Weighted multiple logistic regression analysis was used to identify how levels of food insecurity (no/marginal, moderate, severe) and psychological distress (none/mild, moderate, severe) in the past year were associated with former smoking, adjusting for sociodemographics. Quit ratios (percentage of former smokers out of those who have ever smoked) were compared across levels of food insecurity and psychological distress. Reporting the most severe levels of food insecurity and psychological distress was independently associated with decreased odds of being a former smoker, compared to the mildest levels (AOR = 0.29, 95% CI [0.12, 0.70]). Quit ratios varied across levels of food insecurity and psychological distress. In comparison to the quit ratio of the overall sample (52.8%), those with the most severe levels of food insecurity and psychological distress had the lowest quit ratio (30.4%); those with the mildest levels of food insecurity and psychological distress had the highest quit ratio (63.4%). Specific conditions of impoverishment, such as



severe food insecurity, interact with the severity of psychological distress in its association with lower odds of quitting smoking, and may pose additional barriers to successfully quitting. Interventions to reduce socioeconomic disparities in smoking should consider the interacting role of food insecurity and psychological distress.

FUNDING: Federal

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## POS2-93

### TRENDS IN ABSOLUTE SOCIOECONOMIC INEQUALITIES IN CIGARETTE SMOKING, UNITED STATES, 2002-2015

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**SIGNIFICANCE:** Despite marked declines in overall cigarette smoking prevalence in the U.S. over the past several decades, the extent of this decline has varied across population subgroups. We analyzed data from a national sample of U.S. adults aged  $\geq 18$  years to examine trends in cigarette smoking inequalities during 2002-2015. **METHODS:** Data were from the 2002-2015 National Survey on Drug Use and Health, an annual national survey of the civilian, non-institutionalized U.S. population ( $N=537,092$ ). We assessed five socioeconomic indicators: annual household income; education; health insurance; employment; and government subsidies to the poor. For ordinal variables (household income and education), absolute inequality was measured using the Slope Index of Inequality. For nominal variables (health insurance, employment, and government subsidies), absolute inequality was measured using the sum of weighted absolute differences from the overall mean. Trends in prevalence were measured with logistic regression, and trends in inequalities were assessed with joinpoint regression. **RESULTS:** Among all U.S. adults, cigarette smoking declined significantly during 2002-2015 (27.5% to 21.0%;  $p\text{-trend}<0.01$ ). Declines in prevalence occurred among all levels of the 5 indicator variables ( $p<0.05$ ), except persons on Medicare-only. Within each survey year, prevalence of smoking increased ( $p<0.05$ ) with decreasing education, increased with increasing poverty; was higher among those uninsured than those having private health insurance, Medicare only, or other health insurance; was higher among those receiving government subsidies than those not receiving it; and was highest among those unemployed. During the study period, absolute inequalities in smoking prevalence did not change by education or employment status. However, increased inequality ( $p\text{-trend}<0.05$ ) in smoking was observed by household income, government subsidies, and insurance coverage. **CONCLUSION:** Inequalities in cigarette smoking exist that are growing wider for certain socioeconomic indicators. Efforts to address populations carrying a disproportionate burden of smoking are important to ending the tobacco epidemic.

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## POS2-94

### "MENTHOL IS A PROBLEM IN THE BLACK COMMUNITY, IT REALLY IS." PERCEPTIONS OF HARM AND REACTIONS TO MENTHOL POINT-OF-SALE RESTRICTIONS AMONG AFRICAN AMERICAN SMOKERS

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**SIGNIFICANCE:** In Minnesota, approximately 21% of African Americans are current smokers, with roughly 74% using menthol. Compared to non-menthol cigarettes, menthols make smoking easier, intensifying addiction and presenting challenges to quitting. For decades, tobacco companies have specifically targeted African American communities with menthol advertising and lower prices. Localities are actively pursuing legislative options to limit accessibility to menthol products at the point of sale. In this study, we investigated African American smokers' perceptions of the harm of menthol and responses to policy options. **METHODS:** Interviews with African American daily smokers ( $n=23$ ; ages 25-61) explored smoking behaviors, perceptions of menthol, and reactions to policies. Participants were recruited through flyers and word-of-mouth in community locations around the Twin Cities metro. Transcriptions were deductively analyzed and coded for

thematic content according to the study aims using NVIVO software. **RESULTS:** The majority of participants smoked Newport cigarettes. Participants indicated that menthol tobacco products were more harmful than non-menthol products because of unknown chemical additives related to menthol flavor, higher nicotine content, and menthol's soothing effects. Participants were aware of industry focus on African American communities and reported seeing menthol advertising using aspirational depictions of African Americans in their neighborhoods. There was no consensus among participants that menthol sales restrictions would lead to quitting. However, some indicated that travelling further to access menthol would eventually become burdensome and costly, and may lead to future quit attempts. **CONCLUSIONS:** While menthol was generally perceived as more harmful than non-menthol, smokers are unclear about the specific mechanisms of harm. Additional education is needed on the unique health harms of menthol tobacco in African American communities. Advocacy efforts should also focus on engagement of community members to create support for policies and increase community-driven action.

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## POS2-95

### ARE DUAL USERS OF E-CIGARETTES AND CONVENTIONAL CIGARETTES HEAVY SMOKERS OVER TIME? RESULTS FROM WAVE 1 AND WAVE 2 OF THE PATH STUDY

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**SIGNIFICANCE:** E-cigarettes (EC) have been growing in popularity, yet their risk of dependence and ability to help conventional cigarette (CC) smokers quit or reduce CC use is not well known. **METHODS:** This study analyzed data from adults participating in Wave 1 (2013-2014) and Wave 2 (2014-2015) of the Population Assessment of Tobacco and Health (PATH) study. A total of 2,923 adults (representing a population of 12,486,358 adults) defined three CC smoking groups: 2,232 established CC users naïve to EC use in both waves, 414 dual users who were established CC and EC users in both waves, and 277 new dual users of CC and EC in Wave 2 who were established CC users in Wave 1. Weighted logistic regression models assessed whether heavy CC smoking (greater than 5 CC on the last day you smoked) in Wave 2 was associated with dual use of EC and CC. All models adjusted for Wave 1 CC dependence, heavy smoking, sex, age, race/ethnicity, and education status. **RESULTS:** New dual users in Wave 2 had decreased odds of heavy smoking in Wave 2 compared to exclusive CC users in both waves ( $AOR=0.68$ ,  $p<0.01$ ). There was no association found between dual users in both waves and heavy smoking in Wave 2 ( $p=0.19$ ). More CC dependent smokers in Wave 1 had 1.66 the odds of heavy smoking in Wave 2 compared to less dependent smokers ( $p<0.001$ ). Additionally, heavy smokers in Wave 1 had increased odds of heavy smoking in Wave 2 ( $AOR=3.64$ ,  $p<0.001$ ). Being an established CC smoker between the ages of 25 and 54 was positively associated with heavy smoking in Wave 2 compared to smokers between 18 and 24 years old ( $AOR=1.50$ - $1.68$ ,  $p<0.05$ ). Compared to White smokers, Black ( $AOR=0.44$ ,  $p<0.001$ ) and Hispanic ( $AOR=0.40$ ,  $p<0.001$ ) smokers were negatively associated with heavy smoking. Smokers with Bachelor's degrees or higher had decreased odds of heavy smoking compared to smokers with a high school diploma or less ( $AOR=0.71$ ,  $p<0.05$ ). Females also had decreased odds of heavy smoking ( $AOR=0.72$ ,  $p=0.001$ ). **CONCLUSIONS:** Dual use may be beneficial in reducing CC use in the short-term, but it is unclear whether these reductions persist. Further longitudinal research with longer observation periods is needed.

FUNDING: Federal

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## POS2-96

### MOTIVATIONS FOR E-CIGARETTE USE INITIATION AMONG TEXAS COLLEGE STUDENTS: A LATENT CLASS ANALYSIS

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**SIGNIFICANCE:** Young adults have the highest prevalence of e-cigarette use among all adults. Limited research has quantitatively examined motivations for trying e-cigarettes among these individuals. This study aims to identify latent classes of motivations to initiate e-cigarette use among college students. **METHODS:** Participants were 2,636 18-29 year old (mean age: 20.7; SD: 2.5) ever e-cigarette users (60.9% female; 38.0% white) from 24 Texas colleges who completed a baseline assessment (fall, 2014) via online survey. Latent class analysis was used to identify meaningful groups from 18 baseline indicators reflecting self-reported motivations for e-cigarette initiation (e.g., curiosity, flavors). **RESULTS:** A five class model provided the best fit ( $G^2=5000.35$ ; AIC=5188.35; BIC=5740.79; Entropy=0.79). These classes were: *Curiosity* (44%), *Harm Reduction* (25%), *Flavors & Friends Use* (12%), *Cigarette Alternative* (9%), and *Satisfying & Appealing* (9%). E-cigarette users in the *Curiosity* class had a high probability (0.80) of reporting curiosity as their single motivation to initiate e-cigarette use. *Harm Reduction* members were likely to report flavors (0.70) and friends' use (0.73), but were different from other classes with high probabilities of harm reduction – less harm to me (0.94) and others (0.74). *Flavors & Friends Use* is characterized by flavors (0.79) and friends' use (0.62). *Cigarette Alternative* is defined by reasons including wanting to use e-cigarettes instead of other tobacco (0.63), because they were allowed where cigarettes were not (0.60), no smell (0.62), and for cessation (0.78). Students in the *Satisfying & Appealing* class reported reasons similar to *Cigarette Alternative* group members but were different from them by a high probability (0.70) of reporting e-cigarettes as satisfying. **CONCLUSION:** Five unique classes of motivations to initiate e-cigarette use among young adult college students were identified. Findings indicate young adult e-cigarette initiators are a heterogeneous population that may require motivation-specific public health interventions or interventions that cover multiple motivations.

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## POS2-97

### SET YOUR DATE: EVALUATION OF A TOBACCO CESSATION MEDIA CAMPAIGN

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**SIGNIFICANCE:** Mass media campaigns are an important component of tobacco control activities to change attitudes toward smoking and decrease smoking prevalence. Current estimates indicate the prevalence of smoking has been on the decline. This decrease has been attributed to mass media campaigns. **METHODS:** As part of a comprehensive and coordinated approach to tobacco control, the A Smoke Free Paso del Norte (ASFPdN) Initiative ran a theoretically and empirically-based adult tobacco cessation media campaign from 2007 to 2016. The campaign utilized traditional media (i.e., television, radio, and online advertising). To date, out of the 124 months 79 months displayed media developed by ASFPdN (in coordination with a media firm) with a call to action that included contacting a Quitline. A local number was displayed, however calls were redirected to the Texas Department of State Health Services free telephone-based counseling service. Reports on the number of calls and other requested information is regularly provided by the state. **RESULTS:** For purposes of this study, the presence of media was noted on a monthly basis and a simple linear regression was conducted to assess the relationship between media and calls to the Quitline. The presence of media was a significant predictor of calls to the Quitline. On average, in the months where media was present there were 6.567 ( $p=.039$ ) more calls to the Quitline. Months with media had an average of 28.54 ( $SD=16.56$ ) calls and months with no media had an average of 21.98 ( $SD=17.27$ ) calls to the Quitline. **CONCLUSION:** Present findings corroborate previous research on the effectiveness of mass media campaigns for tobacco cessation. As a result of the effectiveness that has been demonstrated by ASFPdN's media campaigns, the development of a revised social media campaign is currently underway. Despite the limited research that is available on the effectiveness of smoking cessation social media campaigns,

preliminary results have found promising effects. In conclusion, mass media campaigns have indicated a degree of efficacy and outreach and should continue to be applied in the growing efforts of tobacco control policy.

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## POS2-98

### LONGITUDINAL ANALYSIS OF ASSOCIATIONS BETWEEN REASONS FOR USING ELECTRONIC CIGARETTES AND CIGARETTE SMOKING AMONG ADULTS IN THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY

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**SIGNIFICANCE:** Electronic cigarette (ECIG) use has increased in the United States. Most adult ECIG users are current or former users of other tobacco products. Users report many reasons for ECIG use, but little research has examined associations between reasons for ECIG use and subsequent cigarette smoking. This study used longitudinal data to examine associations between reasons for ECIG use and cigarette smoking status. **METHODS:** Data from adults (aged  $\geq 18$  years) who participated in waves 1 and 2 of the PATH Study (2013-2015) who reported past 30-day ECIG use and smoking  $\geq 100$  lifetime cigarettes were analyzed ( $n=2842$ ). Prevalence of reporting ECIG use for 16 reasons at wave 1 was examined and weighted logistic regressions with reasons for ECIG use predicting self-reported every day or some days (EDSD) cigarette smoking at wave 2 were conducted. Examined reasons for ECIG use related to cutting down on smoking, perceiving ECIGs help with quitting smoking, an alternative to quitting tobacco altogether, affordability, using ECIGs where or when smoking was not allowed, perceiving ECIGs as less harmful to self or others, seeing advertisements or people in media using ECIGs, socializing, acceptability, influence from important people, flavors, smell, and ECIGs providing a similar smoking feeling. **RESULTS:** Prevalence of reasons for ECIG use ranged from 15.6% (people in media/public figures use them) to 86.7% (ECIGs might be less harmful to people around me than cigarettes). EDSD cigarette smoking was reported by 81.5% of the sample at wave 1 and 77.5% at wave 2. Three reasons for ECIG use (people in the media use them, I use ECIGs in places where smoking is not allowed, advertisements appealed to me) were associated with greater likelihood of EDSD smoking at wave 2 ( $ORs=1.54-1.79$ ,  $ps<0.05$ ), two reasons (alternative to quitting tobacco altogether, less harm to me than cigarettes) were associated with less likelihood of EDSD smoking at wave 2 ( $ORs=0.54-0.76$ ,  $ps<0.05$ ), and 11 reasons were not associated with EDSD smoking at wave 2. **CONCLUSIONS:** These data indicate that reasons for using ECIGs may affect subsequent cigarette smoking and can inform regulatory policies.

**FUNDING:** Federal

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## POS2-99

### GRUESOMENESS AND RECALL IN GRAPHIC WARNING LABELS: DOES LENGTH OF VISUAL ATTENTION MATTER?

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**SIGNIFICANCE:** One rationale for the use of graphic warning labels on cigarette packages is that images may not only convey information more effectively than text-only warnings, they may also make warnings more memorable to viewers. The more gruesome the image portrayed, the more memorable the warning is expected to be. Testing this hypothesis has implications for policy decisions regarding the implementation of graphic warning labels and may refine theoretical propositions about the role of emotional imagery in persuasive communication. **METHOD:** Our study examined recall of 9 graphic warning labels proposed by the US Federal Drug Administration in 2009. We conducted a within-subjects experiment examining differences in level of recall for gruesome warnings, such as those depicting diseased lungs and rotted teeth, compared to warnings without such images. Using eye tracking, we examined the relationship between participants'





visual attention to both types of warnings and their degree of recall. Participants were low-income adult smokers ( $n=145$ ) and middle school students ( $n=137$ ) from communities in the Northeastern United States. RESULTS: Participants' mean probability of recall was greater for the gruesome warnings ( $M_{\text{youth}}=.38$ ,  $SD_{\text{youth}}=.26$ ;  $M_{\text{adults}}=.23$ ,  $SD_{\text{adults}}=.19$ ) than the non-gruesome warnings ( $M_{\text{youth}}=.19$ ,  $SD_{\text{youth}}=.19$ ,  $t_{\text{youth}}=6.86$ ,  $df_{\text{youth}}=119$ ;  $M_{\text{adults}}=.08$ ,  $SD_{\text{adults}}=.13$ ,  $t_{\text{adults}}=7.98$ ,  $df_{\text{adults}}=129$ ;  $p's<.01$ ), as we hypothesized. However, youth looked at the gruesome warnings ( $M_{\text{youth}}=4.57$ ,  $SD_{\text{youth}}=1.47$ ) for less time than they looked at non-gruesome warnings ( $M_{\text{youth}}=5.06$ ,  $SD_{\text{youth}}=1.48$ ;  $t_{\text{youth}}=-5.01$ ,  $df_{\text{youth}}=136$ ,  $p_{\text{youth}}<.01$ ). There was no difference in the length of time adults looked at the gruesome ( $M_{\text{adults}}=4.77$ ,  $SD_{\text{adults}}=.21$ ) and non-gruesome warnings ( $M_{\text{adults}}=4.91$ ,  $SD_{\text{adults}}=.20$ ;  $t_{\text{adults}}=-1.41$ ,  $df_{\text{adults}}=142$ ,  $p_{\text{adults}}=.16$ ). Recall was not predicted by visual attention for either group. CONCLUSIONS: One possible explanation for these findings is that gruesome images are memorable regardless of how long participants look at them. We discuss additional implications for tobacco regulation policy and communication theory.

FUNDING: Federal

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## POS2-100

### TRENDS AND RACIAL DISPARITIES IN MONO, DUAL, AND POLY USE OF TOBACCO PRODUCTS AMONG YOUTH

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SIGNIFICANCE: Multiple tobacco product use is a growing public health problem, particularly among youth. Monitoring trends over time and racial variations in multiple tobacco product use is critical to prevention efforts to reduce racial disparities in population health effects of tobacco use. We examined racial disparities in mono, dual, and poly use of tobacco products among youth including whether racial disparities changed over time and racial variation in the types of products used among high school youth. METHODS: We analyzed data on high school students from three repeat cross-sectional surveys of the North Carolina Youth Tobacco Survey collected in 2011, 2013, and 2015. Mono, dual and poly use included use of one, two, or three or more tobacco products, respectively, in the past month. Multinomial regression models assessed racial differences and changes over time in mono, dual, and poly use. Data includes product combinations most commonly used by youth from different racial groups. RESULTS: Across years, 24% (in 2011), 27% (in 2013), and 25% (in 2015) of students used at least one tobacco product. No significant changes over time were observed in mono (12%) or dual use (6%). Poly use was 6%, 8%, and 7% in 2011, 2013, and 2015, respectively. Relative to non-use of tobacco, White students had a higher relative risk than Blacks for mono use. Whites and Hispanics had a higher relative risk than Blacks for dual and poly use. No significant interactions occurred between survey year and racial group. Types of products used varied by year and race, with cigarettes, cigars, smokeless tobacco, and e-cigarettes being most commonly used. In 2015, e-cigarette were the most commonly used product among youth from all racial groups. CONCLUSIONS: Substantial racial variation persists over time in mono, dual, and poly tobacco use among NC youth, including racial variation in the types of tobacco products used. Research and policy efforts should examine and eliminate factors that drive multiple tobacco use and racial disparities in use among youth.

FUNDING: Federal

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## POS2-101

### INVESTIGATING CAUSALITY IN ASSOCIATIONS BETWEEN EDUCATION AND SMOKING: A TWO-SAMPLE MENDELIAN RANDOMIZATION STUDY

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BACKGROUND: Lower educational attainment is associated with increased rates of smoking, but ascertaining causality is challenging. We used two-sample

Mendelian randomization (MR) analyses of summary statistics to examine whether educational attainment is causally related to smoking. METHODS: We used summary statistics from genome-wide association studies of educational attainment and a range of smoking phenotypes (smoking initiation, cigarettes per day, cotinine levels and smoking cessation). Various complementary MR techniques (inverse-variance weighted regression, MR Egger, weighted-median regression) were used to test the robustness of our results. RESULTS: We found broadly consistent evidence across these techniques that higher educational attainment leads to reduced likelihood of smoking initiation, reduced heaviness of smoking among smokers (as measured via self-report and cotinine levels), and greater likelihood of smoking cessation among smokers. CONCLUSIONS: Our findings indicate a causal association between low educational attainment and increased risk of smoking, and may explain the observational associations between educational attainment and adverse health outcomes such as risk of coronary heart disease.

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## POS2-102

### PATTERNS OF POLY-TOBACCO PRODUCT USE AMONG LATINO YOUTH

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SIGNIFICANCE: As the most preventable public health problem in the U.S., tobacco use is responsible for a considerable proportion of excess mortality of Latinos. Presently, there is a growing public health concern related to the increase in the use of multiple tobacco products among adolescents, including traditional tobacco products, such as, smokeless tobacco and emerging products such as e-cigarettes and hookah/waterpipe. Despite the health risks, few studies have focused on tobacco product use amongst Latino youth. METHODS: Responses from Latino adolescents ( $N=5115$ ) who completed the 2015 Youth Risk Behavior Surveillance Survey were analyzed to identify typologies of tobacco product use. Tobacco products included were e-cigarettes, cigarettes, cigars/cigarillos, and chewing tobacco. Each tobacco product variable was coded as never use, ever/lifetime use, and current/past 30-day use. RESULTS: Latent class analysis indicated three classes: e-cigarette experimenters (68.3% of the sample), e-cigarette users (21.4%), and poly-tobacco users (10.3%). Multinomial logistic regression revealed that males had three times the odds of being poly-tobacco users vs. e-cigarette experimenters compared to females ( $OR=2.36$ , 95%  $CI=1.70-3.28$ ). CONCLUSIONS: The results present concerning findings in that a true non-users class was not identified. Those in the e-cigarette experimenters class had a 25.7% chance of trying or currently using e-cigarettes. Further, over 10% of the sample were poly-tobacco users. Tobacco use initiation in adolescence is associated with myriad negative health outcomes. New prevention programming may be needed to target combination product usage among Latino youth nationwide. Future research should investigate patterns within Latino sub-groups.

FUNDING: None

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## POS2-104

### EFFECTIVENESS OF A CULTURALLY-TAILORED SMOKING CESSATION INTERVENTION FOR ARAB-AMERICAN

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To date, no smoking cessation programs are available for Arab American (ARA) men, who are a vulnerable population with high rates of smoking. Thus, the primary aim of this one group pre-test/post-test study was to assess the effectiveness of *Sehatack*-a culturally and linguistically tailored smoking cessation program for ARA men. The study sample was 79 ARA men with a mean age of 43 years who smoked between 5 and 40 cigarettes (mean = 19.75,  $SD = 9.1$ ) per day (98.7%). All of the participants reported more interest in smoking cessation post-intervention and many of the participants in the baseline (38.5%) and post-intervention phases (47.7%) wanted to quit smoking "very much". For daily smokers who completed the smoking cessation program, the median number of cigarettes smoked daily was significantly lower than those in the post-intervention phase ( $Z = -6.915$ ,



$p < 0.001$ ). Results of this preliminary study indicate that: (a) *Sehatack* may be a promising way for ARA men to quit smoking, and (b) culturally relevant smoking cessation counselors can be trained to recruit and retain ARA smokers in an intensive group smoking cessation program. Strengths of this study were community engagement and rapport between three faith organizations and the University of Florida College of Nursing. However, a larger trial is needed to address study limitations and to confirm benefits in this population.

FUNDING: State; Federal

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## POS2-105

### EXPOSURE TO MANUFACTURER-PLACED HEALTH WARNING LABELS ON WATERPIPE TOBACCO PACKAGES

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**BACKGROUND:** The FDA extended its regulatory authority to include waterpipe (WP) products and will soon require health warning labels (HWLs) on WP tobacco packages. Small, text-based HWLs currently are placed on WP tobacco packages at the discretion of the manufacturer. To optimize WP HWLs, we examined correlates of exposure to these labels, and whether exposure is associated with perceived harm and intention to quit. **Method Data** were analyzed from Wave 1 of the Population Assessment of Tobacco and Health (PATH), a nationally representative cohort of U.S. youth and adults. Data were examined from 18-34 year olds who smoked WP in the past 30 days ( $n = 1581$ ). Using multinomial logistic regression, exposure to WP HWLs in the past 30 days was categorized as "Never," "Sometimes or rarely," and "Often or very often," and was regressed on demographics and tobacco use (Usual smoking location, WP ownership, and having a regular WP tobacco brand). Next, harm perception (worrying about WP health effects) and intention to quit WP were regressed on exposure to HWLs. All analyses were adjusted for gender, age, and race. **RESULTS:** In the past month, 29.7% ( $n=462$ ) and 8.1% ( $n=125$ ) of participants were exposed to HWLs rarely/sometimes or often/very often, respectively. Compared to those not exposed, smokers exposed often/very often had higher odds of being female (odds ratio [OR]=1.7, 95% confidence interval [CI]=1.0-2.5), owning a WP (OR=3.3, CI=2.0-5.0), having a regular brand (OR=5.0, CI=2.5-10.0), smoking at home rather than a WP cafe (OR=1.5; CI=1.1-1.9), and more frequently worrying about WP harm (graded association ranging from "rarely" thinking about harm (OR=2.3 (1.0-4.9) to "very often" (OR=7.30, CI=3.1-16.9). Exposure was not associated with intention to quit. **CONCLUSION:** Fewer than half of WP smokers notice manufacturer-placed HWLs and are more likely to be female, younger, and smoke a regular tobacco brand at home using their own WP apparatus. Even small, text-based HWLs may increase perceptions of harm, but larger, pictorial HWLs placed on WP apparatus in addition to tobacco packaging, may be needed to enhance salience, reach, and efficacy of messaging.

FUNDING: None

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## POS2-106

### TRANSITIONS IN TOBACCO-PRODUCT USE BY US ADULTS: PATH STUDY WAVES 1 & 2

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**SIGNIFICANCE:** Nearly 28% of U.S. adults were current tobacco users in 2013-14, with 18% of adults smoking cigarettes, and nearly 40% of tobacco users using more than one type of tobacco product. The public health impact of tobacco products depends in part on whether and how tobacco users and nonusers transition

in use of products over time. **METHODS:** Adult data from Wave 1 (2013-14) and Wave 2 (2014-15) of the Population Assessment of Tobacco and Health (PATH) Study were analyzed. Tobacco product types were categorized into cigarettes, cigars, hookah, pipe tobacco, smokeless tobacco, and electronic nicotine delivery systems (ENDS); and separately into combustible, non-combustible, and ENDS products. Within each categorization, single- and multiple-product use was considered. Differences in prevalence of current tobacco product use at each wave and rates of within-person transitions in current product use at each wave are reported. **RESULTS:** Prevalence of current use of any tobacco product decreased between waves, from 27.6% to 26.3%; 72% of young adult tobacco users (aged 18-24 years) at Wave 1 transitioned in use of tobacco product(s) at Wave 2, and 46% of older adult tobacco users (aged 25+ years) transitioned in use; transitions were generally more common for non-cigarette tobacco products than for cigarettes. **CONCLUSIONS:** As the tobacco product marketplace in the U.S. changes, transitions in use of non-cigarette tobacco products are common, particularly among young adults; cigarette use is most stable over approximately one year and remains the predominate type of tobacco product used by adults in the U.S.

FUNDING: Federal

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## POS2-107

### FEASIBILITY AND PRELIMINARY IMPACT OF E-CIGARETTE HARMS MESSAGES DELIVERED TO ADOLESCENTS USING TEXT MESSAGING

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**BACKGROUND:** E-cigarette use has been rapidly increasing among adolescents. We conducted a pilot study to assess the feasibility and preliminary impact of harm messages sent to adolescents via text messaging. **METHODS:** We enrolled 69 adolescents who were 14-18 years old and were susceptible to or current users of any tobacco product. Participants completed an online baseline survey on Day 1, received one e-cigarette harm message per day via text messaging for 6 days (Days 2-7), and completed a follow-up survey on Day 8. The messages addressed nicotine/addiction, harmful chemicals, and brain development. Ninety percent of participants took the follow-up survey. **RESULTS:** Participants were 50% female, 88% white, 12% African American, and 7% Hispanic. Mean age was 16.3. Most (87%) participants were susceptible to e-cigarettes and 49% had ever used e-cigarettes. Ninety-two percent provided responses acknowledging receipt of all 6 text messages sent, and they reported that both the frequency (94%) and timing (84%) of messages was "about right." Knowledge about the e-cigarette harms featured in the messages increased, including e-cigarettes contain addictive nicotine (83% at baseline, 92% at follow-up), harmful chemicals (67% to 87%), and may harm teen brain development (49% to 79%). Adolescents were more likely to think about the risks of e-cigarettes at follow-up ( $M=2.56$ ;  $SD=1.10$ ) vs. baseline ( $M=1.63$ ;  $SD=.89$ ) and had greater e-cigarette risk beliefs at follow-up ( $M=3.50$ ;  $SD=.78$ ) vs. baseline ( $M=3.18$ ;  $SD=.88$ ). Adolescents reported that participating in the study was somewhat or very easy (94%), they would do it again (100%), and would recommend it to a friend (97%). **CONCLUSION:** Messages about the harms of e-cigarettes can impact adolescents' thoughts and beliefs about e-cigarettes, and text messaging is a viable way to deliver these messages. Our findings can inform Food and Drug Administration and other efforts to communicate with adolescents about the harms of e-cigarettes and discourage e-cigarette use among adolescents.

FUNDING: Federal

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## POS2-108

### SOCIOECONOMIC STATUS (SES) AND ADOLESCENT SUSCEPTIBILITY TO E-CIGARETTE USE: THE MEDIATING ROLE OF EXPOSURE TO E-CIGARETTE ADVERTISEMENTS

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**SIGNIFICANCE:** Among adolescents, low socioeconomic status (SES) is associated with greater exposure to tobacco cigarette advertising and susceptibility to smoking. However, associations among SES, e-cigarette advertising, and susceptibility to e-cigarette use are not well understood. This study examined exposure to e-cigarette advertisements as a mediator of the relationship between SES and susceptibility to e-cigarette use among adolescents. **METHODS:** Adolescents were 2,448 non-users of e-cigarettes (52% female) from 8 high schools in Connecticut who completed an anonymous survey in Spring 2015. Path analysis was used to examine whether the total number of sources of recent e-cigarette advertising exposure (i.e., TV, radio, billboard, magazines, local stores [gas stations, convenience stores], vape shops, mall kiosks, tobacco shops, social media) mediated the association between SES (measured by the Family Affluence Scale) and susceptibility to e-cigarette use. We clustered for school and controlled for other tobacco product use, age, sex, race/ethnicity, and perceived social norms for e-cigarette use in the model. **RESULTS:** On average adolescents reported recent exposure to 1.9 (SD = 6.6) advertisements. Mediation was supported (indirect effect:  $\beta = .02$ ,  $SE = .01$ , 95% CI [.01, .03],  $p = .005$ ) such that higher SES was associated with greater recent advertising exposure, which, in turn, was associated with greater susceptibility to e-cigarette use. **CONCLUSIONS:** Our study points to a novel pathway for risk for e-cigarette use among high SES youth. Future research should examine these associations longitudinally and evaluate which types of advertisements target different SES groups. Regulations to reduce youth exposure to e-cigarette advertisements may be especially relevant to higher SES youth.

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## POS2-109

### TOBACCO USE AND SEXUAL ORIENTATION DIMENSIONS: DIFFERENCES BY AGE AND DISCORDANCE ACROSS DIMENSIONS

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**SIGNIFICANCE:** Although disparities by sexual orientation are well documented, very little is known about differences in tobacco use across the three major sexual orientation dimensions (attraction, behavior, and identity), by age, or by discordance among the three dimensions (e.g., a mismatch between self-reported sexual identity and sexual attraction such as heterosexual-identified women having sexual attraction only to women). **METHODS:** We used data from the 2012-2013 National Epidemiologic Survey on Alcohol and Related Conditions collected data via in-person interviews with a nationally representative sample of 36,309 non-institutionalized adults. **RESULTS:** Sexual minority respondents showed greater risk than heterosexually oriented respondents for cigarette smoking, any tobacco/nicotine use, and DSM-5 tobacco use disorder across all three major sexual orientation dimensions, especially for bisexual orientation. For example, past-year cigarette smoking was endorsed by 37.0% of men who reported equal sexual attraction to men and women, 45.2% of men who identified as bisexual, and 57.3% of men who reported both male and female sex partners. In contrast, past-year cigarette smoking ranged from 26.0% to 27.8% for heterosexual men across the three dimensions. Elevated rates were most prominent during young and middle adulthood, and these differences dissipated in older adulthood among lesbian and gay respondents but not among older bisexual adults. The odds of any nicotine/tobacco use, cigarette smoking, and DSM-5 tobacco use disorder were significantly greater among sexual identity-attraction discordant women and significantly lower among sexual identity-attraction discordant men. **CONCLUSIONS:** These findings provide valuable new information about sexual minority subgroups that are at higher risk for cigarette smoking and DSM-5 tobacco use disorder. This higher risk is especially true for self-identified bisexual older adults and sexual identity-attraction discordant women. More research is warranted to examine these subgroups. This

information can be used to target smoking cessation and lung cancer screening efforts.

**FUNDING:** Federal

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## POS2-110

### RECEPTIVITY TO TOBACCO ADVERTISING AT WAVE 1 AND PROGRESSION TO TOBACCO USE AT WAVE 2 IN YOUTH AND YOUNG ADULTS IN THE PATH STUDY

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**SIGNIFICANCE:** Restrictions on cigarette marketing contributed to a reduction in cigarette smoking initiation. Marketing for e-cigarettes and other tobacco products has increased rapidly and may predict cigarette trial. We use Wave 1 (2013-14) and 2 (2014-15) data from the nationally representative Population Assessment of Tobacco and Health (PATH) Study to examine whether receptivity to tobacco product advertising among never users is associated with progression of the specific product advertised, as well as cigarette smoking. **METHODS:** We evaluated receptivity to recent advertising for cigarettes, e-cigarettes, cigars and smokeless products, and progression toward tobacco use at Wave 2 among US youth and young adult never tobacco users from Wave 1 (N=10,989). **RESULTS:** Receptivity to any tobacco advertising at Wave 1 was high for 12- to 14-year olds (44.0%, 95% CI, 42.6-45.4), but highest for 18- to 21-year-olds (68.7%; 95% CI, 64.9-72.2). E-cigarette advertising had the highest receptivity for all age groups compared to advertising for other tobacco products. Except for smokeless tobacco, among 12- to 17-year-old committed never users at Wave 1, low receptivity was associated with progression toward ever use of the product at Wave 2 (cigarettes:  $OR_{adj} = 1.24$  [95% CI, 1.07-1.44]; e-cigarettes:  $OR_{adj} = 1.39$  [95% CI, 1.21-1.59]; cigars:  $OR_{adj} = 1.66$  [95% CI, 1.31-2.11]). Moderate/high receptivity was associated with use of the product at Wave 2 (cigarettes:  $OR_{adj} = 2.25$  [95% CI, 1.20-4.23]; e-cigarettes:  $OR_{adj} = 2.37$  [95% CI, 1.50-3.75]; cigars:  $OR_{adj} = 3.54$  [95% CI, 1.60-7.82]). Compared to those not receptive to any product advertising, receptivity to e-cigarette advertising, but not to cigarette advertising, was an independent predictor of 12- to 21-year-olds having used a cigarette at Wave 2 ( $OR_{adj} = 1.50$  [95% CI, 1.00-2.27,  $p < 0.05$ ]). **CONCLUSIONS:** Receptivity to tobacco product advertising predicts progression toward tobacco use in adolescents. Receptivity was highest for e-cigarette advertising, which was associated with trying a cigarette within the next year.

**FUNDING:** Federal

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## POS2-111

### YOUTH PERCEPTIONS OF HARM AND ADDICTIVENESS OF CIGARETTE AND NON-CIGARETTE TOBACCO PRODUCTS: DESCRIPTIVE FINDINGS FROM WAVE 1 (2013-2014) OF THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH STUDY

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**SIGNIFICANCE:** The Population Assessment of Tobacco and Health (PATH) Study enabled examination of US youth perceptions of the harm and addictiveness of cigarettes and seven other tobacco products in a nationally representative sample from the 13,651 Youth Wave 1 Interviews. The primary aim of this study was to examine harm and addictiveness perceptions of tobacco products among youth, relating differences in risk perceptions of future tobacco use defined based on current use, former use, and susceptibility to use among never users. **METHODS:** We evaluated youth respondents (n=13,651) ages 12-17 from Wave 1 (2013-2014) of the PATH Study. Harm perceptions questions included: "How much do you think people harm themselves when they [USE PRODUCT]?", "How long do you think someone has to [USE PRODUCT] before it harms their health?", and "Is [USING PRODUCT] less harmful, about the same, or more harmful than smoking cigarettes?". Comparative harm perceptions of cigarettes were derived from the pattern of responses to other products. Addictiveness perceptions were assessed using the question, "How likely is someone to become addicted to [PRODUCT]?". Analyses focused on refining measures of perceived harm for each product and delineating respondent characteristics (demographic, tobacco use status) associated with the perceived harmfulness and addictiveness of tobacco products. **RESULTS:** Psychometric evaluation supported reliable measures of a continuum of perceived harm and addictiveness across products. Smokeless tobacco, pipe, hookah and e-cigarettes were each perceived as having significantly lower harm (p's<0.05) than cigarettes, with the lowest ratings of harmfulness and addictiveness observed for hookah and e-cigarettes (p's<0.001). Incrementally lower levels of harm perceptions were observed among youth at increasing risk for tobacco use (p's<0.05). **CONCLUSIONS:** Among US youth, lower perceptions of harm and addictiveness of tobacco products were associated with escalated risk for use. Longitudinal assessments from the PATH Study will provide key information on changes in youth perceptions of harm and addictiveness, and their influence on patterns of tobacco use.

**FUNDING:** Federal

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## POS2-112

### INVESTIGATING ASSOCIATIONS BETWEEN OBJECTIVE MEASURES OF SMOKE EXPOSURE AND LATER E-CIGARETTE USE: EVIDENCE FROM A LONGITUDINAL UK COHORT STUDY

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**BACKGROUND:** Biomarkers can be used to assess smoking status more accurately and objectively than self-report. E-cigarettes are popular among young people and concerns have been raised over the potential of e-cigarettes to act as a gateway to smoking among non-smokers. This study aimed to assess the associations of biomarkers of smoking with later e-cigarette use to explore whether under-reporting of smoking could influence studies of e-cigarette use among reported "non-smokers". **METHODS:** Associations of biomarkers of smoking at 15-17 years with self-reported e-cigarette ever use at 22 were analysed using logistic regressions in the Avon Longitudinal Study of Parents and Children (N=3965). The primary analysis biomarker, cotinine, indicated no short-term smoke exposure, passive exposure or active smoking. In the secondary analysis, decreased aryl hydrocarbon receptor repressor [AHRR] methylation indicated long-term smoke exposure. A range of potential confounders (age, sex, batch, cell count, body mass index, alcohol use and smoke exposure) were adjusted for. Misre-

porting of smoking status was indicated by adjusting for self-reported smoking status at 16. **RESULTS:** Cotinine levels consistent with active smoking at 15-17 years were associated with increased odds of e-cigarette ever use at 22 years (OR=7.24, 95% CI 3.29, 15.93; N=1194) even when self-reported smoking behaviour at age 16 was included in the model (ever smoking, OR=5.00, 95% CI 2.25, 11.14; number of cigarettes smoked, OR=2.35, 95% CI 0.98, 5.62; active [weekly/daily] smoking, OR=3.15, 95% CI 1.32, 7.48). There was weak evidence of an association between increased AHRR methylation at 15-17 years and decreased odds of e-cigarette ever use at 22 years (OR per percentage increase in methylation=0.95, 95% CI 0.90, 1.00; N=410). **DISCUSSION:** Cotinine levels consistent with smoking in adolescence were strongly associated with increased odds of later ever e-cigarette use. Weak associations remained after adjusting for smoking behaviour at age 16 indicating self-reports were inaccurate. Therefore, inaccurate self-reported smoking status may bias studies exploring e-cigarette use in reported "non-smokers".

**FUNDING:** Academic Institution; Nonprofit grant funding entity

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## POS2-113

### ADVERTISING AND SOCIAL FACTORS PREDICTING ENDS USE AMONG HISPANIC YOUNG ADULTS

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**SIGNIFICANCE:** ENDS products have gained popularity among college students, including Hispanics. Research suggests that peer influences, living with tobacco users, and being receptive to tobacco marketing are positively associated with tobacco use. However, there is limited information examining the relationship between these factors and ENDS use among Hispanic young adults. **METHODS:** Participants were 1,126 Hispanic students (M age=20.40, SD age= 2.27) of the Marketing and Promotions across Texas (M-PACT) Project. Students were recruited from 24 two- and four-year colleges in Texas. Self-reported exposure to ENDS advertising was measured with one item, "When you visited the stores above, how often did you see signs marketing ENDS products?". Response options ranged from 1= Never/not that I remember to 4= Every time. Current ENDS use was measured by asking participants, "During the past 30 days, have you used any ENDS product (i.e. an e-cigarette, vape pen, e-hookah, or mod), even one or two puffs, as intended (i.e. with nicotine cartridges and/or e-liquid/e-juice)?" Response options included "yes" or "no". Peer ENDS use was measured with one item, "How many of your close friends smoke/use ENDS products?". Responses ranged from 1=None to 5=All. Finally, household ENDS use was measured with one item, "Does anyone you live with now use ENDS products?". Responses options were 0=No, 1=Yes, and 3= I don't know. A multivariate logistic regression model was used to examine the association between exposure to ENDS advertising, peer ENDS use, household ENDS use, and current ENDS use after six months, controlling for age and sex, adjusting for school clustering effect. **RESULTS:** Exposure to ENDS advertising (OR: 1.56, CI: 1.23, 1.99, p<.01), peer ENDS use (OR: 1.94, CI: 1.54, 2.47, p<.01), and living with someone who uses ENDS (OR: 1.37, CI: 1.11, 1.68, p<.01) predicted current ENDS use among Hispanic college students. **CONCLUSION:** Findings from this study highlight the need for interventions and policies that result in changes to the social and physical environment as they can help reduce ENDS use among young adults, including Hispanics.

**FUNDING:** Federal

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## POS2-114

### DOES CHANGE IN PERCEPTION OF TOBACCO RISK AFFECT SMOKERS' BEHAVIOR? AN EMPIRICAL ANALYSIS

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Information dissemination on harmful effects of tobacco has always been a major tool for reducing tobacco consumption in all countries. It is widely believed that exposing smokers to the right information on tobacco risk will eventually lead them to quit smoking or at least reduce tobacco consumption. Two main issues are addressed in this paper. First, this paper wants to observe how Perception of Tobacco Risk (PTR) varies among different types of smokers (cigarettes, bidi and quitters) and non-smokers across different socio-demographic backgrounds. Second, it examines among the cigarette smokers across different socio-demographic groups how changing PTR over the years influences their behavior towards smoking. The panel data from International Tobacco Control (ITC) Bangladesh is used in this paper. By observing individuals over a length of time, this paper develops a yearly Perception of Tobacco Risk Index (PTRI) for all smokers and non-smokers. RESULTS: show that among all different types of smokers, quitters have the highest PTRI whereas bidi (cheap local alternative to cigarettes) smokers have the lowest. Among the different socio-demographic groups the higher income, more educated, and those living in urban areas display a higher PTRI than their respective counterparts. However, when looking at a change in PTRI over the years, it is observed that the change is bigger among the lower income, less educated and those living in rural areas. Analysis of panel data reveals that the change in PTRI is positively correlated with the probability to quit smoking for most socio-demographic groups. However, increase in PTRI does not significantly affect initiation of smoking and reduces cigarette consumption per day only for the more educated group. Such results hold strong policy implications. First, they show that changing PTR holds promising implications for controlling tobacco consumption concerning raising quitting probability. Second, they bring into light, specific socio-demographic groups where policies to change PTR should be targeted.

FUNDING: Nonprofit grant funding entity

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## POS2-115

### TOBACCO PRODUCT INITIATION CORRELATED WITH CROSS-PRODUCT CHANGES IN TOBACCO HARM PERCEPTIONS: LONGITUDINAL ANALYSIS OF POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY YOUTH COHORT

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SIGNIFICANCE: Use of  $\geq 1$  types of tobacco among youth predicts initiation with additional tobacco products. Experience using one tobacco product may affect perceived harm of other products, possibly influencing subsequent initiation. OBJECTIVE: Evaluate longitudinal changes in perceived tobacco-related harm and how such changes correlate with trying tobacco products. METHODS: For each of cigarettes, e-cigarettes, hookah, and smokeless tobacco (ST), baseline tobacco never-users (age: 12-16; 50% female) who completed PATH Youth Waves 1 & 2 (N=7,984) rated perceived harm to health on a 4-point scale ("no harm" to "a lot") in both waves. For each product, we estimated the association between a decrease in harm rating (e.g., from "some" in Wave 1 to "little" in Wave 2), or an increase in harm rating, with new trial (from never- to ever-user) of cigarettes, e-cigarettes, hookah, ST, and other combustibles (e.g., pipes, cigars) using multivariate probit regression (multiple outcomes), adjusting for socio-demographic variables and other tobacco risk factors. RESULTS: Of initial tobacco never-users, 10.4% tried a tobacco product between Waves 1 & 2, most often e-cigarettes (64.5% of new triers). Perceiving less harm at follow-up than at baseline varied by product (cigarettes: 10.2%; e-cigarettes: 21.2%; hookah: 26.0%; ST: 15.8%), as did perceiving more harm (cigarettes: 9.5%; e-cigarettes: 28.9%; hookah: 23.2%; ST: 20.6%). Compared to persistent tobacco never-users, those who tried a product were consistently more likely to reported decreased harm of that same product. Additionally, trial of other combustibles was independently and statistically significantly associated with perceiving decreased harm of all other products at follow-up. Trial of e-cigarettes was associated with lowered hookah harm perception; hookah trial was associated with lowered ST harm perception. CONCLUSIONS: Trying a tobacco product is correlated with a decrease in perceived harm of that same prod-

uct. Additionally, trial of some products is independently correlated with changes in perceived harm of other products, suggesting a potential mechanism from use of one product type to initiation with another.

FUNDING: Federal

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## POS2-116

### LATENT CLASS ANALYSIS OF YOUNG ADULT CANNABIS USERS: EXPLORING DIFFERENCES IN TOBACCO CONSUMPTION

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SIGNIFICANCE: Despite the variety of cannabis administration methods (i.e., bong, edibles), users are often considered a homogenous group. Many cannabis administration methods involve simultaneous tobacco use (e.g., blunt) that may influence concurrent tobacco use patterns, but this relationship is relatively unexplored. The current study aimed to identify subgroups of cannabis users based on cannabis administration methods using a latent class analysis (LCA) and compare their use of tobacco products. METHODS: Past 30-day cannabis users were selected from an online survey of undergraduates collected in 2017 (n=208/446). LCA indicators were frequency of cannabis administration methods in the past 30 days with joints, blunts, pipe/bowl, and bong using a 3-point scale (0, 1-10, 10+ times) and edibles and rig/vaporizer using a binary scale (yes, no). Past 30-day tobacco use by product (i.e., cigarette, little cigar, hookah, electronic cigarette [ECIG]) was compared between classes. RESULTS: LCA identified four classes: Low-Blunt, Low-Bong, Mod-Poly, and High-Poly. The Low-Blunt class was the largest (60%) and was characterized by blunt use at low frequencies (1-10 times). The Low-Bong class (24%) primarily involved bong use at low frequencies (1-10 times). The Mod-Poly class (13%) was characterized by use of all cannabis methods at various frequencies. The High-Poly class was the smallest class (4%) and included participants who used all cannabis methods at high frequencies. Low-Blunt and Low-Bong users had similar rates of little cigar (16%) and hookah (10%) use. Low-Bong users smoked cigarettes (37% vs. 24%) and used ECIGs (16% vs. 5%) at a greater rate than Low-Blunt users. Mod- and High-Poly classes had the highest rates of use across products (except hookah). Cigarette and little cigar use were the most common across classes. CONCLUSIONS: Cannabis users differed in their administration method use and these use patterns were associated with differential tobacco use characteristics. Results are informative and support the integration of cannabis and tobacco cessation efforts as simultaneous (blunts) and concurrent tobacco/cannabis use patterns were so prevalent.

FUNDING: State; Federal

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## POS2-117

### CORRELATIONS BETWEEN OBJECTIVELY AND SUBJECTIVELY ASSESSED EXPOSURES TO TOBACCO MARKETING IN RETAIL OUTLETS AMONG YOUTH AND YOUNG ADULT TEXAS STUDENTS

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SIGNIFICANCE: Two commonly used measures of tobacco marketing at retail tobacco outlets (RTOs) include self-reported exposure and direct observation. Both methods have strengths and limitations, and can be useful in estimating tobacco marketing exposure and its impact on tobacco use. Here, we determine the correlation between self-reported and objectively measured exposure to cigarette and e-cigarette marketing in RTOs. METHODS: Students in grades 6, 8 and 10 (~N=226,524) and students in 24 colleges (n=3,676) in Texas self-reported their exposure to cigarette and e-cigarette marketing at RTOs within a half-mile radius and one-mile radius, respectively, around their schools/colleges in 2014-15. Trained data collectors audited these outlets for cigarette and e-cigarette marketing. Self-reported exposure was weighted by how often the student visited RTOs



near their school/college to obtain weekly self-reported exposure. Similarly, objective RTO data also were weighted by how often the student visited RTOs near their school/college to obtain weekly objectively measures of exposure. Spearman rank correlation coefficients between self-reported and objectively assessed exposure to marketing, accounting for clustering within schools, were estimated. RESULTS: Among young adults, correlations for cigarette marketing at tobacco/vape stores and convenience stores were 0.75, and 0.59 respectively. Similarly, correlations for e-cigarette marketing were 0.74 and 0.58, respectively. Among adolescents, the correlations were 0.48 for cigarette and 0.19 for e-cigarette marketing exposure combined across gas/convenience and grocery stores. CONCLUSIONS: Correlations between the two measures varied by product type, RTO type, and between youth and young adults, indicating that while they do provide overlapping information, the two measures may capture slightly different information about the RTO marketing environment. Thus, both are useful measures to document retail tobacco marketing. Further, the moderate to high correlations, especially among young adults, suggest self-reports provide meaningful measures of the RTO marketing environment.

FUNDING: Federal

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## POS2-118

### E-CIGARETTE USE AMONG YOUTH NOT SUSCEPTIBLE TO USING CIGARETTES

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SIGNIFICANCE: Prior research suggests that youth who use electronic cigarettes (e-cigarettes), including youth not susceptible to smoking cigarettes (i.e., youth who have never smoked and are not attitudinally susceptible to using cigarettes), are more likely to initiate using cigarettes or other combustible tobacco products than youth who do not use e-cigarettes. In this study, we examine correlates of e-cigarette use and susceptibility among youth not susceptible to future cigarette smoking. METHODS: We used data on high school students from the 2015 North Carolina Youth Tobacco Survey (n=1,627). SAS logistic regression survey procedures were used to account for the complex survey design and sampling weights. RESULTS: Increasing perceived harm of e-cigarettes was associated with lower odds of susceptibility to using e-cigarettes (aOR: 0.79, 95% CI: 0.65, 0.96) and current use of e-cigarettes (aOR: 0.43, 95% CI: 0.25, 0.72). Similar patterns were found for perceived harm of e-cigarette vapor. Exposure to e-cigarette vapor in indoor or outdoor public places was positively associated with susceptibility to using e-cigarettes (aOR: 1.96; 95% CI: 1.33, 2.91) and with current e-cigarette use (aOR: 5.69; 95% CI: 2.57, 12.61). CONCLUSIONS: To prevent youth initiation of e-cigarettes and future tobacco product use, particularly among youth not susceptible to smoking cigarettes, educational campaigns could target harm perceptions associated with e-cigarettes. In addition, regulations that limit youth exposure to e-cigarettes in public places may decrease e-cigarette use by non-susceptible youth.

FUNDING: Federal

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## POS2-119

### PUBLIC BELIEFS ABOUT INDOOR E-CIGARETTE USE TRIGGERING SMOKE DETECTORS

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BACKGROUND: The triggering of smoke detectors by indoor e-cigarette use has become an emerging issue, causing unnecessary evacuations at airports, hotels, apartment buildings, university dorms, and high schools. Little is known about public beliefs about e-cigarette use setting off smoke detectors. METHODS: We recruited a convenience sample (n=843) of adults through Amazon's Mechanical Turk to complete an online questionnaire, and asked "Do you think that using an e-cigarette indoors can set off a smoke alarm?" and "Have you ever heard of a

smoke alarm going off because of someone using an e-cigarette indoors?". After responding to these two items, participants were asked identical questions about regular cigarettes. RESULTS: All respondents resided in the US, a majority were male (56%), 81% identified as White, 41% were < 29 years of age, and 51% had a bachelor's degree or higher. Overall, < 20% believed that indoor e-cigarette use could set off a smoke detector. In contrast, 70% believed indoor cigarette smoking could set off a smoke detector (p<0.001). Similarly, only 5% of respondents reported ever hearing of an e-cigarette setting off a smoke detector, compared to 43% hearing of a cigarette setting off a smoke detector (p<0.001). Among current e-cigarette users, 20% believed that e-cigarettes could set off a smoke detector, compared to 19% of non-e-cigarette users (p=0.758). By education, belief that e-cigarette use could set off a smoke detector was highest among respondents with a bachelor's degree or higher (24%) and lowest among respondents with a high school diploma or less (9%; p=0.001). CONCLUSIONS: Educational campaigns are needed to inform e-cigarette users about the risk of triggering smoke detectors. Moreover, policymakers need to be educated, as including e-cigarettes in smokefree legislation could help reduce smoke detector false alarms, unnecessary evacuations, and prevent the wasting of financial and fire-related resources.

FUNDING: Federal

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## POS2-120

### BACTERIAL COMMUNITY SHIFTS WITH CHANGES IN NICOTINE LEVELS AND MENTHOLATION IN CIGARETTES

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Novel research is needed to characterize the microbial constituents of tobacco products and their associated adverse health effects. In previous studies characterizing bacterial community in commercially-available cigarettes, we have shown a significantly different array of bacteria across different brands, also affected by mentholation. Despite their critical importance in infectious and chronic diseases, microbial constituents of tobacco products still lack detailed characterization. Specifically, there has been no comprehensive characterization aimed at assessing the effect of nicotine on the bacterial communities present in cigarettes. We conducted time-series experiments with six mentholated and six non-mentholated NIDA research cigarettes with different nicotine levels. Samples were incubated under 3 different storage conditions with varying temperature and relative humidity. Sub-samples were harvested at days 0, 5, 9 and 14 for DNA extraction using enzymatic and physical lysis of tobacco, followed by PCR amplification of the V3V4 region of the 16S rRNA gene, and sequencing. Sequences were analyzed using the QIIME analysis software, and R. Overall, ~2,600 species-level operational taxonomic units (OTUs) were identified from more than 10 million sequences across 288 samples. Alpha diversity analyses showed significant differences (p<0.005) in Observed OTUs with different nicotine levels, and between mentholated and non-mentholated products with similar nicotine levels. Beta diversity analysis using Bray-Curtis dissimilarity also found significant differences between mentholated and non-mentholated products (ANOSIM R= 4.7%, p<0.005). 3.1% (p<0.005) of the bacterial diversity was explained by days in incubation and 13.8% (p<0.005) by levels of nicotine content. Actinobacteria, Bacteroidetes, Firmicutes, Proteobacteria and Saccharibacteria were the top 5 phyla found across all the products. Additional analyses are currently ongoing to characterize these differences in greater detail. This study is the first to characterize the effect of varying levels of nicotine on bacterial communities present in cigarettes.

FUNDING: Federal

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## POS2-121

### PREDICTING CIGARETTE INITIATION AND RE-INITIATION AMONG ACTIVE DUTY AIR FORCE RECRUITS

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Military personnel have among the highest rates of tobacco use in the US and are underserved with respect to tobacco control efforts. Spanning the career of an active duty Air Force enlisted member, the first year of service is a particularly vulnerable moments for tobacco use. All enlisted Air Force recruits are required to remain tobacco free for the first 12 weeks of their military service, and the constraints of their training make it virtually impossible to violate this ban. In addition, most Airmen are completely confident they will remain tobacco free. However, the majority return to smoking once the ban is lifted and many non-smokers initiate. Thus, understanding factors associated with cigarette smoking initiation (among nonusers) and re-initiation (among former users) is important. The current study examines patterns of cigarette smoking among a sample of 2,395 new Air Force recruits (74.9% male; 20.5(2.3) years mean age(SD); 69.6% White; 13.9% Hispanic) over their first year of service. Logistic regression analyses were conducted to examine associations between baseline predictors and initiation and re-initiation of cigarette smoking at a one-year follow-up. In the final models, the strongest predictors of initiation in comparison to never users, were intending to use a tobacco in the future (ORs range 1.99 to 2.89) and owning cigarette-branded merchandise (OR 3.81, 95% CI 1.67, 8.71). Compared to former users who chose not to re-initiate, the strongest predictor of re-initiation was intention to use tobacco (OR 2.08, 95% CI 1.53, 2.83). Compared to initiators, the strongest predictors of re-initiation were prior tobacco use (ORs range 2.37 to 4.63) and intentions to use tobacco (ORs range 1.85 to 2.46). We will discuss how our results can be used to develop effective interventions for Airmen in training. While this study focuses on a specific population, the diversity of new recruits into the Air Force can inform cessation efforts in both civilian and military settings.

FUNDING: Federal

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## POS2-122

### THE INTERACTIVE INFLUENCE OF GENDER, ACCULTURATION, AND EDUCATION ON CURRENT SMOKING AMONG LATINOS OF DIFFERENT NATIONAL BACKGROUNDS

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SIGNIFICANCE: Research has assumed that as Latinos acculturate, they will smoke at higher rates. The present study investigated the relationship between acculturation level, educational attainment, and cigarette smoking by gender and national background among diverse Latinos. METHODS: Data from the 2009-2012 National Health Interview Survey were analyzed and included gender, national background, acculturation level, educational attainment, and current smoking. Participants included 1,111 Cubans, 813 Dominicans, 13,281 Mexicans, 2,197 Puerto Ricans, and 3,591 Central and South Americans. Multivariable logistic regression was used to model acculturation and educational predictors of current smoking, stratified by gender and national background. Predictors included acculturation level and educational attainment. Stratifying variables included gender and national background. The main outcome variable was current smoking, as defined by self-reported cigarette smoking every day or some days among those who ever smoked at least 100 cigarettes. RESULTS: Most respondents were interviewed in English (62%) and had a high school education or less (60%), but only 39% were U.S. born. Overall, 17.8% men and 9.6% women reported current smoking. By national background, smoking prevalence was highest among Puerto Ricans (16% of women and 23% of men) and lowest among Dominicans (6% of women and 10% of men). More acculturated Mexican women and men had significantly higher odds of current smoking (aOR=2.94; 95% CI=2.01, 4.31 and aOR=1.62; 95% CI=1.23, 2.14; respectively). Mexican men who were more acculturated and educated had lower odds of smoking (aOR=0.66; 95% CI=0.48, 0.92) compared to their less acculturated and educated counterparts. CONCLUSIONS: The relationship between acculturation and health behaviors among Latinos is influenced by education and both factors, in addition to gender and national background, and should be considered by public health and clinician stakeholders when developing or adapting tobacco control strategies.

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FUNDING: Academic Institution; Federal

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## POS2-123

### E-CIGARETTES, VAPE PENS, OR MODS: WHAT DO YOUNG ADULTS CALL THEM?

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SIGNIFICANCE: There are 460+ brands of electronic nicotine delivery systems (ENDS), presenting challenges to surveillance. The purpose of this study was to understand what terms young adults employ to describe ENDS, and to identify individual characteristics associated with correctly identifying the device as an ENDS versus a non-ENDS, such as cigarettes, marijuana, or non-tobacco products. METHODS: We randomized Truth Initiative Young Adult Cohort participants (n=3,354) to view ENDS images (Cigirex, a white cigalike ENDS; blu, a black cigalike ENDS, EZ Cig, a pink and green cigalike ENDS; a black e-Go T; and an orange Joyetech eVic VT). We classified participants' qualitative responses into 1 of 9 classifications: "e-cigarette," "e-hookah," "vape-related," "mod," "other or more than one kind of ENDS," "marijuana-related," "non-ENDS tobacco product," "misidentified," and "don't know." We used weighted logistic regression models to identify demographic correlates of correctly identifying the ENDS. RESULTS: The majority of participants identified the devices as some type of ENDS (57.7%-83.6% depending on the type); however, participants used terms such as vape, e-cigarette, and e-hookah to identify the same device. The Cigirex, e-Go, and Joyetech caused confusion, with a large proportion of "don't know" responses (12.2%-25.05%), or misidentification as a combustible tobacco product (1.4%-14.6%) or as a non-tobacco/non-ENDS product (3.4%-16.1%). Non-Hispanic Blacks (aOR 0.32, 95% CI 0.16, 0.63) and Hispanics (aOR 0.39, 95% CI 0.22, 0.70) were less likely to correctly identify the e-Go than non-Hispanic whites; Hispanics were also less likely to correctly identify the blu and the Joyetech. Education and income were also related to correctly identifying the e-Go and the mod. Occasional alcohol drinkers were 1.74 (95% CI 1.19, 2.54) times more likely to identify the mod than non-drinkers. CONCLUSIONS: Consistency in terminology varies among young adults and knowledge of ENDS differs by sociodemographics. These findings provide a basis for development of more robust survey items to identify not just ENDS use, but subtypes of ENDS use.

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## POS2-124

### TOBACCO REGULATION AT THE POINT-OF-SALE IN KOREAN COMMUNITIES

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The Food and Drug Administration (FDA) has authority to regulate tobacco products at the point of sale. Levels of compliance with tobacco regulation tend to be relatively low in Korean (K) communities. However, little data exists regarding knowledge, attitudes and beliefs about tobacco products and regulation at the point of sale of the Korean community. METHODS: We examined knowledge, attitudes and beliefs of Korean community key opinion leaders (KOL) and independent tobacco retailers regarding FDA tobacco regulations. 100 retailers in low-income Korean communities in Los Angeles were interviewed, and two focus groups (n=8-12 each) were conducted with KOLs from various sectors of the community, including education, religion, business, health, and media. RESULTS: Focus Groups re-





vealed some negative attitudes among KOLs related to FDA: "FDA doesn't really care about health. They only check off categories of ingredients and substances". "Cigarettes are not even food or drugs" "They are not doing their job". However, when retailers in the Korean community were interviewed, 67% said the FDA is a trustworthy source of information regarding tobacco rules; 62% stated the FDA has the authority to regulate tobacco in their own stores; and 33% actively searched for information regarding tobacco products. 38% of retailers in the Korean community stated they received information directly from the FDA. Further, 16% of retailers in the Korean community believed that e-cigarettes were safer than combustible cigarettes and 85% believed that e-cigarettes and other vaping products contribute to young people becoming addicted to nicotine. CONCLUSION: Due to some positive perceptions of the FDA by retailers, opportunities exist to work with Korean retailers to increase knowledge regarding FDA regulations. However, more work is needed to inform KOL in the Korean community of the FDA's role in tobacco regulation and increase its credibility. Tobacco messaging regarding e-cigarettes may be useful in this community.

FUNDING: Federal

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## POS2-125

### LOVE AT FIRST PUFF: POSITIVE FIRST EXPERIENCE OF CIGARILLO USE

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**SIGNIFICANCE:** Research has shown that a positive experience of cigarette initiation is related to the development of nicotine dependence and current smoking behaviors. This relationship, however, has not been thoroughly examined for the use of little cigars and cigarillos (LCCs). We examine users' descriptions of their initiation with LCCs and explore its relationship with product use. **METHODS:** We analyzed thematically an open-ended screener question about LCC initiation from a survey on LCC use. The population included 14-28 year olds who smoked two or more cigarillos per week. Using descriptive statistics, we examined demographics and cigarillo use in the last 7 days of respondents reporting a positive first experience and those who did not. **RESULTS:** Of the 985 who took the screener and were eligible for the survey, 54 expressed a positive first experience (PFE) with LCCs. Of these, 31 reported liking and enjoying the experience and 23 discussed loving product attributes and falling in love with the experience. Others experienced an immediate hook or addiction upon first use. This is in contrast to descriptions of initiation that included the situational context of initiation, the relationship of initiation to other substance use, and life circumstances at the time of initiation. These other reasons lacked the passionate response of PFE, the focus of this analysis. While 29.9% of the 931 non-PFE group reported using >7 cigarillos in the week prior to the screener, this behavior was reported by 38.9% of the 54 PFE respondents, although not significantly different. **DISCUSSION:** In this sample, 5% expressed a positive first experience with LCCs. A deeper exploration of PFE and perceptions of risk, nicotine dependence, and the trajectory of use patterns can provide insight into how messaging of the harms and addictiveness of LCC might be crafted to reduce initiation and use of these products.

FUNDING: Federal

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## POS2-126

### INCREASING AWARENESS AND CREDIBILITY OF FDA AS A TOBACCO REGULATOR: RESULTS OF A 2016-2017 US NATIONAL SURVEY OF ADULTS

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**SIGNIFICANCE:** The FDA was granted regulatory authority over tobacco products in 2009, yet surprisingly studies report low public awareness that FDA regulates tobacco products. The current study examines awareness of FDA tobacco regulation and their credibility as a tobacco regulator among adults in the US in 2016-2017. **METHODS:** Data from a national phone survey of 4964 adults conducted from

August 2016 to May 2017. Survey items assessed awareness and trust of FDA, knowledge that FDA regulates how tobacco products are made, advertised, sold, and awareness that FDA communicates the risks of tobacco products to the public. Survey items also assessed credibility of FDA with an 8-item scale. **RESULTS:** Over 90% of adults who participated in the survey reported that they had heard of FDA. Among those who had heard of FDA, almost half reported that they know that FDA regulates how tobacco is made (49%), and over half that FDA regulates how tobacco is advertised (60%) and sold in stores (62%). A larger percentage reported that FDA communicates the risks of tobacco to the public (71%). A majority also felt that the FDA is honest about the risks of tobacco products (69%), are capable of doing a good job regulating tobacco products (70%), and almost half (44%) believed the FDA is an expert on regulating tobacco products. Public awareness and credibility of FDA as a tobacco regulator increased across multiple dimensions from 2014-2015 to 2016-2017. **CONCLUSIONS:** Public awareness and credibility of the FDA role in tobacco regulation have increased. Ongoing efforts to educate the public about FDA regulatory and communication roles on tobacco are likely to increase perceptions of FDA credibility.

FUNDING: Federal

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## POS2-127

### CIGARETTE BRAND PREFERENCES OF ADOLESCENT AND ADULT SMOKERS IN THE UNITED STATES

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**SIGNIFICANCE:** The forces that influence smoking initiation and maintenance are undoubtedly complex, but advertising and promotion play an important role. Despite restrictions on where and how cigarette companies can market their products, cigarettes remain one of the most heavily promoted consumer products in the US. Examining the brand preferences of smokers may provide clues to understanding how shifting consumer preferences and industry marketing strategies are influencing smoking-related behaviors. **METHODS:** This study presents estimates of cigarettes brand preferences of youth (ages 12-17) and adults (18+) in the US. Data were available for 10,509 adults and 283 youth current cigarette smokers from the Population Assessment of Tobacco and Health (PATH) Survey Wave 1. Only respondents who reported purchasing their own cigarettes were included. **RESULTS:** Respondents reported 64 different cigarette brands, with a greater number of sub-brands among older respondents. The most popular brands smoked by youth and adults were Marlboro (56.3% vs 40%), Newport (16.8% vs 15%), and Camel (14.7% vs 10%), respectively. Mentholated cigarettes were smoked by 40.4% of youth, and 38.5% of adults with a higher preference for menthol brands among younger adults (47.8%), Hispanics (46.2%), and African Americans (86.6%). Discounted brands were more popular among adults (16.4% than youth (4.1%). **CONCLUSIONS:** Price discounting and the use of menthol flavoring appear to be important marketing features of contemporary cigarettes.

FUNDING: None

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## POS2-128

### PERCEIVED MESSAGE EFFECTIVENESS OF ANTI-TOBACCO ADVERTISEMENTS: A SYSTEMATIC REVIEW

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**BACKGROUND:** Target audience perceptions of anti-tobacco advertising effectiveness, also known as perceived message effectiveness (PME) ratings, are increasingly used during message development and selection. Despite this, little is known about the conceptual and methodological characteristics of extant PME measures used in studies of anti-tobacco print, video, and radio advertising. **METHODS:** We systematically reviewed 75 studies conducted from 1983 to 2016 in 21 countries. Two independent coders coded sample, study design, message, and PME measurement characteristics. Coded categories included PME persua-



sive constructs, use of referents (e.g., me, others, people my age), referencing of behavior (e.g., smoking), number of items, coefficient alpha, and response scales. Mean percent agreement was 95%. **RESULTS:** We identified 126 measures representing 9 persuasive categories which included 16 unique PME constructs. The most commonly assessed PME constructs were argument strength (31%), cognitive elaboration (31%), personal relevance (29%), credibility (27%) and motivation to act (26%). The least assessed constructs were message agreement (6%), memorability (7%), interpersonal communication (7%), interest (8%), and general effectiveness (8%). Seventy percent of measures used referents, with 81% of those measures employing a referent of "me." Only about half of measures (52%) referenced tobacco products or smoking behaviors. The number of items in measures ranged from 1 to 13 ( $M = 3.46$ ,  $SD = 2.51$ ), with 30% being single items. Coefficient alpha of multi-item scales ranged from .59 to .95 ( $M = .82$ ,  $SD = .13$ ). Most response scales were five (58%) or seven (29%) point scales applying agreement (62%), quantity (20%), or semantic differential (15%) formats. **CONCLUSIONS:** Considerable variability exists across PME measures used in anti-tobacco advertising. Current measures vary greatly in terms of their underlying persuasive constructs, use of referents, and referencing of behavior, as well as on methodological characteristics. Greater consensus is needed on best practices for assessing PME to more precisely gauge the potential effectiveness of anti-tobacco advertising.

FUNDING: Federal

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## POS2-129

### SOURCES USED TO OBTAIN ELECTRONIC VAPOR PRODUCTS AMONG US ADULTS, 2017

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**SIGNIFICANCE:** Monitoring where users obtain electronic cigarettes and other electronic vapor products (EVPs) can help inform tobacco product regulation and tobacco control practice. While scanner data exist on EVP sales in traditional retail outlets, these data do not capture all sources, including "vape shops." This study assessed the sources where U.S. adults obtained EVPs in 2017. **METHODS:** Data came from the 2017 *Styles* survey, an Internet survey of U.S. adults aged  $\geq 18$  years ( $N = 4,107$ ; response rate = 74%). Ever users of EVPs (use  $\geq 1$  time in lifetime;  $n = 591$ ) were asked to select all sources they had ever obtained EVPs from nine options. Descriptive statistics were used to assess the three most common sources where EVPs were obtained, both overall and by cigarette smoking status (never, former and current). **RESULTS:** Overall, 15.0% of respondents (95% confidence interval: 13.8-16.3) ever used EVPs. Among ever EVP users, 78.3% (74.5-82.0) selected a single source where they obtained EVPs. Among ever EVP users, the three most common sources where EVPs were obtained were another person (28.7%, 24.4-32.9), a "vape shop" (20.6%, 16.9-24.3), and a tobacco specialty store (16.5%, 13.0-19.9). Among current cigarette smokers, the most common sources were a tobacco specialty store (22.6%, 16.6-28.6), a "vape shop" (22.1%, 16.2-27.9), and a gas station (21.8%, 16.1-27.4). Among former smokers, the most common sources were another person (29.0%, 21.7-36.2), a "vape shop" (17.6%, 12.1-23.0), and a tobacco specialty store (13.7%, 8.3-19.1). Among never smokers, the most common sources were another person (51.3%, 41.1-61.5), a "vape shop" (21.8%, 13.2-30.3) and a tobacco specialty store (9.0%, 3.9-14.0). **CONCLUSIONS:** Among U.S. adults who have ever used EVPs, the primary sources where they obtained EVPs were another person, a "vape shop", or a tobacco specialty store. Obtaining the products from another person was more common among never cigarette smokers, while "vape shops" and tobacco specialty stores were more common among current and former smokers. Continued surveillance of EVP access patterns is important to inform tobacco product regulation and tobacco control practice.

FUNDING: Federal

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## POS2-130

### PREDICTORS OF SMOKING CESSATION ASSISTANCE IN PRIMARY CARE CLINICS SERVING VULNERABLE POPULATIONS

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**SIGNIFICANCE:** Significant disparities in smoking rates exist in the United States. Community health centers (CHCs) and public health clinics are important resources for reducing smoking disparities, as they serve patients with high smoking prevalence. To further our understanding of smoking cessation assistance in these settings, we examined factors associated with provision of smoking cessation medication orders, counseling, and a comprehensive approach of both ordering medication and counseling. **METHODS:** Electronic health records (EHR) data were extracted from the OCHIN network of clinics across the US from patients  $\geq 18$  years of age with indication of 'current smoker' at  $\geq 1$  primary care visit in 2014-2016. Assistance was dichotomized (coded 'yes' if assistance documented at  $\geq 1$  visit in study period). Patient covariates included sex, age, race/ethnicity, household income as percent of federal poverty level (FPL), medical and psychiatric comorbidities, number of visits, insurance type, readiness to quit smoking, and urban/rural primary clinic. Multinomial logistic regression was used to model odds of receipt of smoking cessation assistance (4 categories: none (ref), medication order, counseling received, or both) by covariates. **RESULTS:** Of the 469,514 patients with  $\geq 1$  visit to a study clinic, 29.6% were identified as a current smoker. Location of patient's primary clinic, FPL, and cancer diagnosis were not associated with the odds of receipt of smoking cessation assistance. For all three types of cessation assistance, odds of assistance were higher among those with more visits, those assessed for readiness to quit, and patients with asthma/COPD, and coronary artery disease. All other characteristics were associated with odds of receipt of at least one type of assistance, with more similar predictors among those with medication orders and those with both orders and counseling, compared to counseling only. **CONCLUSIONS:** Characteristics of patients seen in CHCs and public health clinics are associated with differing odds of smoking cessation assistance. This knowledge could lead to targeted interventions to decrease smoking rates among our vulnerable populations.

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## POS2-131

### SMOKING CESSATION AMONG YOUNG ADULT DUAL USERS OF E-CIGARETTES AND TOBACCO CIGARETTES IN A MOBILE PHONE INTERVENTION: ANALYSIS OF DATA FROM A RANDOMIZED CONTROLLED TRIAL

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**SIGNIFICANCE:** Dual use of e-cigarettes and tobacco cigarettes has increased in the past few years in Canada without evidence of it being effective as a smoking cessation aid. This study examined the relationship between dual-use and smoking cessation among young adult Canadian smokers by comparing continuous e-cigarette use with e-cigarette experimenters and non-users over a six-month period. **METHODS:** Secondary analysis of survey data obtained from a RCT of a smartphone-based cessation intervention, Crush the Crave (CTC), was conducted with a sample of 851 young adult Canadian smokers. Continuous e-cigarette use was defined as using e-cigarettes at both baseline and six-month follow-up. Those who used e-cigarettes only at baseline or at follow-up were defined as experimenters. Non-users did not use e-cigarettes at baseline or follow-up. The relationship between frequency of e-cigarette use, ever use of nicotine-containing e-cigarettes and smoking cessation was also examined. Cessation rates (30-day point prevalence abstinence) were compared across these groups using logistic regression while controlling for baseline individual characteristics, self-efficacy, level of addiction, use of other quit supports and number of quit attempts made. **RESULTS:** At 6-month follow-up, continuous e-cigarette users had a lower cessation rate than experimenters or non-users (13% vs 23% and 29%, respectively). This was validated by the odds ratio, non-users being three times more likely to quit than continuous users, even after adjusting for other predictors ( $AOR = 3.2$ , 95% CI [1.41-7.40],  $p < 0.01$ ). Similarly, experimenters were more likely to quit than continuous users ( $AOR = 2.34$ , 95% CI [0.99-5.90],  $p < 0.01$ ). The majority of continuous e-cigarette users used other cessation supports ( $\chi^2 = 13.2$ ,  $p < 0.05$ ) and perceived e-cigarettes as a quit aid ( $\chi^2 = 5.70$ ,  $p < 0.05$ ). Smokers with high self-efficacy were



twice as likely to quit than people with low efficacy (OR=1.92, 95% CI [1.14-3.21],  $p < 0.05$ ). CONCLUSIONS: Continuous or experimental use of e-cigarettes over a six-month period was associated with a lower rate of quitting smoking for a young adult population of smokers motivated to quit smoking.

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## POS2-132

### PROMOTING SMOKE-FREE HOMES: EXPLORING ETHIOPIAN WOMEN'S PERCEPTIONS OF DIFFERENCE BETWEEN SECONDHAND TOBACCO SMOKE VERSUS COOKING FIRE SMOKE

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SIGNIFICANCE: In Sub-Saharan Africa, where use of solid fuel (biomass) remains ubiquitous, the escalating rates of tobacco use threaten to compound the serious health risks associated with household air pollution. Cooking fire smoke (CFS) is the third leading cause of early morbidity and mortality for both sexes worldwide; significantly increasing risk for many of the same health conditions associated with secondhand tobacco smoke (SHS) exposure. Both CFS and SHS exposure are highly gendered, disproportionately harming women and young children, and reductions would contribute to achievement of many of the Sustainable Development Goals. Our study investigates Ethiopian women's perceptions of these two sources of household air pollution for the purpose of better understanding the socially motivated behavior relative to smoke in the home. METHODS: We conducted a mixed methods study among women in Aleta Wondo, Ethiopia. These data were collected through surveys, open-ended questions ( $n=353$ ), and focus group discussions ( $n=4$ ). Descriptive statistics were conducted for survey data. Responses to open-ended questions and focus groups were transcribed verbatim, translated into English, and coded for major themes. RESULTS: Use of solid fuel for cooking was nearly universal (95%), while few (14%) of women reported smoking occurring daily inside their homes. Major themes include; 1) utility, which captured the perception that CFS is necessary while cigarette smoke was not deemed useful, 2) perceptions of difference in harm and/or health, 3) smell, 4) appearance, and 5) socially derived meanings associated with each type of smoke. CONCLUSIONS: These themes help us understand the symbolic meaning of CFS and SHS in this population and can help to inform development of contextualized interventions that address the meaning of smoke derived from these two sources. The findings suggest that further exploration of the intersection between these two sources of household air pollution has merit, particularly in the Sub-Saharan African context.

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## POS2-133

### AN EYE TRACKING STUDY ON IMPACT OF SOURCE AND ENGAGEMENT TEXT FOR QUITTING IN A SMOKING CESSATION COMMUNICATION CAMPAIGN

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SIGNIFICANCE: FDA is required under the Family Smoking Prevention and Tobacco Control Act to communicate to the public about the risks of tobacco use. FDA has also used communication campaigns to message about the toxic chemicals in tobacco smoke. Few studies have examined impacts of communication about different chemicals, impacts of campaign source, or ways to augment campaign impact with engagement text on smoking cessation. METHODS: In an eye tracking study of 221 current cigarette smokers, participants viewed different cigarette constituent messages varied by FDA source (presence, absence), and engagement text for quitting [benefits of quitting and quitline number] (presence, absence). Participants viewed different messages within the same condition about

the toxic effects of formaldehyde, arsenic and uranium in cigarette smoke, as well as a message about the toxic effects of cigarette smoke in general. Participants were then asked to recall the source of the messages, and the national quitline number. RESULTS: Attention to the area with engagement text on smoking cessation was higher for the group where the information was present. Participants that saw information about the benefits of quitting and the quitline number were significantly more likely than those in the no engagement text on quitting conditions to recall the number for the national quitline. While attention to the area where FDA source was displayed was higher for the group where FDA source was present, only 22% of participants recalled the FDA logo on the messages, and there was no difference in recall of the source by constituent or engagement text. Attention to FDA source significantly increased recall of the source of the messages among the participants where source was present. CONCLUSIONS: Engagement text on constituent communication campaign significantly increases recall of of the quitline, an important resource for smokers. Attention to campaign source was a significant predictor of recall, but only a minority of participants recalled the source. Future research will examine the relationships between attention to the campaign source, recall and quitting related impacts.

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## POS2-134

### OVERVIEW OF MORTALITY ATTRIBUTABLE TO TOBACCO IN DIFFERENT REGIONS AND COUNTRIES: IMPLICATIONS FOR PUBLIC HEALTH POLICIES

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BACKGROUND AND OBJECTIVES: Tobacco endgame programmes usually indicate goals in terms of statements about smoking prevalence. However, since the ultimate goal is a matter of eliminating premature death and disease, it might be more appropriate to make statements about lowering of mortality attributable to tobacco, for example by indicating what percentage of total deaths that should be accepted as attributable to tobacco. This study makes an overview of the current status in different regions and countries in order to find what could be learnt from country comparisons. METHODS: Data on current status of mortality attributable to tobacco were retrieved from the database of the Global Burden of Disease Study 2015. These were matched against data on tobacco use patterns. This made it possible to identify background conditions in countries with different level of successfulness in reducing mortality attributable to tobacco. FINDINGS: Globally, 17% of male and 8% of female deaths are estimated to be attributable to tobacco. Among European countries the figures for men span between 26% (Belarus) and 11% (Sweden). Percentages are considerably lower for women than for men in all countries except Sweden. The finding that Sweden takes a unique position in both these respects suggests that the development has been influenced by some country-specific condition for tobacco use that differs between men and women. A clear such difference is the use of snus, the Swedish kind of low-toxicity oral smokeless tobacco, which has since long been widespread among men but not among women. CONCLUSIONS: The assumption that male snus use in Sweden is associated with the successfulness in lowering of mortality attributable to tobacco is supported by numerous studies showing that health risks of snus use are very small and that availability of snus both hampers initiation and helps cessation of smoking. These kinds of characteristics are shared by other alternative nicotine delivery systems that do not involve combustion. Public health policies should promote such alternatives and state targets such as reduction of deaths attributable to tobacco to no more than 1% of all deaths.

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**POS2-135****PERCEPTIONS ABOUT E-CIGARETTE FLAVORS: A QUALITATIVE INVESTIGATION OF YOUNG ADULT SMOKERS WHO USED E-CIGARETTES TO QUIT SMOKING**

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**SIGNIFICANCE:** Despite the claim that e-cigs hold promise as a smoking cessation tool for young adults, little research has been conducted exploring the perceptions of young adult smokers who have used e-cigs to quit smoking, particularly as it pertains to e-cig flavors. **METHODS:** The investigators used qualitative methods to examine the following topics: 1) young adult smokers' attitudes and beliefs towards e-cig flavors; 2) their perceptions of the role of e-cig flavors in quitting smoking; and 3) their perceptions of how flavor bans would affect their use of e-cigs. We conducted in-depth, semi-structured interviews to explore these themes among a purposive sample of 25 young adult smokers (aged 18-34) who had used e-cigs to quit smoking. Thematic content analysis was employed to assess qualitative data and document themes. **RESULTS:** Most participants reported enjoying e-cigs with sweet, fruity, or menthol/mint flavors, and valued having a wide selection of flavors. Most participants perceived e-cig flavorings as helpful in quitting smoking and stated that using preferred flavors may help alleviate persistent barriers of quitting smoking, including the loss of a way to manage stress. However, some stated that sweet and fruity flavors hid the harshness of nicotine and were "delicious" and "addicting," possibly causing them to consume more nicotine from vaping than from smoking cigarettes. Many also expressed concerns about inhaling toxic chemicals from e-cig flavorings. Additionally, about half of the participants reported they would still vape if e-cig flavors were banned, while the other half would not. **CONCLUSIONS:** Participants mostly held positive beliefs about the role of e-cig flavors in smoking cessation, but also shared concerns about the potential harm, enhanced nicotine addiction, and an escalation in vaping frequency caused by using flavored e-cigs. Banning flavored e-cigs may reduce e-cig use among young adult smokers, yet its consequences for smoking cessation are unclear. Public health practitioners need to educate young adult smokers on the harm and risks of using flavored e-cigs, in order to avoid nicotine overdose and minimize negative health consequences.

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**POS2-136****SCENARIO BUILDING TO INCREASE SMOKING CESSATION RATES: AN AGENT-BASED MODEL ON THE INFLUENCE OF RESIDENTIAL SEGREGATION BY INCOME**

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**SIGNIFICANCE:** Smoking, the leading preventable cause of death and disease, is likely to worsen health inequalities among low-income households. Low-income is generally associated with poorer smoking cessation outcomes due to the high cost and low reach of currently available interventions. The unequal distribution of resources for smoking cessation could be one of the main contributors to income disparities in smoking cessation profiles. This study aimed to examine the role of residential segregation by income in shaping quit smoking behavior and to present policies that can counter income disparities in population quit rates. **METHOD:** Concepts from the Behavior Change Wheel guided the study. An agent based model (ABM) was used to explore residential segregation patterns that create income inequalities in smoking cessation. The households' automatic and reflective motivation, psychological and physical capability, and physical and social opportunities to quit smoking were identified and incorporated in the model. Simple experiments in 9 scenarios were tested to explore the impact of changes in the households' motivation, opportunity, capability and relative access to overcome the differential generated by residential segregation. **RESULTS:** In the absence of other factors, when high-income and low-income households shared capability, opportunity and motivation to quit smoking, low-income quit rates improved, but inequality remained (37% vs. 63%). Different scenarios showed how changes in access to quit smoking resources in low-income areas could overcome the differential generated by income segregation. In the best scenario, the overall quit rate increased and the relative proportion of low-income quitters increased from 37% to 68%. **CONCLUSIONS:** ABMs help to predict the consequences of multidimen-

sional interaction of opportunity, capability and motivation for fostering favorable behavior change (quit smoking) when people are residentially segregated. Simulation modeling can be a useful tool for testing the impacts of different policies on behavior change and predict how changes in specific indicators lead to changes in population quit rates in a complex system.

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**POS2-137****THE ASSOCIATION BETWEEN SMOKERS' SELF-REPORTED HEALTH PROBLEMS, QUIT ATTEMPTS, PLANNING, AND SELF-EFFICACY TO QUIT IN THE FUTURE: FINDINGS FROM THE INTERNATIONAL TOBACCO CONTROL FOUR COUNTRY SURVEY**

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**SIGNIFICANCE:** Smokers having health conditions caused or exacerbated by smoking might be expected to be more motivated to stop smoking compared to those without any such health problems. This paper examines the association between self-reported health problems, quit attempts, planning to quit, and self-efficacy to quit. **METHODS:** Data come from the 2016 wave of the International Tobacco Control Four Country Survey (ITC-4C) in Australia, Canada, England, and the United States. We asked adult current or former smokers (n=12,023) whether they were currently being treated for, or diagnosed with, each of these health problems: depression, anxiety, severe obesity, alcohol problems, chronic pain, diabetes, heart disease, or chronic lung disease; along with socio-demographics and other smoking/quitting related questions, including planning to quit, self-efficacy to quit, quit attempts since last survey wave, and their concerns that smoking would damage/had damaged their health. **RESULTS:** Across the four countries, varying percentages of respondents reported having depression (16-22%), anxiety (14-19%), chronic pain (11-14%), diabetes (9-11%), or heart disease (5-9%). Overall, about 43% of current and former smokers in the four countries were worried that smoking had damaged their health at least somewhat, and 59% of current smokers worried that smoking would damage their health in the future. Compared to current smokers, ex-smokers were more likely to report having severe obesity, chronic pain, diabetes and heart disease (all p<0.01). Respondents with depression, anxiety or severe obesity were more likely to plan to quit and to have made attempts (all p<0.001). Those worried that smoking had damaged/would damage their health were more likely to plan to quit, but also to report a lower self-efficacy. Having chronic pain, diabetes or heart disease was also associated with lower levels of self-efficacy. **CONCLUSIONS:** The association between health conditions and cessation outcomes varies. Mental health conditions were associated with higher quit planning and quit attempts, whereas physical illness and worries about damage were more associated with lower self-efficacy to quit.

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**POS2-138****MIDDLE SCHOOL STUDENTS' WILLINGNESS, INTENTIONS, AND USE OF E-CIGARETTES: DIFFERENCES BY ETHNICITY AND ACCULTURATION**

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**SIGNIFICANCE:** Endorsement of willingness to use e-cigarettes and intentions to use e-cigarettes in the future indicate susceptibility to e-cigarette use. There is emerging evidence that Hispanic youth may be more susceptible to e-cigarettes compared to non-Hispanics, but more research is needed. **METHODS:** Most 6<sup>th</sup>, 7<sup>th</sup>, and 8<sup>th</sup> graders from two schools in Oregon (n = 821; 53% female; 60% Hispanic) completed surveys in the fall of 2016 (T1) and the spring of 2017 (T2). Students reported their willingness, intentions, and use of e-cigarettes, as well as their acculturation and language spoken at home. **RESULTS:** At T1, 8% of students





had used e-cigarettes at least once (lifetime use), up to 13% at T2. Hispanics had higher rates of lifetime use compared to non-Hispanics, but it was not significant at either time point (T1: Hispanics, 10% vs. non-Hispanics (mostly white), 7%; T2: Hispanics, 15% vs. non-Hispanics, 11%). At T1, 26% of students reported being willing to use e-cigarettes and 33% reported intentions to use e-cigarettes. Also at T1, Hispanics were significantly more likely to indicate willingness to use e-cigarettes, 30% vs. 21% for non-Hispanics,  $\chi^2(\text{chi square}, 1, N = 802) = 7.48, p < .01$  and intentions to use e-cigarettes, 38% vs. 26% for non-Hispanics,  $\chi^2(1, N = 807) = 12.60, p < .001$ . Hispanic students who were more acculturated to Hispanic culture were less likely to report willingness to use e-cigarettes, compared to those who were less acculturated to Hispanic culture,  $\chi^2(1, N = 445) = 4.63, p < .05$ . Hispanic students who primarily spoke Spanish at home (40% of the full sample) were less likely to intend to use cigarettes compared to Hispanic students who primarily spoke English at home,  $\chi^2(1, N = 478) = 4.59, p < .05$ ; this was not significant for willingness. Hispanic students who primarily spoke Spanish at home were less likely to have used e-cigarettes compared to Hispanic students who primarily spoke English at home,  $\chi^2(1, N = 447) = 3.86, p < .05$ . CONCLUSIONS: Hispanic students appear to be more susceptible to e-cigarette use, compared to non-Hispanics; however, level of acculturation and language spoken at home may moderate these relationships.

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## POS2-139

### UNC PERCEIVED MESSAGE EFFECTIVENESS SCALE (UPMES): DEVELOPMENT AND VALIDATION OF A BRIEF TOOL FOR IDENTIFYING PROMISING HEALTH MESSAGES

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BACKGROUND: Perceived message effectiveness (PME) is a common metric for identifying promising health messages, but standardized measures are few, lengthy, and assess constructs distal to behavior. We sought to establish the psychometric properties of the UNC Perceived Message Effectiveness Scale (UPMES) in the context of messages about the harms of chemicals in cigarette smoke. METHODS: Participants were a national convenience sample of 999 adults and national probability samples of 1,692 adults and 869 adolescents, recruited in 2015. Participants included smokers and nonsmokers who rated 10 brief messages about chemicals in cigarette smoke. The UPMES has three items: "This message makes me concerned about the health effects of smoking"; "This message discourages me from wanting to smoke"; and "This message makes smoking seem unpleasant to me". Response options ranged from "strongly disagree" to "strongly agree". We examined the scale's psychometric properties in an item factor analytic framework. RESULTS: Results were similar across samples and messages. The UPMES was strongly unidimensional across the brief messages (all factor loadings  $\geq 0.75$ ). The scale had high reliability ( $\alpha \geq 0.85$ ) over a large standardized range of PME scores (range  $z = -3$  to  $5$ ). The UPMES demonstrated convergent validity through very strong correlations with the established Davis Perceived Message Effectiveness Scale (average  $r = 0.83$ ) and strong correlations with message credibility (average  $r = 0.57$ ), and discriminant validity through a modest correlation with message reactance (average  $r = -0.47$ ). The scale did not exhibit appreciable differential test functioning by education, sex, or smoking status (range Cohen's  $d = -0.1$  to  $0.1$ ). CONCLUSIONS: The UPMES reliably and validly measures PME among adults and adolescents who differ on demographic characteristics that influence smoking disparities. The brief scale may be used to evaluate a set of health messages in a study with repeated assessments without increasing the cognitive burden on participants. The scale's wording is general enough that it may be suitable for use in developing short messages for other risk behaviors.

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## POS2-140

### SEX DIFFERENCES IN EXERCISE, SMOKING-RELATED SYMPTOMATOLOGY, AND SMOKING BEHAVIOR

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Extensive research has been conducted on smoking cessation interventions (e.g., pharmacotherapy, behavioral interventions and electronic aids), however, nearly 70-85% of Americans who attempt to quit still relapse within one year. Exercise has shown promise as an effective intervention, yet few studies have investigated what role sex differences may play. Our goal was to examine sex differences in self-reported exercise, smoking-related symptomatology and smoking behavior. Participants were recruited throughout the United States using the on-line crowdsourcing platform, Amazon's Mechanical Turk. They completed a survey consisting of self-report measures assessing physical activity (Baecke's Questionnaire for Habitual Physical Activity; BAQ), smoking-related symptomatology (Subjective State Scale; SSS) and smoking behavior (frequency, dependency and years of smoking). Data were collected and managed using REDCap secure web-based application. ANOVA was used to analyze continuous variables and chi-square was used for categorical variables. Males and females who were self-reported daily smokers ( $N=604$ ) were  $31.7 (\pm 6.0)$  and  $32.9 (\pm 6.3)$  years of age; respectively. Most were Caucasian (84% and 86%), with at least some college education (40% and 56%) and evenly divided by sex (50.5% male). Males scored significantly higher than females on the BAQ ( $2.39 \pm 0.68$  vs  $2.23 \pm 0.67$  respectively,  $p=.003$ ). Males scored significantly lower on the SSS withdrawal ( $2.08 \pm 1.41$  vs  $2.38 \pm 1.54$ ,  $p=.01$ ), craving ( $4.81 \pm 1.77$  vs  $5.20 \pm 1.67$ ,  $p=.006$ ) and physical symptoms ( $1.48 \pm 1.20$  vs  $1.85 \pm 1.34$ ,  $p=.01$ ) subscales. Males also smoked fewer cigarettes per day ( $11.9 \pm 7.8$  vs  $13.9 \pm 8.4$ ,  $p=.003$ ), had lower dependency (first cig within 5 min of waking: 23.9% vs 35.2%,  $p=.03$ ) and had fewer years of smoking ( $12.3 \pm 6.5$  vs  $13.7 \pm 6.9$ ,  $p=.01$ ). Males reported significantly more daily exercise than females and displayed significantly less withdrawal, craving, physical symptoms and nicotine dependence. Since exercise has shown promise in reducing these symptoms/smoking behaviors, awareness should be heightened and specific exercise interventions should be tailored by sex as a potential treatment strategy.

FUNDING: Academic Institution

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## POS2-141

### TRAJECTORIES OF MATERNAL CO-USE OF CIGARETTES AND CANNABIS PREDICT SUBSTANCE USE DISORDER IN ADULT OFFSPRING

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SIGNIFICANCE: Co-use of cannabis and tobacco is increasingly common (Schauer et al., 2015; 2017a; 2017b) and is associated with tobacco and cannabis dependence, psychosocial problems, and poorer cessation outcomes (Agrawal et al., 2008; Ford et al., 2002; Gourlay et al., 1994; Haney et al., 2013; Hindocha et al., 2015; Peters et al., 2012). However, no study has examined patterns of co-use over time in women, or the impact of maternal co-use on substance use and substance use disorder (SUD) in offspring. METHODS: Women were asked about substance use during each trimester of pregnancy, at 8 and 18 months, 3, 6, 10, 14, and 16 years postpartum. As young adults (M age = 22.8 years, range = 21-26), 608 offspring completed the Diagnostic Interview Schedule (DIS-IV: Robins et al., 2000) and the Fagerström Test for Nicotine Dependence (FTND: Heatherton et al., 1991). Growth mixture modeling (GMM) was used to identify trajectories of maternal co-use. Maternal trajectories of co-use were regressed onto substance use and SUD in adult offspring, controlling for prenatal exposure to alcohol, race, sex, and education. RESULTS: GMM identified four maternal trajectories: no co-use (64%), decreasing co-use (18%), postpartum-only co-use (11%), and chronic co-use (8%). Chronic maternal co-users reported more average daily joints and cigarettes per day at every time point. Young adults whose mothers were chronic co-users were twice as likely to have a SUD (Adjusted Odds Ratio = 2.67; 95% CI = 1.22-6.02) than young adults whose mothers were not co-users. Offspring of decreasing and postpartum-only maternal co-users also differed from the offspring of non-co-users in risk for co-use and Cannabis Use Disorder. Maternal co-use trajectories did not predict tobacco dependence in offspring. CONCLUSIONS: Three different maternal patterns of co-use of cannabis and tobacco from pregnancy to





16 years post-partum were identified. Some mothers resumed co-use postpartum, others desisted their co-use over time, and others were chronic co-users. Maternal trajectories of co-use were associated with inter-generational transfer of risk for substance use and dependence in adult offspring.

FUNDING: Federal

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## POS2-142

### EXAMINING COMBUSTIBLE CIGARETTE SMOKING AND ALTERNATIVE TOBACCO PRODUCT USE AMONG YOUTH EXITING FOSTER CARE

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Although many youth currently in or recently exiting foster care face a host of negative physical and mental health issues, tobacco use remains low on the priority list for researchers and practitioners, alike. Indeed, there have been no studies of multi-form tobacco use among this vulnerable population. Thus, the aim of the current study was to determine the prevalence of lifetime and current tobacco use in a sample of youth exiting foster care, and to compare obtained rates to national surveillance data. Participants completed a comprehensive survey on multi-form tobacco use, environmental predictors of smoking, and access to cessation treatment. Among the first 123 participants (mean age: 19.79, range: 18-24), 55% were female and 29% were Hispanic/Latino. In terms of race, 49% were Caucasian, 28% were Black or African-American, and 18% indicated more than one race. Over three-quarters (77%) were lifetime smokers, over twice the U.S. national rate of 38%. Fifty-seven percent of ever smokers identified as current smokers, with 62% of those young people smoking daily. With regard to lifetime history of other forms of tobacco use, 55% were lifetime e-cigarette users, 52% had smoked cigars, 61% had smoked hookah, and 11% had used smokeless tobacco; other forms (e.g., bidis, snus, and pipe) were less prevalent. Thirteen percent of participants were current e-cigarette users; similar rates were reported for cigars and hookah. Over half of participants were currently living with a cigarette smoker. Of current cigarette smokers, 62% reported having their first cigarette within an hour of waking. Only 25% of current smokers had been advised by a physician or nurse within the last year to reduce/quit smoking. The most acceptable forms of intervention for quitting smoking included patches/gum (54%), text messaging (52%), one-on-one counseling (38%), and using a computer/internet-based program (38%). Youth exiting foster care are at high risk for smoking and other tobacco product use, as well as dependence, yet are rarely screened for use or advised to quit. The current results underscore a missed opportunity to promote public health in a vulnerable population.

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## POS2-143

### DIFFERENCES IN SMOKING PREVALENCE IN PERSONS WITH AND WITHOUT PTSD AND TRAUMA

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SIGNIFICANCE: Cigarette smoking is one of the most dangerous yet preventable causes of morbidity and mortality in the United States (US). Smoking prevalence for adults in the United States has declined from 1965 (42.4%) to 2014 (16.8%). This decline is not represented in those with Post-Traumatic Stress Disorder (PTSD); a population whose smoking prevalence rate remained elevated in 1991 (44.6%). This study uses national US adult data to examine differences in smoking prevalence and smoking behaviors in (1) those with and without PTSD, and (2) those who have experienced different types of traumatic events. METHODS: This study examines data from Wave 2 of the National Epidemiologic Survey on Alcohol and Related Conditions-II (NESARC-II) which were collected in 2004-2005 from a sample of 34,654 US adults. Data including demographics, PTSD diagnoses, traumatic events and smoking behaviors (i.e., smoking quantity, smoking frequency) were analyzed via Chi-square and independent sample t-tests to assess the group differences in smoking prevalence and behaviors based on PTSD diagnoses and

traumatic experiences. RESULTS: The smoking prevalence for the full sample was 24.5%. There was a significant association between PTSD diagnosis and smoking prevalence (no PTSD diagnosis 23.4% vs. PTSD diagnoses 35.1%;  $\chi^2(2)=240.69$ ,  $p<0.001$ ). Among current smokers, 87.5% of smokers without PTSD smoked daily while 91.1% of smokers with PTSD smoked daily ( $\chi^2(1) = 8.509$ ,  $p=0.004$ ). On average, smokers with a PTSD diagnosis smoked more cigarettes per day (CPD;  $M=17.74$ ,  $SD=11.01$ ) than smokers without a PTSD diagnosis ( $M=16.14$ ,  $SD=10.97$ ;  $t(7446) = -3.921$ ,  $p<0.001$ ). Some traumatic events were significantly associated with higher smoking prevalences, CPD, and frequency (daily vs. non-daily) of cigarettes smoked. CONCLUSIONS: Significant differences in smoking prevalences and smoking behaviors remain between adults with and without PTSD. Adults exhibit different smoking behaviors based on the type of traumatic event they experienced. More research is needed to determine post-traumatic stress' impact on smoking, which can then be used to develop specific treatment options for smokers with PTSD.

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## POS2-144

### THE ASSOCIATION BETWEEN PERCEIVED E-CIGARETTE AND NICOTINE ADDICTIVENESS, INFORMATION SEEKING, AND E-CIGARETTE TRIAL AMONG US ADULTS

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SIGNIFICANCE: Perceptions of harm and addictiveness are associated with smoking combusted cigarettes, but these factors have not been fully explored for e-cigarettes. Specifically, little is also known about how consumers form harm and addictiveness perceptions and how information seeking is related to trying e-cigarettes. We analyzed data from the 2015 US Food and Drug Administration Health Information National Trends Survey (HINTS-FDA 2015) to explore the relationship between 1) perceived e-cigarette harm and addictiveness and trying e-cigarettes; 2) perceived nicotine addictiveness and trying e-cigarettes; and 3) information-seeking, Internet use, and trying e-cigarettes. METHODS: We assessed the independent associations of perceived e-cigarette harm, perceived e-cigarette addictiveness, perceived nicotine addictiveness, e-cigarette information seeking, and personal Internet use with ever trying e-cigarettes, among 3,195 adults controlling for smoking status, age, and education. RESULTS: Those who believed that e-cigarettes were less addictive than combusted cigarettes had higher odds of trying e-cigarettes compared to those who believed that e-cigarettes were just as or more addictive than combusted cigarettes (OR: 2.49, 95% CI: 1.30, 4.74). People who searched for information about e-cigarettes had higher odds of trying e-cigarettes (OR: 10.23, 95% CI: 5.41, 19.33) and reported potential health effects (37.9%) as the topic most frequently searched. Perceived e-cigarette harm, perceived nicotine addictiveness, and personal Internet use were not associated with trying e-cigarettes. CONCLUSIONS: Even though e-cigarettes typically contain nicotine, perceived nicotine addictiveness was not associated with trying e-cigarettes while perceived e-cigarette addictiveness was. This suggests people do not fully understand the characteristics and implications of using this new tobacco product. Information seeking was also associated with trying e-cigarettes, and results suggest that people are interested in learning about the potential impact of e-cigarette use on their health. More research will help to better understand these complex relationships.

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**POS2-145****BLUNT USE AND RISK OF SUBSEQUENT COMBUSTIBLE PRODUCT USE AMONG ADOLESCENTS**

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A substantial proportion of adolescents report blunt use (hollowed cigars containing marijuana) but not use of other tobacco products. Adolescent blunt users naïve to combustible tobacco use may be introduced to other products through use of blunts. However, the risk of transition may differ by e-cigarette use status because those who have tried e-cigarettes may be more willing to try other products with nicotine than those who have not. We assessed whether blunt use at baseline would increase the risk of transition to combustible tobacco products at one-year follow-up and whether this association differs by e-cigarette use status, after adjusting for demographic characteristics (grade level, gender, race/ethnicity, and study). Data were combined from two school-based prospective cohort studies in California and Connecticut. Among adolescents who had not tried any combustible product (N=3,371), 6.67% had tried a blunt at baseline. 8.25% of those who had not tried any combustible product at baseline had done so by follow-up (26.2% of blunt users and 6.96% of non-blunt users) (AOR=2.36, 95% CI: 1.62, 3.42). The association between blunt use at baseline and the risk for subsequent combustible tobacco initiation differed significantly by baseline e-cigarette use status (p<0.001). Specifically, among those who had never used e-cigarettes (n=2,838), those who had tried a blunt at baseline had 5.75 times the odds of reporting combustible product use at follow-up when compared with those who had not tried a blunt (95% CI: 3.32, 9.96). Among those who had tried e-cigarettes by baseline the association was not significant (AOR=1.48, 95% CI: 0.94, 2.31). Blunt use among adolescents may increase the risk of subsequent combustible product use, particularly among those who have also not tried e-cigarettes. Future studies are needed to better understand the risk of combustible tobacco use initiation by blunt and by e-cigarette use status. When developing policies that regulate cigars, little cigars, and cigarillos, policymakers should consider the additional risk posed by manipulation of these products and the potential for transitioning from blunts to other tobacco products.

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**POS2-146****CHALLENGES, BENEFITS, AND RESULTS OF ADMINISTERING TRIBALLY-SPECIFIC SURVEILLANCE OF AMERICAN INDIAN ADULT TOBACCO SURVEY IN CHEROKEE NATION**

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Tobacco use and secondhand smoke (SHS) exposure are disproportionately high in many American Indian/Alaska Native (AI/AN) communities in the US. However, national surveys rarely include a sufficient sample of AI/ANs to monitor tobacco use and SHS exposure. Cherokee Nation (CN) Public Health has initiated a tribal-specific tobacco surveillance program using the American Indian Adult Tobacco Survey (AI ATS). Descriptive statistics about tobacco use and SHS will be presented. Further, the challenges and benefits of implementing the AI ATS will also be presented, including survey methodology and lessons learned. In 2014, the CN AI ATS was administered to over 4,000 CN citizens. Healthcare registration data were used to develop the sampling frame which created some privacy and cultural barriers that will be discussed. Despite some challenges, there were many strengths of this survey, including, a large sample size, tribal-specific data, and initiated and implemented by the tribe. In 2014, CN AI ATS found lower prevalence of smoking (21.4%) compared to AI/ANs (26.5%) throughout Oklahoma. However, there was significant variation in the prevalence of smoking by county (16.1%-27.3%). In contrast, 9.1% CN citizens reported using smokeless tobacco compared to 4.3% of Oklahomans, and 2.1% reported using both cigarettes and smokeless tobacco. SHS exposure at work (12.4%) and home (13.9%) were lower than exposure in vehicles (24.6%). Slightly more CN citizens reported home smoking bans (83.3%) than AI/ANs in Oklahoma (80.8%). This survey data will be used to target limited CN resources to areas within CN with disparate smoking rates and to further develop tribal health policy.

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**POS2-147****FACTOR ANALYSIS OF TOBACCO DEPENDENCE SCALE AMONG BIDI AND SMOKELESS TOBACCO USERS**

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**SIGNIFICANCE:** Fagerstrom Test for Nicotine Dependence (FTND) is widely used screening instrument for physical nicotine dependence. Psychometric properties of FTND variant for smokeless tobacco users (FTND-ST) and bidi smokers is not well documented. The present study aims to evaluate reliability, construct validity, and structure model of FTND among bidi smokers and smokeless tobacco users. **METHODS:** A cross sectional survey was conducted among 1350 patients visiting primary care facilities in two states of India in 2016. Measures of internal consistency i.e. Cronbach's coefficient alpha was estimated to evaluate the reliability of FTND scale. We applied exploratory factor analysis (EFA) with principal component extraction and varimax with Kaiser Normalization rotation to ascertain the factor structure of the FTND scale. Eigen values greater than 1 were used as a criterion for factor extraction. Items with loadings less than 0.3 were dropped. **RESULTS:** Out of 1350 tobacco users, 406 (30%) were smokers, 818(60%) were smokeless tobacco users with mean FTND scores of 4.29± 1.67 and 4.42±1.72 respectively. Cronbach's alpha coefficients were low for FTND among bidi smokers (FTND-0.47) and smokeless tobacco users (FTND-0.32). FTND score did not predict the intention to quit tobacco use among bidi smokers and smokeless tobacco users. The results of exploratory factor analysis suggest eigenvalues greater than 1 for item 1(How soon after you wake up do you smoke your first cigarette) and Item 4 (How many cigarettes per day do you smoke?). The other items in the scale add no relevant information. **CONCLUSIONS:** Items of the FTND are best modeled as two correlated factors on tobacco use. A short version of FTND i.e. Heaviness of smoking index may represent an alternative to FTND for measuring nicotine dependence among bidi smokers and smokeless tobacco users. Future research should focus on refining questionnaires that more precisely measure nicotine dependence in bidi and smokeless tobacco users in primary care.

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**POS2-148****RISK FACTORS OF MONO, DUAL, AND POLY TOBACCO USE OF AMONG YOUTH**

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**SIGNIFICANCE:** Despite decreases in cigarette smoking, use of other tobacco products (OTPs) is increasing among youth, leading to persistent high prevalence of tobacco use and to worrisome increases in dual and poly tobacco use. To help counter tobacco use initiation, we examined risk factors associated with mono, dual, and poly use of tobacco products among youth. **METHODS:** We analyzed data on high school students from the North Carolina Youth Tobacco Survey (NCYTS 2015, n=3,420). Use of one only, two only, or three or more tobacco products in the past month, represent mono, dual, and poly use, respectively. Adjusting for demographic variables, multinomial regression models assessed risk factors of mono, dual, and poly use in comparison to one another and in comparison to youth non-users of tobacco products. Risk factors included risk perception of tobacco products, perceived positive smoker prototype, family and friend smoking, rules of smoking at home, exposure to smoking behavior, exposure to second-hand smoke, and exposure to tobacco advertising on the internet or at point of sale. **RESULTS:** Of students, 75%, 13%, 6%, and 7% were non-users, mono, dual, and poly users of tobacco, respectively. Mono, dual, and poly users were 2, 4, and 9 times more likely than non-users to have friends who smoke. They were also more likely to perceive youth smokers as cool and reported greater exposure to second-hand smoke than non-users. When compared to mono users, dual and poly users were 2 and 4 times more likely to have friends who smoke and reported greater exposure to second-hand smoke. When compared to dual users, poly



users were twice as likely to have friends who smoke and reported lower tobacco-related risk perception and greater exposure to smoking behavior than dual users. Other differences among the sub-populations emerged in rules of smoking at home, family smoking, and exposure to tobacco advertising. **CONCLUSIONS:** Study findings highlight differences in risk profiles of youth mono, dual, and poly users of tobacco, which can be used to inform prevention efforts of mono and multiple tobacco product use in youth.

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## POS2-149

### QUITTING "COLD TURKEY": NEW INSIGHTS FROM CURRENT AND FORMER TOBACCO SMOKERS

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**SIGNIFICANCE:** Two-thirds to three-fourths of successful quitters quit smoking unassisted without using pharmacotherapy or formal tobacco counseling. Public health interventions toward cessation seem to have missed opportunities to support this key population of smokers that wish to quit "cold turkey" or quit unassisted. **PURPOSE:** We sought to explore individual perceptions and attitudes related to smoking and quitting using the "cold turkey" method to develop a new campaign targeting this group of current smokers. Our study looked at two focus groups of (i) past smokers that successfully quit cold turkey and (ii) current smokers that attempted cold turkey but were unsuccessful. **METHODS:** Two focus groups lasting 90 minutes each. Group 1: Quit smoking "Cold Turkey" (n=11). Group 2: Unsuccessful in Quitting "Cold Turkey" (n=12). Individuals were recruited from the 2016 Arkansas Adult Tobacco Survey pool of respondents. Groups were moderated by a third-party research team. Participants completed a confidential Lifestyle Survey prior to the focus group discussion to gain additional smoking-related information. Video recordings and transcripts were made available to the Arkansas Department of Health. **RESULTS:** Former smokers that quit "cold turkey" stated that it worked because they were finally "ready to quit". Current smokers that failed the "cold turkey" approach attributed their failure to lack of readiness, and a general skepticism towards any quit approaches. Additionally, negative messages were minimally impactful with regard to quitting. **CONCLUSIONS:** The focus groups revealed that a "cold turkey" public health campaign should be positive, empowering, and demonstrate the scope for renewed health. Telling people what quitting WILL DO, not what NOT QUITTING WILL DO appeared vital in this sample.

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## POS2-150

### USE OF A STATE QUITLINE AMONG SMOKERS WITH DIABETES

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Diabetes mellitus and cigarette smoking are major causes of morbidity and mortality in the US. Harms of smoking are profound among individuals with type 2 diabetes (T2D), with an accelerated progression of micro- and macrovascular complications and increased mortality. Few studies have examined the extent to which smokers with T2D utilize state quitlines and the effectiveness in this priority population. We examined Oklahoma Tobacco Helpline registration data from July 2015 through June 2017 to compare utilization patterns and quit outcomes (satisfaction and 30-day point prevalence abstinence at 7-month follow-up). We calculated proportions and 95% confidence intervals (CI) and used logistic regression to compare quit outcomes by T2D status. During the study period, 9.5% (n=6,163) of callers to the Oklahoma Tobacco Helpline reported having T2D. Helpline registrants with T2D were more likely to be female, 45 years or older, of Black/African American or American Indian race, and have health insurance. When comparing Helpline enrollment, 47% of registrants with T2D enrolled in the multiple call program compared to only 38% of those without T2D who were more likely to enroll in individual services that included one or more of the following: NRT starter kit, text messages, emails, and web support. Individuals with T2D participated in slightly

more calls and received more NRT. Satisfaction with Helpline services was similar in both groups. At 7-month follow-up, the 30-day quit rate among those with T2D was 33.2% (95% CI: 27.3, 39.2) which was not statistically different from those without T2D (32.1%, 95%CI: 30.1, 34.2). After adjusting for gender, income, cigarettes per day at baseline, number of coaching calls, and weeks of NRT received, participants with T2D had similar odds of quitting compared to those without T2D (OR: 1.10; 95% CI: 0.81, 1.48). Individuals with T2D who called the Helpline were just as likely as those without T2D to report 30-day abstinence at the 7-month follow-up. Given the burden of T2D, a better understanding of effective cessation strategies for individuals with T2D is necessary to reduce diabetes complications exacerbated by smoking.

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## POS2-151

### ADOLESCENTS' AWARENESS OF NICOTINE E-LIQUIDS: PRELIMINARY RESULTS FROM A 2017 SURVEY OF CONNECTICUT HIGH SCHOOLS

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**SIGNIFICANCE:** Electronic (e-) cigarettes are the most popular tobacco product among American adolescents. Given that nicotine adversely affects adolescent neurodevelopment, it is important to understand the extent to which adolescents are being exposed to nicotine via e-cigarette use. However, prior research suggests that many adolescents (34%) do not know the nicotine concentration of the e-liquids that they use (Morean et al., 2016). **METHODS:** The current study had two aims. First, similar to the prior survey, we evaluated adolescent past-month e-cigarette users' knowledge about the nicotine concentration of the e-liquids they use (Did you vape e-cigarettes with nicotine in the past 30 days?; What concentration of nicotine do you typically use in your e-cigarette?). Second, expanding on our prior research, we evaluated how adolescents come to know what concentration of nicotine is in the e-liquids they use (How do you know what nicotine level is in your e-liquids?). The analytic sample comprised the subsample of 628 high school students who reported past-month e-cigarette use on a larger school-based survey conducted in Connecticut in May-June 2017 (N= 2,945). **RESULTS:** The majority of e-cigarette users reported using nicotine e-liquid (69.9%), but, similar to our prior findings, many were unaware of the specific nicotine concentration they use (33.1%). Those who did know the concentration reported typically using 3 mg/ml (14.2%), 6-12 mg/ml (15.3%), or 10.7%18-25 mg/ml (10.7%). Students reported learning about their e-liquid's nicotine concentration from the e-liquid label (58.9%), from a friend/sibling (23.7%), from a vape shop employee (11.6%), from a website (10.5%), or from a parent (1.8%). **CONCLUSIONS:** These findings suggest that many adolescents continue to be unaware of the nicotine content of the e-cigarettes they use. Among those who know what nicotine concentration they use, most obtain information about nicotine concentration from e-liquid labels or from friends/siblings (who may be unreliable). Tobacco regulatory efforts should consider how to provide accurate information about nicotine content to adolescents and work to standardize e-liquid labeling.

FUNDING: Federal

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## POS2-152

### EXPLORING THE HOOKAH RETAIL LANDSCAPE: ASSOCIATIONS BETWEEN HOOKAH AVAILABILITY AND NEIGHBORHOOD SOCIODEMOGRAPHIC CHARACTERISTICS

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Rates of hookah use among young adults have been increasing and there is indication of increased use among certain racial/ethnic groups. Though public health attention has focused on hookah use around college and university campuses, in-



creases in the availability of retail hookah could be influencing current use trends. This primary aim of this pilot study was to describe the prevalence and spatial distribution of hookah outlets across the Bronx, NYC. Secondary aims were to examine 1) differences in tobacco outlet characteristics between hookah and non-hookah tobacco outlets and 2) associations between tobacco and hookah outlet density and neighborhood sociodemographic characteristics. Tobacco outlets ( $n=173$ ) in 22 census tracts across the Bronx, NY were identified via neighborhood canvassing. Field workers determined whether the outlet sold tobacco and/or shisha. Fisher's exact tests assessed the differences in the exterior presence of tobacco advertising, tobacco paraphernalia, and tobacco products, between hookah and non-hookah tobacco outlets. Pairwise correlations examined associations between tobacco outlet density and census tract sociodemographic characteristics (e.g., % under age 18, % unemployed, and % living in poverty). Almost a third (30.1%) of the tobacco outlets inspected were hookah outlets. E-cigarette advertisements were significantly more likely to be displayed on the exterior of hookah outlets than non-hookah tobacco outlets (25% vs. 11.6% respectively,  $p<0.05$ ). Tobacco paraphernalia, such as small pipes (17.3% vs. 2.5%,  $p=0.001$ ) and bongs (25% vs. 1.7%,  $p<0.001$ ) were also significantly more likely to be visible from the exterior of hookah outlets than non-hookah tobacco outlets respectively. Tobacco outlet density ranged from 0.27 to 2.71 tobacco outlets per 1,000 population across all census tracts. Tobacco outlet density and neighborhood unemployment was moderately negatively correlated,  $r(171)=-0.48$ ,  $p=0.02$ . The emergence of retail hookah within high risk vulnerable minority populations could lead to increases in the use of this emergent tobacco product.

FUNDING: Truth Initiative internal funding

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## POS2-153

### THE ASSOCIATION BETWEEN COLLEGE STUDENTS' EXPOSURE AND ENGAGEMENT WITH TOBACCO AND NICOTINE PRODUCT MESSAGING ON SOCIAL MEDIA AND USE BEHAVIORS

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The landscape of tobacco advertising and use has evolved rapidly with the increasing popularity of new and alternative products and their marketing via non-traditional channels like social media. Limited research examines relationships between exposure and engagement with tobacco and nicotine product marketing and messaging and use behaviors. This study examines these associations among young adults, a population in which tobacco and social media use are most prevalent. Participants were 4,390 18-29 year old students ( $m\text{ age}=20.4$   $SD=2.31$ ; 64.5% female; 35.5% non-Hispanic white) from 24 Texas colleges who completed wave 6 (spring, 2017) of an online survey. Multivariate logistic regression models assessed the relationship between past 30-day recall of i) exposure to and ii) engagement with any tobacco/nicotine messaging on social media and past 30-day use of cigarettes, cigars, smokeless tobacco, electronic nicotine delivery systems (ENDS), and hookah. Exposure to tobacco and nicotine product advertising on social media was significantly associated with increased likelihood of past 30-day use of cigarettes [OR: 1.33 (95% CI: 1.12-1.59)], cigars [2.29 (1.74-3.01)], smokeless tobacco [2.55 (1.71-3.82)], ENDS [1.74 (1.40-2.15)] and hookah [1.95 (1.58-2.40)]. Engagement was also associated with use of all products except ENDS: cigarettes [1.45 (1.01-2.08)], cigars [2.36 (1.34-4.17)], smokeless tobacco [6.18 (2.13-17.94)], and hookah [1.68 (1.20-2.55)]. As the level of students' engagement with tobacco and nicotine product social media increased, the likelihood of students' use of all tobacco products also increased: cigarettes [1.15 (1.10-1.21)], cigars [1.35 (1.27-1.43)], smokeless tobacco [1.48 (1.37-1.59)], ENDS [1.15 (1.08-1.22)] and hookah [1.26 (1.19-1.32)]. This study revealed significant associations between tobacco and nicotine social media marketing and messaging and tobacco and nicotine product use among college students. Results support a need to extend federal regulatory authority of tobacco product marketing to cover new and alternative products, as well as new media channels. Future research will examine these relationships longitudinally among our sample.

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## POS2-154

### GEOSPATIAL ASSOCIATIONS BETWEEN RETAIL TOBACCO OUTLETS AND CURRENT USE OF CIGARETTES AND E-CIGARETTES AMONG YOUTH IN TEXAS

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**SIGNIFICANCE:** To identify the geospatial association between the presence of retail tobacco outlets (RTO) around schools' neighborhoods, and current use of cigarettes and e-cigarettes among adolescents in four counties in Texas. **METHODS:** Students in grades 6, 8 and 10th were surveyed in their schools in 2014-2015. The schools' addresses was geocoded to determine the presence of at least one RTO within half a mile of the school. Two outcomes were considered: past 30-day use of (a) cigarettes and (b) e-cigarettes. Bayesian structured additive regression models and Kriging methods were used to estimate the geospatial associations between the presence of RTO and use in three counties: Dallas/Tarrant, Harris, and Travis. **RESULTS:** We observed a geospatial association between the presence of RTO around the schools and current use of cigarettes in the eastern area of Dallas County and in the southeastern area of Harris County. Also, a geospatial association between the presence of RTO around the schools and current use of e-cigarettes was observed in the entire Tarrant County and in the northeastern area of Harris County. **CONCLUSIONS:** The identification of hot-spots in the Texas counties, where the presence of RTO is associated with cigarette or e-cigarette use is important, as these findings support the potential need for regulation of RTO around the identified geospatial areas. This association was not consistent across all the counties. More research is needed to determine why some areas are at higher risk for this association.

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## POS2-155

### CHARACTERIZATION OF CURRENT ADULT ENDS USERS BY CIGARETTE SMOKING STATUS

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**BACKGROUND:** Electronic nicotine delivery system (ENDS) use has markedly increased. Many adult ENDS users are current or past cigarette smokers. This study examines how current ENDS users with various cigarette smoking histories differ in perceived tobacco-related health risks. **METHODS:** The sample consisted of 1494 current ENDS users, a subset of 2561 participants from a national adult ENDS use survey. We assessed demographic characteristics and perceptions of tobacco-related health risks by cigarette smoking status using Chi-square and ANOVA analyses. **RESULTS:** Of the participants, 45%, 47.4% and 7.6% were Current, Former and Never Smokers, respectively; 56% were <35-years-old; 51.7% female; 28.3% black, 29.5% white, and 42.2% other races; 54.1% were of Hispanic ethnicity. There were no significant differences in income, education, or sexual orientation by cigarette smoking status. Significant differences were observed for employment (80.7%, 73.7%, 73.7% employed) and marital status (54.9%, 46.6%, 62.3% single) for Current, Former, and Never Smokers, respectively. Participants indicated considerable knowledge about health risks associated with tobacco use ( $8.52 \pm 1.96$ ) but less so regarding ENDS ( $6.05 \pm 3.10$ ). Current Smokers indicated ENDS posed higher health risks for the users and others, whereas Former Smokers rated cigarettes, cigars, or smokeless tobacco as riskier to the users, and Never Smokers rated these tobacco products as riskier to others. Former Smokers were more likely to perceive tobacco-related risks as cardiovascular diseases, diabetes, and cancer, whereas Current Smokers were more likely to associate such risks with ENDS. Never Smokers were more likely to perceive pancreatitis and stomach ulcers as associated risks with tobacco and ENDS use. **CONCLUSIONS:** Among current ENDS users, there were significant differences in perceived health risks based on cigarette smoking history, including risks to self and others of traditional tobacco versus ENDS. Improved message and communication strategy tailoring for ENDS use can be achieved when cigarette smoking status is taken into account.





FUNDING: Federal

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## POS2-156

### NICOTINE DELIVERY AND CIGARETTE SMOKERS' PERCEPTIONS OF VARIOUS E-CIGARETTE DEVICES

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**INTRODUCTION:** E-cigarettes vary in size, shape, taste, and nicotine delivery, and these product characteristics may affect smokers' perceptions of different devices. These perceptions may facilitate or hinder the uptake of e-cigarettes among tobacco smokers. **METHODS:** Sixteen daily smokers smoked their tobacco cigarettes during an initial visit and returned six times to try six different e-cigarette devices, one on each visit. The devices used in this study were the disposable, rechargeable, e-Go, vaporizer, e-cigar, and e-pipe. Participants ranked each device before and after use and filled out multiple satisfaction questionnaires. Blood was drawn from each participant at multiple time points throughout each visit for nicotine pharmacokinetic analysis. **RESULTS:** Smokers reported that all devices relieved nicotine withdrawal symptoms similarly and that all devices tasted similar to tobacco cigarettes. The e-Go and vaporizer were rated higher than other devices on satisfaction and enjoyment from use, taste, pleasantness, harshness, and speed of effect, but lower on perceived health risk and embarrassment from use ( $p < 0.05$ ). Perception about the relative health risk changed after smokers tried all devices: at the initial visit the smallest device (disposable) was ranked safer compared to bigger devices (e-cigar, e-pipe, and rechargeable) ( $p < 0.05$ ). At the final visit, the disposable and e-Go were ranked less dangerous than the e-cigar and e-pipe ( $p < 0.05$ ). Preliminary serum nicotine data shows that all devices had lower  $C_{max}$  and higher  $T_{max}$  than a tobacco cigarette. The vaporizer and the e-Go had the highest  $C_{max}$  and lowest  $T_{max}$  of all of the devices. **CONCLUSIONS:** For a smoker trying to switch to an e-cigarette, some potential facilitators include taste, speed of withdrawal relief, product harshness, and nicotine delivery, while embarrassment and perceived health risk may be barriers. Although the e-Go and vaporizer did not provide stronger relief of nicotine withdrawal symptoms, smokers liked them more than other devices.

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## POS2-157

### INFLUENCE OF ECOLOGICAL AND SOCIOSPATIAL CHARACTERISTICS ON ADULT CIGARETTE SMOKING PREVALENCE: A COUNTY LEVEL ANALYSIS

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**SIGNIFICANCE:** Few studies have examined ecological and sociospatial environmental factors (e.g. natural amenities, rurality, primary care physician (PCP) density) and their association with cigarette smoking prevalence. In this study, we employ multiple methods to examine county level ecological and sociospatial characteristics, and the association between these characteristics and adult cigarette smoking prevalence. **METHODS:** We linked data from the 2012 Behavioral Risk Factor Surveillance System (BRFSS) Selected Metropolitan/Micropolitan Area Risk Trends (SMART) dataset to county-level ecological and sociospatial indicators. These indicators include the county natural amenity score, rurality, PCP density, violent crime rate, and % racial minority population. We first used spatial regression to explore the relationship between county level smoking prevalence and county characteristics at an aggregate level. We then used hierarchical non-linear modeling of individuals nested within counties to examine how individual smoking status varies across counties, controlling for county and individual level characteristics. **RESULTS:** We observed significant clustering of smoking prevalence for 32 out of 37 spatial clusters of counties that share a border, meaning that most neighboring counties had similar adult smoking prevalence. County level

prevalence tended to be lower in clusters of counties with high levels of natural amenities and higher in those with higher violent crime rates. County-level characteristics accounted for 7.1% of the overall variability in individual smoking status. County natural amenity score and violent crime rate accounted for 21.0% and 14.3% of the between-county variance in smoking, respectively. **CONCLUSIONS:** Ecological and sociospatial characteristics may be important factors to take into consideration when implementing tobacco control interventions at the county level. Targeted comprehensive tobacco control interventions could be particularly beneficial in counties with lower natural amenities, higher violent crime rates, or with neighboring counties with higher adult smoking prevalence.

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## POS2-158

### PREVALENCE AND DETERMINANTS OF EXPOSURE TO SECOND-HAND SMOKE (SHS) AMONG SECONDARY SCHOOLS STUDENTS IN THE GAMBIA

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**SIGNIFICANCE:** Annually 600,000 deaths are attributed to exposure of non-smokers to second-hand smoke (SHS). These include 165,000 among children, about 60% of which occur in Africa and South-East Asia. In 2011 only four countries in the African region had comprehensive smoke-free legislation covering all types of public places. Given the increasing prevalence of smoking in many low income countries, preventing exposure to SHS is an urgent public health priority, particularly in sub-Saharan Africa. **METHODS:** We used two-stage cluster random sampling to select students in upper and senior secondary schools throughout The Gambia, and a self-administered questionnaire to collect data on demographic details, exposure to second hand smoke, support for public smoking regulations and knowledge of the harmful effect of SHS. **RESULTS:** Of 10,392 eligible students, 10,289 (99%; 55% girls and 44% boys, age 12-20 years) participated. The proportion of students reporting any SHS exposure was 97.0% (enclosed public places 59.2%, outdoor public places 61.4%, school 21.3% and home 38.2%), with the majority (96.4%) reporting some exposure outside the home. Exposure to SHS in the home was more common in older boys, and among students in grant-aided schools, of non-Muslim faith, who lived in homes where smoking was allowed, or had family or friends who smoked. Parental education, living with parents and having been sent to purchase cigarettes for others were significantly associated with exposure to SHS both in and outside the home. A majority of students supported policies that ban public smoking (56.0%). Many were unaware of the harmful effects of exposure to SHS, about one in four (26.6%) and one in ten (9.4%) participants reported that exposure to SHS was definitely not harmful and probably not harmful respectively. **CONCLUSIONS:** Exposure to SHS is highly prevalent among young people in the Gambia, and occurs mostly outside the home. Interventions to reduce SHS exposure in young people are urgently needed.

FUNDING: Academic Institution

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## POS2-159

### HEALTH RISK ASSESSMENT OF HARM REDUCTION PRODUCTS

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Tobacco industry develops products that claim to have a lower health risks associated with conventional tobacco products, so-called harm reduction products. Risk assessment of tobacco products is challenging given the complex mixture of substances present in the smoke of the products. In addition to the differences in emissions, harm reduction product differ on other aspects like design and related smoking behaviour. There is a need for a pragmatic method to rank tobacco products by hazard to subsequently assess their potential health risk. We have made a first assessment of harm reduction products and the current knowledge on their use and health effects. Aspects, that should be considered to assess health risks, are the composition of the product, the smoker's behavior and the health effects of the product. Some of these products may have a role in reducing the harm



caused by smoking tobacco. Products may prevent tobacco users to completely quit smoking or serve as a 'gate-way product' for non-tobacco users. The health effects of tobacco harm reduction products can be compared by considering (1) health effects of the emissions of the product on the short and long term, (2) the users' behavior, dual use or the effect on smoking cessation, (3) addictiveness of the product, (4) attractiveness of the product for smokers and non-smokers and (5) marketing of the product. For many products, sufficient information for a proper health risk assessment is lacking, especially on the health effects for by-standers, the long term health effects, the addictiveness and the attractiveness. As a first step towards comparison of health risks of harm reduction products, we further explored the health effects with a focus on the adverse effects for users. We compared the emissions of selected compounds between products and, as a lower emission does not imply a lower toxicity, we translated this to health effects. The emissions of the selected compounds and their associated health effects were used to get an estimate of the overall health effect. This approach will be discussed with international experts in a workshop in November 2018 and a summary of this will be presented.

FUNDING: Dutch government

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## POS2-160

### THE REPORTED CHEMOSENSORY APPEAL OF MENTHOL CIGARETTES AMONG LOW-INCOME AFRICAN-AMERICAN SMOKERS IN BALTIMORE

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BACKGROUND: Menthol cigarettes are engineered to provide a chemosensory experience that may ease initiation and increase addiction. African-Americans smoke menthols at a high rate, and industry documents detail that tobacco industry's targeting of menthols to African-American communities. The current study explored the reported appeal of menthols in association with individual's harm perceptions, neighborhood ad exposures, and perspectives on tobacco company behaviors among a hard-to-access population of low-income African-Americans in Baltimore. METHODS: Among 533 African-American smokers that were surveyed, 503 smoked menthols. Participants were asked whether they preferred the taste and smell of menthols better than non-menthols. We analyzed two multivariate logistic regression models with listwise deletion of missing data ( $n=24$ ) and reported adjusted odds ratios (AOR) to predict preferences for menthol taste and smell. RESULTS: Among the sample, 32% strongly agreed that menthols taste better and 61% strongly agreed/agreed that menthols smelled better. Females (AOR=1.56, 95%CI:1.03-2.38) and those exposed to neighborhood cigarette ads (AOR=1.98, 95%CI:1.18-3.32) preferred the taste of menthols. People who believed that tobacco companies target poor neighborhoods (AOR=1.66, 95%CI:1.11-2.48) and people who believed that menthols are more harmful than non-menthols (AOR=1.78, 95%CI:1.19-2.68) preferred the smell of menthols. Participants with a higher addiction score preferred the taste (AOR=1.04 per point, 95%CI:1.02-1.07) and smell (AOR=1.03, 95%CI:1.01-1.05) of menthols. CONCLUSION: Study participants are attracted by the taste and smell of menthols, and female smokers may be particularly vulnerable. Preferences were associated with neighborhood ad exposure and the belief that poor communities are targeted. Results suggest that more addicted smokers had a greater chemosensory attraction to menthols. Regulating tobacco product additives and marketing may help reduce the disparate burden of tobacco-related harms. Future work can focus on how perceived harms related to menthol and non-menthol cigarettes can influence communication strategies.

FUNDING: Federal

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## POS2-161

### AN UPDATED EVALUATION OF A TRI-STATE AND BI-NATIONAL TOBACCO CONTROL NETWORK

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SIGNIFICANCE: Effectively trained and engaged coalitions that promote health behavior change are useful in furthering public health agendas. More specifically, networks of organizations that emphasize tobacco control public health issues have proven reasonably effective in recent. The Paso del Norte Tobacco Control Network engages representatives from West Texas, Southern New Mexico, and Cd. Juarez, Chihuahua, Mexico in collaborative efforts that seek to address tobacco control in the US / Mexico border region. METHODS: Participants completed a pre-test survey ( $N = 27$ ) in March 2017 and are scheduled to take a post-test in 12 months. Participants completed measures to assess collaboration perceptions, knowledge regarding content shared throughout the Network's monthly meetings, the CDC's Best Practices for Comprehensive Tobacco Control, and the Internal Coalition Effectiveness [ICE] Instrument. RESULTS: Descriptive results indicated attendance to monthly meetings was moderate (51%), and members reportedly devoted an average of 31% of work efforts to tobacco control activities. Mean values for ICE subscales (range = 1-5) suggested a strong enthusiasm of Network members and recognition of the importance of a cohesive Social Vision ( $M = 4.2912$ ), employment of Efficient Practices ( $M = 3.9843$ ), improved and maintained Knowledge/Training ( $M = 4.2469$ ), and stable and strong Relationships ( $M = 4.2742$ ). There was variance among members on their perceived level of collaboration and their desired level of collaboration (Kappa = .298). Finally, overall knowledge of shared content was low ( $M = 4.85$ , range = 1-10). CONCLUSIONS: Differences among Network members on perceived and current level of collaboration identified a need to engage in more collaborative activities. Ratings on the ICE Instrument indicate high levels of satisfaction with activities and goals, which allows for further emphasis on growth and promotion of these activities. These results emphasize the effectiveness of the Network's ability to assist the region with collaboration and education efforts on tobacco control policies.

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## POS2-162

### DOES MESSAGE CONGRUENCY IN PICTORIAL HEALTH WARNING LABELS AFFECT ATTENTION AND RECALL OVER TIME?

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SIGNIFICANCE: Recent research has shown that message congruency, the degree to which visual and textual features reflect a common theme, affects attention to and recall of label content of pictorial health warning labels (PWLs). In congruent PWLs, visual and textual features reflect a common theme, while incongruent PWLs display an image and text that do not convey the same message. Recent research showed that smokers exposed to incongruent PWLs spent more time focusing on the text than smokers exposed to congruent PWLs, while image dwell time did not differ during initial viewing of the PWL. Despite lower dwell time on the text, smokers in the congruent condition were more likely to correctly recall the text and the overall message immediately after exposure than smokers in the incongruent condition (Lochbuehler et al., 2017). The current study aimed to examine whether congruency effects change over time. METHODS: 320 daily smokers (60.3% male; cigarettes/day:  $Mean = 15.31$ ,  $Standard deviation = 7.15$ ) attended 4 laboratory sessions over a period of 10 days in which they were exposed to the same PWL (one of the nine FDA-proposed PWLs) while eye-movements were recorded. Recall of label content was assessed after each exposure. RESULTS: Overall, correct recall of the image was initially high and remained high over time (96.3% - 99.0%) while recall of the text (32.3% - 80.6%) and the message increased over time (50.8% - 88.7%). Smokers exposed to incongruent PWLs focused longer and faster on the text than smokers exposed to congruent PWLs. Also, smokers exposed to incongruent PWLs were less likely to correctly recall the text and the message initially than smokers exposed to congruent PWLs. Recall of the text and the message increased over time in both conditions but increased more slowly in the incongruent group. CONCLUSIONS: Correct recall of label content of incongruent PWLs improves over time. The current study replicates previous findings of initial message congruency effects and extends this research



by examining cumulative exposure over time, and highlights the importance of message congruency in the design of PWLs.

FUNDING: Federal

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## POS2-163

### RACIAL/ETHNIC VARIATIONS IN INTERPERSONAL COMMUNICATION ABOUT CIGARETTE HEALTH WARNING LABELS AND ITS RELATIONSHIP WITH SUBSEQUENT QUIT ATTEMPTS

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**SIGNIFICANCE:** This study explored ethnic differences in communicating about cigarette health warning labels (HWLs), which prior research found to have an independent association with subsequent quit attempts. **METHODS:** Longitudinal data were analyzed from an online cohort of US adult smokers. From January 2013 to September 2014, approximately 1,300 smokers were surveyed every four months, with an oversample of 400 Latinos at each survey. The sample included Non-Hispanic Whites and Latinos (Individuals: n=4,628; Observations: n=7,668), classifying Latinos as English- or Spanish-preference according to the language they chose for the survey. One analytic sample included all participants and another only those followed up at least once. Three items assessed frequency of talk about HWLs. When HWL talk was the dependent variable, item scores were summed; when considered an independent variable, tertiles of summed scores were used. At followup, participants reported quit attempts in the prior 4 months. Using the whole sample, Poisson generalized estimating equation (GEE) models regressed HWL talk on study variables. For the follow-up sample, logistic GEE models regressed quit attempts at follow-up on study variables from the prior survey, including interactions between ethnicity and HWL talk, while adjusting for key smoking and sociodemographic characteristics. **RESULTS:** Report of any HWL talk was highest among Spanish-preference Latinos (85%), followed by English-preference Latinos (59%), and non-Hispanic Whites (35%), with statistically significant differences between these groups in the frequency of HWL talk in an adjusted model. Frequency of talk about HWLs predicted subsequent quit attempts ( $AIRR_{low \ v \ none} = 1.17$ , 95% CI=1.02, 1.33;  $AIRR_{high \ v \ none} = 1.27$ , 95% CI=1.12, 1.43), although no significant interactions between ethnicity and HWL talk were found. **CONCLUSIONS:** Results indicate that Latinos report talking more frequently about HWLs than non-Hispanic Whites and that HWL talk is consistently associated with smoking cessation across ethnic groups. Anti-smoking campaigns may consider using messages that encourage interpersonal communication to increase cessation.

FUNDING: Federal

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## POS2-164

### ONLINE RECRUITMENT OF SMOKER PREGNANT WOMEN FOR A COUPLE SMOKING CESSATION TRIAL CONDUCTED IN AN EASTERN EUROPEAN COUNTRY

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**SIGNIFICANCE:** Almost 15% of Romanian women continue smoking during pregnancy with negative effects on maternal, pregnancy, and infant health, emphasizing the need for smoking cessation programs. Online social networks, such as Facebook, are considered an efficient and affordable method for recruitment in health interventions. To date, few studies have considered online enrollment in smoking cessation trials targeting pregnant couples. **METHODS:** Recruitment is ongoing since June 20 2017. Participants are now recruited via Facebook targeted ads using: gender (women); age (18 to 45); location (Romania); and keywords related to pregnancy, motherhood, expectant parents, and tobacco use. Ads contain combinations of images and text, and prompt pregnant smokers potentially interested in the RCT to visit the study's website, where they have the option of initiating the self-enrollment process or of requesting enrollment assistance. The

landing webpage contains value propositions reflecting the benefits of enrollment in the RCT, interposed with call-to-action buttons that redirect potential participants to an eligibility screener, consent, and the baseline questionnaire. Eligibility criteria are age >18; pregnancy week <28; married or living with a partner; and willingness to provide partners' phone number for subsequent enrollment in the RCT. **RESULTS:** We used 10 Facebook ads (newsfeed and promoted ads) that reached 69,436 people and generated 174,456 impressions and 2,552 unique link clicks. Out of the 2,552 unique clicks, 349 (14%) women initiated the self-enrollment process, 292 (11%) filled out the eligibility screener, and 26 were eligible and consented to participate in the study. Fourteen partners also gave their consent to enroll in the study along with the eligible women. Overall promotion costs were of ≈\$350 (\$0.34/unique link click) and \$14/enrolled couple. **CONCLUSIONS:** Advertising over Facebook enabled us to scale up RCT recruitment and reach national coverage. Even with our somewhat restrictive eligibility criteria, we are ahead of our pre-established enrollment schedule. We are in the process of improving our Facebook ads to reduce costs per enrolled woman.

FUNDING: Federal

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## POS2-165

### CONTENT ANALYSIS OF PRINT AND ONLINE E-CIGARETTE NEWS COVERAGE IN THE US, 2015-2016

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**SIGNIFICANCE:** Coverage of electronic cigarettes (e-cigarettes) in the news media may shape public perceptions about the products and their impact on individual and population health. This study examined the discussion of e-cigarettes in top-circulating print and online news media sources in the U.S. in 2015-2016. **METHODS:** Systematic database searches using *Access World News* and *Factiva* identified all e-cigarette-related news articles appearing in the top 30 circulating newspapers, 5 newswires, and 5 online news sources in the U.S. between January 2015 and December 2016 (n=730 articles). Coders identified the main topic of each article and documented the presence of statements related to regulation, trends in use, and health effects. **RESULTS:** Nearly half of all articles (44%) focused primarily on policy and regulatory issues, although the health effects (24.9%) and prevalence of e-cigarettes (17%) were also common main topics. Over the two year period, a major spike (169 articles) was seen in the second quarter of 2016 coinciding with the May 5<sup>th</sup> announcement of FDA's new deeming rules on e-cigarettes. Concerns about youth use continued to be topic of concern with 36% of articles citing the rise in youth e-cigarette use, 28.9% mentioning that e-cigarettes could be a gateway to tobacco use, and nearly a quarter (22.4%) citing that flavors appeal to youth. A topic of concern that emerged in the last quarter of 2016 was incidents of exploding e-cigarette batteries and other mechanical dangers. **CONCLUSION:** In looking at e-cigarette news coverage over 2015-2016, rising rates of e-cigarette use among youth and changing policies and regulations dominated print and online news sources in the United States, setting an agenda for what the public may view as the most critical issues related to e-cigarettes. With more research on the health effects of e-cigarettes emerging as well as evolving state and federal e-cigarette policies and regulations, it is important to continue to monitor news coverage of e-cigarettes.

FUNDING: Federal

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## POS2-166

### CIGARETTE TOBACCO AND WATERPIPE USE AMONG TAIBAH UNIVERSITY STUDENTS IN MEDINA OF SAUDI ARABIA: THE IMPACT OF TOBACCO SALES BAN

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This study aimed to examine prevalence of waterpipe and cigarette smoking among students of Taibah University, the biggest university in Medina city where tobacco sales ban is implemented. RESULTS: showed that prevalence of current and ever waterpipe use was 24.2% and 36.04%, respectively, while for current and ever use of cigarette smoking it was 31.9% and 42.7%, respectively. This prevalence is similar to that reported by studies conducted in other Saudi cities where tobacco sales are allowed. Multivariate analysis showed that waterpipe use was higher among senior students, those with monthly household income between 5000-9000 SR, those with pocket money spending of more than 500 SR/month, and if number of individuals living at the household is  $\geq 5$ . On the other hand, current cigarette smoking was higher in those of  $\geq 22$  years, among male students, in those with pocket money spending of more than 500 SR/month and those who lived away from their parents. Collectively, waterpipe and cigarette smoking, despite ban on tobacco sales, are still common among Taibah University students in Medina/Saudi-Arabia.

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## POS2-167

### RECEIPT OF TOBACCO DISCOUNT COUPONS, LGBTQ ADULTS, USA, 2017

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BACKGROUND: The prevalence of smoking among lesbian, gay, bisexual, transgender, and queer (LGBTQ) adults is considerably higher than among heterosexual and cisgender adults. One cause of this disparity is industry marketing that targets this population. The majority (66%) of the marketing budget for cigarettes is spent on price promotions, including coupons to reduce the cost of tobacco products. Prior studies have reported on receipt of price promotions by smoker status and delivery channels (e.g., email, mail), but this has not been examined in the LGBTQ population. This study examines the receipt of discount tobacco coupons, how they were received, and differences by smoker status. METHODS: We analyzed data from a 2017 national probability sample of more than 350 LGBTQ adults and their romantic partners. The survey administered a range of measures relevant to LGBTQ tobacco disparities, including price promotion measures adapted from the PhenX toolkit. Respondents who indicated they had received a tobacco discount coupon in the past six months were asked if they had received the coupon through four possible channels: email, on a tobacco product, by mail, or by text message. RESULTS: Among LGBTQ adults, nearly 75% of everyday smokers received a tobacco discount coupon in the past six months, compared to roughly 40% of some-days smokers and 18% of non-smokers. The channels through which coupons were delivered varied with roughly 20% of participants reporting having received a coupon by mail and 15% on a tobacco product. A small proportion of coupons were received by email (5%) or text message (< 1%). CONCLUSIONS: Disparities in who receives tobacco price promotions, including discount coupons, have been observed in other vulnerable populations; however, such high levels of coupon receipt for LGBTQ population have not been previously reported. Our results showed three quarters of LGBTQ smokers received discount tobacco coupons. These findings provide additional evidence that tobacco companies target discount coupons to the LGBTQ community through multiple channels, and have important implications for the etiology of tobacco use disparities.

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## POS2-168

### ARE MEDICAID ENROLLEES AWARE OF AVAILABLE CESSATION RESOURCES AND INSURANCE BENEFITS?

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SIGNIFICANCE: In the U.S. adults enrolled in Medicaid smoke at twice the rate of privately insured adults (29% vs. 13%). The CDC's *Best Practices for Comprehensive Tobacco Control Programs* recommends expanding insurance coverage for evidence-based cessation treatments and actively promoting coverage so that smokers and health care providers are aware of available smoking cessation benefits. The current study assessed New York State Medicaid enrollees' awareness of cessation services, insurance benefits and perceived effectiveness of quitting methods. METHODS: In July-August 2017, we conducted a probability-based representative online survey of Medicaid beneficiaries in New York State (n=266; AAPOR 4RR=22.5%). Participants were eligible if they were between 18-65, enrolled in Medicaid, and current smokers or recent quitters. We performed descriptive analyses and used Adjusted Wald tests to detect differences in awareness of cessation services and perceived effectiveness of cessation services. RESULTS: Most participants were aware of existing evidence-based cessation services: nicotine replacement therapy (87.1%), Quitline (71.6%), stop smoking medications (67.4%), and cessation classes (60.3%), but fewer than half of enrollees knew that Medicaid would pay for them. A higher proportion of Medicaid beneficiaries perceived stop-smoking medications as very or somewhat effective at helping people quit (78.7%) than quitting cold turkey (60.8%) or e-cigarettes (53.6%) ( $p < 0.05$ ). However, quitting cold turkey was the most common method used to ever try to quit (70.4%), followed by NRT (40.2%), e-cigarettes (37.0%), stop-smoking medications (18.2%), Quitline (14.2%), and cessation classes (6.8%). CONCLUSION: Medicaid-enrolled smokers in New York State believe that evidence-based treatments are effective means to quit, but most use non-evidenced-based methods. Raising awareness of Medicaid benefits may address cost barriers, although interventions should also address smokers wanting to quit on their own without help. Understanding awareness of cessation services and Medicaid benefits can inform messaging and help address tobacco-related disparities in the United States.

FUNDING: State

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## POS2-169

### RELATIONSHIP BETWEEN TOBACCO SMOKE EXPOSURE AND MARIJUANA USE IN ADOLESCENTS ATTENDING AN URBAN PUBLIC HOSPITAL CLINIC

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SIGNIFICANCE: Adolescent tobacco smoking is associated with higher lifetime rates of marijuana use. There is mixed evidence of racial/ethnic variations with some studies reporting that, compared to whites, some minorities have a higher prevalence of use, while others find African American (AA) and Latinos reporting lower use. Much of this research utilizes data acquired via self-report which may be biased. METHODS: The current study measured the prevalence of tobacco exposure and marijuana use in a population of urban, lower socioeconomic class adolescents using urine biomarkers cotinine (COT) and delta-9 tetrahydrocannabinol (THC). Urines were collected from 769 12-21 year olds (57% female; 57% Hispanic) being seen in an urban, public hospital. RESULTS: Twelve percent of the sample were THC positive. Active smokers were significantly more likely to be THC positive than those with heavy SHS exposed or light SHS/third hand smoke exposure (72% vs. 10% vs. 2%,  $p < 0.001$ ). There were no significant sex differences; however, marijuana use increased with age; and AAs were significantly more likely to be THC positive than all other groups ( $p < 0.001$ ). CONCLUSIONS: Marijuana use occurred predominantly in those who were active tobacco cigarette smokers, and in older and AA adolescents. Racial differences in marijuana use may be related to the popularity of products such as blunts in AA groups.

FUNDING: Nonprofit grant funding entity

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## POS2-170

### REASONS WHY YOUNG ADULTS VISIT VAPE SHOPS

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**SIGNIFICANCE:** The number of vape shops has tripled in recent years, reaching over 10,000 shops in the US where consumers can purchase, sample, and obtain support on how to use electronic nicotine delivery systems (ENDS). However, little is known about vape shop consumers. We explored characteristics of young adults who visit vape shops. **METHODS:** Data were collected in an online survey from a cohort of young adults (N=1,797) who were originally recruited in 2010 during their first year of college in North Carolina or Virginia. Current use of ENDS, cigarettes and marijuana was assessed. All respondents were asked if they visited a vape shop in the past 6 months. Those who had visited were asked why they visited and selected all applicable response options. **RESULTS:** Approximately 11% (n=201) reported visiting a vape shop in the past 6 months. Vape shop visitors were 52.1% female, 84.5% white, and mean age of 25 years ( $SD=0.7$ ). 30.3% reported current (past month) ENDS use, 23.9% reported current cigarette use, and 50.8% reported current marijuana use. Current ENDS users most often reported visiting a vape shop to buy ENDS (68.8%) and sample flavors (32.8%). Current cigarette smokers reported visiting to buy ENDS (44.9%) and non-ENDS products (e.g. bong, marijuana-related items; 38.8%). Current marijuana users visited to buy non-ENDS products (46.2%) and accompany someone else (45.3%). About 27% of vape shop visitors had never used ENDS and reported visiting with someone else (59.6%) and to buy non-ENDS products (40.3%). Multivariable regression analyses showed that current ENDS users were 17.3 times as likely to visit vape shops compared to non-ENDS users ( $OR=10.2-29.6$ ) and current marijuana users were 2.3 times as likely to visit compared to non-marijuana users ( $OR=1.7-3.3$ ). **CONCLUSIONS:** Findings indicate that vape shops appeal to consumers that use ENDS and marijuana. Young adults' reasons for visiting vape shops seem to vary by substances used. ENDS users visited to buy ENDS products and sample flavors, while cigarette smokers and marijuana users visited to buy ENDS as well as non-ENDS products. Findings could inform future regulatory considerations for vape shops.

FUNDING: Federal

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## POS2-171

### USING INSTRUMENTAL VARIABLES FOR SMOKING INTERVENTIONS

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Smoking is correlated with psychosocial variables (i.e., depression) among youth and young adults. However, the literature is mixed. Perhaps such inconsistencies are due to reverse causality--smokers may smoke because they are depressed, or they may become depressed because they smoke. The inconsistencies in the literature also may be due to omitted variable bias. That is, there may be a difficult-to-observe variable related to both depression and smoking, such as social difficulties, so that there is no potential for causation. Instrumental variables offer a way to isolate the unbiased effect of smoking on psychosocial variables, which has implications for intervention design. We use two datasets to estimate the effects of smoking on depression using instrumental variables, using bivariate probit models. The first dataset we use, Mexican American Tobacco Use in Children with data from the years 2005-11, includes genetic data (single nucleotide polymorphisms associated with smoking initiation and nicotinic receptors). The second dataset is the Youth Development Survey 1988 to 2011. In these data, genetic information is not available. However, it is possible to take advantage of the intergenerational nature of the data to identify persons whose parents smoked, and the intensity of their smoking. In order to satisfy conditions for instrumental variables (IV), we do not instrument using current parental smoking as the proximal act of smoking around children is likely correlated with their smoking. However, if parents previously smoked, and then quit, we can avoid the environmental influence and isolate on the genetic predisposition -- youth whose parents smoke are more likely to be predisposed to nicotine use and addiction. Early results show that the link between smoking and several psychosocial variables is endogenous, and that our IV estimations provide unbiased coefficients. For example, we regressed self-reported feeling "blue" on smoking. In the normal probit regression, the coefficient for smoking was an insignificant -.245, but tripled to a significant -1.611 when endogeneity was addressed. The likelihood ratio test revealed that smoking is endogenous.

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## POS2-172

### FDA'S COMPLIANCE AND ENFORCEMENT ACTIVITIES TO ENSURE COMPLIANCE WITH THE PROHIBITION ON SALES TO MINORS OF REGULATED TOBACCO PRODUCTS

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FDA is responsible for enforcing the provisions of the Federal Food, Drug, and Cosmetic Act and FDA regulations that restrict the sale of tobacco products to minors. FDA has developed several resources to assist tobacco retailers with compliance including webinars, guidance, small entity compliance guides and offers technical and other non-financial assistance through FDA's Office of Small Business Assistance. FDA routinely inspects and conducts surveillance of tobacco retailers (both brick and mortar and online) and takes advisory or enforcement actions, as appropriate, when violations are observed to ensure compliance. Potential actions include Warning Letters, Civil Money Penalties (fines), and No Tobacco Sale Orders. This poster will provide information on: FDA's compliance resources, the numbers of violations found in the retail environment for illegal sales to minors and failure to verify date of birth by photo-id involving tobacco products regulated both prior to and after the final deeming regulation, numbers of Warning Letters and Civil Money Penalty complaints issued as the result of violations, and examples of kid appealing flavors of these products sold to minors during inspections of brick and mortar tobacco retailers and via online retail sales.

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## POS2-173

### MEDICAL STAFF CONTRIBUTIONS TO THIRDHAND SMOKE CONTAMINATION IN A NEONATAL INTENSIVE CARE UNIT

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Residual nicotine and other chemicals (thirdhand smoke [THS]) left on surfaces by secondhand smoke (SHS) may be ubiquitous, even in smoke-free environments such as a neonatal ICU (NICU). Animal and *in vitro* studies have demonstrated potential health consequences from THS exposure (e.g., hindered respiratory development), raising concerns for medically fragile NICU infants. Our primary aim was to characterize the extent to which medical staff come in contact with SHS and THS and transport nicotine (a THS proxy) to the NICU. On-duty NICU medical staff at a large hospital were recruited to participate during rounds (in January and February of 2017). Participant and household characteristics (e.g., race, ethnicity, age), cigarette and electronic nicotine delivery systems (ENDS) use, and SHS/THS exposure questions (e.g., how often are you near smoking/ENDS in friends'/family members' homes?) were surveyed. Approximately one-third of staff were randomly selected for a finger-nicotine wipe sample and a carbon monoxide (CO) breathalyzer to verify self-reported smoking ( $\geq 11$  CO parts-per-million). Over 60% of all NICU staff were approached (n=260). The sample included nurses (n=170), respiratory therapists (n=51), fellows/residents (n=13), MDs (n=12), neonatal nurse practitioners (n=12), and others (n=2); 5.4% refused to participate (n=14). Twenty-one NICU staff (8.9%) reported formerly smoking; 1.7% (n=4) reported current smoking (consistent with CO levels); and, 5.6% of staff reported living with at least one person who smokes. Similarly, 4.6% (n=11) reported trying ENDS, but none reported current ENDS use. Almost a third (30.5%; n=73) reported some SHS exposure (i.e., ">Less than monthly") in friends'/family homes and 73.7% (n=171) reported SHS exposure in other locations. ENDS exposure was reported in 20.1% (n=49) of friends'/family homes and 49.2% (n=116) of other locations. Three-quarters of NICU medical staff reported SHS or ENDS exposure. This may serve as a potential NICU exposure path as THS can be transmitted through con-



tact with contaminated clothes and skin. Further research into exposure and health consequences for NICU infants should be pursued.

FUNDING: Federal

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## POS2-174

### TOBACCO USE AND VAPING AMONG HISPANIC/LATINO IMMIGRANTS IN CHICAGO

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**SIGNIFICANCE:** Over 30% of Chicago's population are Hispanics/Latinos (H/Ls), 70% of whom are Mexicans/Mexican Americans. Limited data exist about the use of tobacco and/or vaping products among H/L immigrants. Due to language barriers and low socioeconomic status (SES), immigrants are often missed in local and national tobacco studies. We examine tobacco use patterns, including Electronic Nicotine Delivery Systems (ENDS). **METHODS:** In June 2016, 101 face-to-face surveys were conducted in Spanish by trained bilingual workers in Latino *barrios* in Chicago. To be eligible, participants had to be living in the U.S. for less than 5 years, be at least 18 years of age, have low or no knowledge of the English language, and be regular users of conventional cigarettes and/or ENDS or experimenting with e-cigs, hookah, and/or other ENDS. **RESULTS:** Of the participants, 76% were males, with an average age of 37 years and an average of 5 years in the U.S.; 79% did not have a high school degree; and 34.6% had household incomes of ≤\$20,000. About 13% used conventional cigarettes only; 7% used vaping only, regularly; 22% reported experimenting with ENDS only; and 58% engaged in cigarette smoking and ENDS either regularly (16%) or experimenting (42%). Users of all products prefer menthol, fruit and candy flavors. Only 4% reported knowing a lot regarding the health effects of ENDS use, and cough was the most frequent health problem reported among vapers (51%). **CONCLUSIONS:** The majority of Hispanic/Latino immigrant tobacco users in this study are young/middle age, males, low SES, and dual users of conventional cigarettes and ENDS, who prefer flavored over non-flavored products. Most of vaping users were exposed to these products when they came to the U.S. Very few participants reported knowing a lot about the health effects of ENDS use.

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## POS2-175

### SUPPORT AND OPPOSITION FOR ANTI-ENDS CAMPAIGNS ON TWITTER: COMPARATIVE THEMES, SOURCES, AND REACH

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**SIGNIFICANCE:** Although smoking rates in the US have decreased, the cigarette sales declines are offset by sharp increases in the consumption of other tobacco products including vaping products or electronic nicotine delivery systems (ENDS). The prevalence of e-cig use and vaping among youth and young adults (YYA) now exceeds that of combustible cigarettes. One of the reasons behind the rapid increase is the extensive and effective marketing strategies. These products are aggressively marketed on social media, which are disproportionately popular among the hard-to-reach at-risk age group. Social media interventions to prevent vaping are necessary but have unknown potential effects in a competitive media environment characterized by an influx of ENDS product marketing and advocacy, resulting in audience confusion and misinformation. **METHODS:** We identify and quantify Twitter messages related to the three campaigns over time and by campaign. We characterize Twitter content by source, valence, major themes of those tweets. We analyze Twitter conversations about campaigns launched by public health institutions at the *local* (#VapingTruth, Chicago Dept of Public Health), *state* (Still Blowing Smoke, California Dept of Public Health), and *national* levels (Tips from Former Smokers, CDC). We collected approximately 14,000,000 messages about ENDS on Twitter in 2014-2015. Preliminary intake of the content on the

three campaigns shows that there is over 110,000 relevant posts. Textual, profile, and social network analysis were performed. **RESULTS:** Our preliminary analyses of the data show that pro-vaping advocates appropriated/hijacked identity features of each of the three campaigns to promote benefits of electronic nicotine delivery products. 95% of the posts were pro-vaping, and 77% of them were from vaping advocates, 66% of them are following each other on Twitter. The vaping community is a very closely connected group, and misinformation is likely to be shared and becomes searchable. Findings highlight a pressing need for public health professionals to monitor discussion and engage the public on social media, and to develop strategies to reduce bias in social media conversation.

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## POS2-176

### USE OF SMARTVISION TO QUANTIFY CIGARS AND DEPENDENCY DISCUSSIONS ON SOCIAL MEDIA

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**SIGNIFICANCE:** Though the Food and Drug Administration's (FDA) Center for Tobacco Products has announced its intention to lower nicotine amounts in cigarettes to curb addiction, nicotine levels in cigars, for the present, will remain unchanged. Cigars are popular products among youth and young adults. Understanding consumers' perceptions about nicotine in cigars may shed light on why and how the products are used. Social media, a primary mode of communication for youth and young adults, is a useful vehicle to examine consumer-generated messaging and perceptions about nicotine and addictiveness in cigars. We documented consumer-generated messaging about cigars and nicotine-related perceptions across a range of social media sites popular among youth and young adults. **METHODS:** We applied "SmartVision", a Battelle proprietary program that tracks content, public sentiment and perceptions, to sample social media data on cigars for five days in June 2017. Queries that captured cigar mentions (e.g. cigar, Black and Mild, Swisher, cigarillo, etc.) or dependency (e.g. addiction, addict, hooked, nicotine, etc.) were searched across YouTube, Facebook and Twitter, three popular social media sites among youth and young adults. **RESULTS:** Approximately 6,000 tweets per day contained cigar-related mentions; 522 of these mentioned dependency topics. Facebook revealed 2,015 pages of cigar content; 21 addiction-related posts and 60 comments and responses about addiction were found. There were 611 YouTube cigar-related videos found, and these contained 2057 dependency-related comments. Across the social media sites, notable topics discussed included the FDA's regulation of cigar products; whether the products regulated by the FDA are addictive; and perceptions about cigars, marijuana and blunts (cigars filled and smoked with marijuana). **CONCLUSION:** The data indicate the high activity of consumer-generated comments about cigars and about their addictive potential on social media. Screening social media activity to monitor real-time public perceptions and sentiments about the effects of nicotine regulation in cigars may have implications for health risk communication.

FUNDING: None

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## POS2-177

### HOW DOES THE REGULATORY ENVIRONMENT INFLUENCE WHERE VAPERS GET THEIR PRODUCTS: FINDINGS FROM THE ITC 4-COUNTRY PROJECT

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**SIGNIFICANCE:** Government regulations affecting the marketing of e-cigarettes (ECs) have evolved rapidly over the past 10 years. In Australia (AU) and Canada (CA) the sale of nicotine containing ECs are prohibited while their sale is allowed

in England (EN) and the United States (US). The aim of this study is to examine how differences in the regulatory environment impacts where vapers report getting their EC devices and supplies. **DESIGN/METHODS:** Data came from 12,411 adult (aged 18 years and older) current and former smokers and vapers who participated in the 2016 International Tobacco Control (ITC) Four Country Survey carried out in AU (n=1491), CA (n=3801), EN (n=4339) and US (n=2780). The web-based survey recruited participants from online panels in each country with selection criteria intended to generate representative samples of current and former smokers and vapers in each country. Respondents were asked about their current and past vaping behaviors and where they had last purchased their vaping devices and supplies. Purchase location was sorted into three categories: online, at a vape shop, other retail establishment (i.e., convenience store, supermarket, etc.). **RESULTS:** In AU vapers tended to rely on online sources for their devices and supplies, while in CA where the law prohibiting the sale of nicotine ECs has not been strictly enforced, most reported purchasing ECs from vape shops. By contrast, in the US and EN those using tank systems purchased from vape shops and online sources, while those using disposable devices and pre-filled cartridges purchased more often from other retail establishments. While most vapers reported having nicotine in their ECs, more of those from CA and AU reported purchasing e-liquids without nicotine. **CONCLUSIONS:** The regulatory environment appears to have marked impact on where vapers get their devices and vaping supplies.

**FUNDING:** Federal

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## POS2-179

### THE ROLE OF THE TRANSPORTABILITY TRAIT IN DRIVING PERCEIVED RISK OF USING TOBACCO PRODUCTS DURING A MOBILE-PHONE TEXT-MESSAGE CAMPAIGN FOR YOUNG ADULTS

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**BACKGROUND:** While the prevalence of current cigarette smoking is steadily decreasing among young adults (ages 18-25 years), tobacco companies have increased advertising and development of alternative tobacco products (e.g., water pipe or hookah, and Electronic Nicotine Delivery Systems or ENDS such as electronic cigarettes or e-cigarettes). The success of pro-tobacco marketing is exacerbated by some young adults' tendency to be immersed or emotionally transported by pro-tobacco messages. Alternatively, young adults who have tendencies of transportability can also become influenced by messages that communicate the risks of tobacco products. The current study presents the effect of transportability trait on the success of a mobile-phone SMS program, *Project Debunk* in communicating about the risks of tobacco products. **METHOD:** Within a longitudinal study in Houston community-college campuses, 646 young adults received a series SMS messages. We conducted two campaign-waves of one month each, delivering 2 messages per day. Data were collected on transportability trait and perceived risk (PR) of using regular cigarettes, hookah, and e-cigarettes, at baseline, 3-months post-baseline, and 6-months post-baseline. **RESULTS:** Controlling to time, transportability trait was related to PR of using cigarettes (P=0.040) and e-cigarettes hookah (P=0.033), but not hookah (P=0.524). When controlling for the transportability-by-time interaction effect, increases by 3-months post-baseline in PR of using cigarettes (P=0.201), e-cigarettes (P=0.191), and hookah (P=0.052) are lost. On the other hand, by 6-months post-baseline, increases in PR of using cigarettes (P=0.020), and hookah (P=0.002) are maintained, but the increase in PR of using e-cigarettes is lost (P=0.063). **CONCLUSION:** Transportability trait is a predictor of PR, and it can influence the effectiveness of mobile-phone SMS messaging campaigns on increasing PR of using nicotine and tobacco products. Considering young adults' tendency to be transported by message content is crucial to the success of tobacco risk communication campaigns.

**FUNDING:** Federal

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## POS2-180

### SYNTHESIZING THE EXISTING RESEARCH ON E-CIGARETTES AND CESSATION: FINDING PATTERNS IN DISCREPANT RESULTS

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**SIGNIFICANCE:** The current state of the research on whether e-cigarettes help with or hinder cessation is unsettled. Systematic reviews to date suggest a modest effect, although the state of the evidence remains relatively weak. Several approaches have been employed to examine the link between e-cigarette use and smoking cessation, but cohort studies may be the most important for understanding real-world effectiveness. To this point, the results from cohort studies have been varied and often contradictory. **METHODS:** This study reviews the cohort studies that aim to uncover the relationship between e-cigarette use and smoking cessation, recording a variety of methodological choices and the result of each study. **RESULTS:** At least two major patterns have emerged from these seemingly discrepant results. First, cohort studies that characterize e-cigarette use in more precise ways, particularly those that allow for at least two categories of e-cigarette use that vary in intensity, have shown that more intensive e-cigarette use has a much stronger association with smoking cessation than less intensive use. Second, cohort studies that measure e-cigarette use at baseline only, comparing smokers who have used e-cigarettes at or before baseline with those that have not, find less (or negative) association with cessation compared with those that measure e-cigarette use between baseline and follow up. **CONCLUSIONS:** Differences in study design, particularly the timing and intensity of e-cigarette use, can lead to differences in study results. The causal meaning of these discrepancies will be considered and discussed.

**FUNDING:** None

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## POS2-181

### MEDIA INFLUENCES, PACKAGE WARNING LABELS, AND THE DEVELOPMENTS OF UNDERGROUND MARKETS: PERSPECTIVES OF US SERVICEMEMBERS IN PACIFIC COUNTRIES

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**INTRODUCTION:** US military servicemembers have higher rates of tobacco use than their civilian counterparts. Of all the US services, Marines stationed overseas have the highest tobacco use prevalence. This study examines Marines and Sailors stationed on Okinawa, Japan. Media portrayals of tobacco have a significant influence on use in this population. This population also has frequent exposure to media and tobacco packaging from countries throughout the Pacific. Results of this study can inform tobacco cessation policies and media campaigns. **METHODS:** Thirty one-on-one semi-structured interviews were conducted with Marines and Sailors, including healthcare workers. Sessions were recorded, transcribed and analyzed in MAXQDA, a qualitative data management and analysis software. **RESULTS:** Analysis identified three major media themes: (1) US media portrays military tobacco use positively, (2) use of tobacco in role models has a greater influence on starting and continued use than use in peers or bystanders, and (3) graphic health warnings on packages of tobacco products can have the inverse desired effect as servicemembers collect these package warning labels. Analysis identified one major access theme: service members develop their own underground markets when tobacco sources becomes scarce. **DISCUSSION:** Servicemembers have unique cultures and are influenced by military specific role models and media images. Many of the role models servicemembers aspire to are historical war heroes from times when tobacco use prevalence was higher. Consequently, images of these role models frequently show tobacco use. Separately, graphic health warnings recommended by the WHO may not discourage use in current military tobacco users. These servicemembers collected the cigarette packages from Thailand and Australia and used them as trading cards. Finally, entrepreneurial servicemembers will supply their peers with tobacco at exorbitant prices when supplies are scarce. The loss of tobacco sources happens frequently when servicemembers deploy to the field or go to sea. Policies intended to restrict military tobacco use should also restrict servicemembers from developing underground markets.

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## POS2-182

### USING CONVENIENCE AND PROBABILITY SAMPLES FOR TOBACCO RESEARCH: COMPARING ESTIMATES OF EXPERIMENTS, CORRELATES, AND PREVALENCE

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**SIGNIFICANCE:** Online convenience samples are a quick and low-cost way to conduct tobacco research, but there is need for more research on their comparability to findings from probability samples. We sought to compare findings for tobacco experiments, correlates, and prevalence acquired by national probability and convenience samples. **METHODS:** We recruited a probability sample of 5,014 US adults by phone from September 2014 through May 2015 and an online convenience sample of 4,137 US adults through Amazon Mechanical Turk (MTurk) in December 2014. All participants completed a survey with experiments, measures of tobacco product use, and demographic characteristics. We compared the statistical significance and direction of experimental findings. We also used unadjusted logistic regressions and one-sample t tests or proportion tests to compare correlations and prevalence estimates, respectively. **RESULTS:** MTurk convenience and probability samples showed the same pattern of statistical significance and direction in almost all experiments (19 of 22 analyses did not differ) and correlational findings (19 of 25 associations did not differ). Demographic characteristics of the samples differed substantially (1 of 17 estimates did not differ), with the convenience sample being younger, having more years of education, and including more Whites and Asians. Tobacco product use also differed substantially (1 of 22 prevalence estimates did not differ), with the convenience sample reporting more cigarette and e-cigarette use. **CONCLUSIONS:** Tobacco research using MTurk convenience samples can yield generalizable findings for experiments and correlates. On the other hand, prevalence estimates from MTurk convenience samples are likely to be over- or underestimates and should be interpreted with caution.

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## POS2-183

### A COMPARISON OF METHODS TO MEASURE CONSUMPTION OF TOBACCO PRODUCTS AMONG ADOLESCENT AND YOUNG ADULT CIGARILLO USERS

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**OBJECTIVE:** Accurate assessment of cigarillo use is complicated by patterns of use that include sharing and multiple product use. In this study we compare a conventional tobacco use assessment to a more detailed measurement strategy which accounts for sharing. **METHODS:** This is a cross-sectional study of adolescent and young adult cigarillo smokers aged 14-28 who completed a web-based survey. Conventional measures of tobacco use were assessed with these questions: 'on how many of the past 30 days did you smoke cigarillos, and 'on average how many were smoked on these days'. The detailed method assessed use of each tobacco product for each of the past 7 days and how many of each cigar product were smoked alone vs. shared with others, how many were in the sharing group, and how many products were smoked during a session. Analyses compared cigarillo use per day for the conventional vs. the detailed method using paired t-test and stratified analyses to examine the association with amount of cigarillo use, product sharing, multiple product use, and daily smoking. **RESULTS:** The mean number of cigarillos per day was 1.72 (SD 2.28) and 1.57 (SD 1.97) for the conventional and the detailed approach respectively,  $p=.38$ . For individuals that mostly shared when smoking cigarillo products, the conventional approach yielded 1.05 (SD 1.37) per day vs. the detailed approach 0.35 (SD 0.34),  $p<.001$ . Significant differences for low level cigarillo users 1.06 (SD 1.69) vs. 0.48 (SD 0.31),  $p<.001$  and for high level cigarillos users 3.48 (SD 2.67) vs. 4.88 (SD 2.98),  $p<.001$  indicates that the conventional approach yields a higher amount for the low level users but a lower amount for the high level users in contrast to the detailed approach. There were no significant differences in approach by gender, age group,

daily smoking or multiple product use. **CONCLUSIONS:** This study indicates that a compared to a detailed approach, a conventional measure of tobacco use for cigarillo users yields significantly higher daily consumption estimates for individuals that share products and those that smoke low amounts of cigarillos and significantly lower estimates for high level cigarillo users.

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## POS2-184

### "PHANTOM SMOKERS": SMOKER IDENTITY AMONG TEEN AND YOUNG ADULT USERS OF CIGAR PRODUCTS

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**BACKGROUND:** There is a growing trend among young smokers to consume tobacco products mostly in social settings or to maintain consistent but nondaily smoking habits. These "phantom smokers" tend to underestimate their own health risks and feel less need to quit compared to self-identified smokers. Cigar, cigarillo, and little cigar (CCLC) use is associated with behaviors common to phantom smokers, suggesting these smokers may be particularly prone to phantom smoker beliefs and associated risks. **METHODS:** An online survey was conducted among 14-28 year olds who actively smoke at least 2 cigarillos per week. Phantom smoker status was determined by a negative response to the question, "Do you consider yourself a smoker?" Other variables included smoking frequency, group smoking, products used, and confidence in ability to quit. Association between smoker identity and these factors was tested using chi square and t-tests. **RESULTS:** Of 330 participants, 77(23.3%) were identified as phantom smokers, despite regular use of CCLC. Black participants (22.1%) were less likely to be phantom smokers than Whites (57.1%,  $p<.05$ ). Phantoms and identified smokers did not otherwise differ demographically. Phantoms smoked about half as many cigarillos per week ( $M=4.95$ ,  $SD=11.56$ ) as identified smokers ( $M=8.75$ ,  $SD=8.91$ ,  $p<.01$ ). While 58.7% of identified smokers smoked cigarillos and cigarettes, phantoms were more likely to smoke only cigarillos (35.5%,  $p<.05$ ). Only 11.8% of phantom smokers expressed concern about becoming addicted to tobacco, as compared to 54.5% of self-identified smokers ( $p<.05$ ). Phantom smokers were more likely to smoke mainly in group settings (36.8%) than identified smokers (15.8%,  $p<.05$ ). On a 5-point confidence scale phantoms also reported higher confidence in ability to quit ( $M=4.4$ ,  $SD=1.02$ ) than identified smokers ( $M=3.74$ ,  $SD=1.27$ ,  $p<.05$ ). **DISCUSSION:** Nearly a quarter of respondents did not self-identify as smokers, despite being regular cigarillo users. Phantom smokers' lack of perceived addiction risk and high confidence in ability to quit implies that conventional quitting messages and smoking assessments may be less effective with these smokers.

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## POS2-185

### CIGARETTES, LITTLE CIGARS, AND CIGARILLOS: INITIATION, MOTIVATION, AND DECISION MAKING

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**INTRODUCTION:** Cigarettes and LCCs (little cigars/cigarillos) are the most prevalent dual use tobacco combination; one-third of cigarette smokers use LCCs. Risk factors for multiple tobacco product use have been reported, however there is little understanding of why some individuals transition to and maintain multiple product use. In this study, we examine narratives of tobacco product initiation and decision-making among LCC only and LCC/cigarette smokers. **METHODS:** We audio-recorded in-depth interviews with 60 individuals, aged 14-28, who reported smoking  $\geq 1$  cigarillo per week; half also smoked cigarettes. Transcribed interviews were coded using a phenomenological approach to examine themes about smoking initiation, motivation, and product decision-making. **RESULTS:** Among dual users, 60% began smoking LCCs before or at the same time as cigarettes, and 40% began smoking cigarettes first. Reasons for smoking cigarettes in addition to LCCs included easier access when experiencing craving and less time to





prepare the product to smoke. Cigarette smokers reported first smoking LCCs in social contexts when sharing LCCs with other smokers, or when they could afford a single LCC but not a pack of cigarettes. LCC-only smokers reported not smoking cigarettes due to their expense, unpleasant taste/smell, and fear of becoming addicted. **CONCLUSIONS:** In this sample of current LCC users, half also used cigarettes. Product initiation order was almost evenly split, but reasons for initiating the second product differed, with immediacy of reducing cravings as a key reason for LCC users to smoke a cigarette and social and financial reasons for cigarette users to smoke a LCC.

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## POS2-186

### NICOTINE DEPENDENCE AMONG ADOLESCENT SMOKERS: APPLICATION OF A BRIEF, PRODUCT-NEUTRAL DEPENDENCE MEASURE

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Nicotine dependence among youth who smoke cigar products is not well understood as measures of ND have been developed for cigarette smokers. A novel, product-neutral measure of nicotine dependence was included in a surveillance survey conducted in Cuyahoga County, Ohio, which is known to have high rates of cigar product use and multiple tobacco product use. Data for this study were drawn from the 2017 Cuyahoga County Youth Risk Behavior Survey conducted in Spring 2017 in 44 participating high schools in Cuyahoga County, Ohio; 13,907 youth completed the survey (overall response rate of 60%). Youth responded to 12 items to assess nicotine dependence (ND). Items were summed for final score ranging from 12 (low dependence) to 60 (high dependence). Analysis was limited to youth who reported smoking cigarettes or cigars, cigarillos, and little cigars (CCLC) in the past month and completed the ND measure (n=702). Overall, 13.1% of students reported current CCLC use and 6.2% reported current cigarette smoking; 4.8% reported using both. Mean ND score for CCLC users was 21.7 compared to 24.2 for cigarette smokers. Dual users had the highest ND score (26.6) compared to exclusive cigarette smokers (19.5) and exclusive CCLC smokers (17.7). Youth reporting initiating smoking at age 8 or younger reported a score of 32.1 compared to 17.9 for those who initiated at 15-16 years. ND scores increased as the number of products consumed increased. CCLC users smoking <1 CCLC on the days they smoked scored 17.3 compared to 35.3 for those who smoked 6 or more on the days they smoked. A similar pattern was observed for cigarettes, with a score of 16.9 for <1 cigarette on days smoked compared to 47.6 for >10 cigarettes on days smoked. Among dual users, youth smoking high amounts of CCLC and cigarettes had the highest ND score at 52.2, compared to 22.5 for youth smoking low amounts of both products. Youth who smoke CCLC exhibit signs of nicotine dependence. Youth who consume (certain levels) of CCLC products have ND scores similar to those who consume (certain levels) of cigarettes. Youth use of CCLC put youth at increased risk for long-term ND and chronic disease.

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## POS2-187

### FEASIBILITY OF INTENSIVE DATA COLLECTION OF E-CIGARETTE USE BEHAVIOR AMONG SMOKERS: ECOLOGICAL MOMENTARY ASSESSMENT AND GEO-TRACKING

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**INTRODUCTION:** Intensive longitudinal methods have been successfully used to understand within-person cigarette smoking dynamics, as well as the effect of the social and built environment on smoking behavior. The objective of this research was to examine the feasibility of applying these methods to ECIG use behavior. Participants' own smartphones were used to collect ecological momentary assessment (EMA) data on ECIG behavior and the social/policy environment. METH-

**ODS:** Data come from the Moment Study, an intensive longitudinal study that examined factors influencing ECIG use among adult smokers. Participants self-reported cigarette and/or ECIG use and responded to up to 6 random prompts/day (assessing mood and craving) via text message over 3 weeks; reports were tagged with latitude and longitude. Additionally, participants completed 4 in-person study visits and a 30-day follow up survey online. **RESULTS:** The sample included 107 adult smokers (51 male), with a mean age of 41.0 years (SD=12.3). Over the 3-week protocol, participants completed 7,279 random prompts (55.7% of total available) and initiated 4032 CIG/ECIG use reports. No sociodemographic characteristics were associated with random prompt compliance. Random prompt compliance rates were significantly higher in Week 1 compared to Weeks 2 and 3 ( $p < 0.0001$ ); however, random prompt compliance rates in Weeks 2 and 3 did not significantly differ. The majority (69.0%) of all self-report surveys had corresponding geodata. A majority (73.1%) of participants completed all 4 in-person visits, with most (44.6%) drop-out occurring after the baseline visit and before the Week 1 visit. Four participants who completed the final in-person visit during Week 3 were lost to follow-up. Sociodemographic variables did not significantly affect the likelihood of completing the 30-day follow up survey. **CONCLUSIONS:** Using participants' own smartphones to collect ECIG EMA data is feasible; however, associating it with geodata is more challenging and depends on cell phone network coverage. Use of an app that catches self-report data and geodata could reduce data loss.

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## POS2-188

### DIFFERENCES IN RATES OF TOBACCO PRODUCT USE AND CAMPAIGN AWARENESS AMONG US HISPANIC YOUTH

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**BACKGROUND:** Hispanic youth are diverse and a priority population for tobacco control. Yet there is limited research regarding Hispanic youth tobacco use by subgroup. National surveys often report low smoking rates among Hispanics in comparison to other racial/ethnic groups, but this may obscure differences in smoking rates among Hispanic subpopulations. Similarly, evaluations on the impact of tobacco education campaigns do not account for differences among Hispanic subpopulations that could be influenced by cultural norms, smoking rates and sociodemographic factors. **METHODS:** We examined Wave 2 youth data from the Population Assessment of Tobacco and Health (PATH) study. The PATH study is a nationally representative survey of youth aged 12-17 and adults, living in the US. This dataset provides information on whether a participant is Mexican, Cuban, Puerto Rican, or of another Hispanic heritage. We examined differences in susceptibility to use and ever use of four tobacco products (cigarettes, e-cigarettes, cigarillos and hookah) among Hispanic youth as well as awareness of two national campaigns: *The Real Cost* and *truth*. **RESULTS:** Mexican, Cuban, Puerto Rican and other Hispanic youth were more likely than non-Hispanic youth to be susceptible to hookah use (ORs=1.7, 2.5, 1.5 and 1.6, respectively), while Mexican and other Hispanic youth were more likely to be susceptible to e-cigarette use (ORs=1.3 and 1.2, respectively) and cigarillo use (ORs=1.4 and 1.4, respectively). Mexican, Cuban, and other Hispanic youth were more likely to have tried smoking hookah (ORs=1.5, 4.1 and 1.65, respectively). Mexican (OR=.69) and other Hispanic youth (OR=.85) were less likely to report awareness of *The Real Cost*, while Puerto Rican youth were more likely to report awareness of *truth* (OR=1.5). **DISCUSSION:** Different Hispanic sub-groups exhibit differential risk for, and use of, tobacco products. It is critical to consider the ethnic diversity among the U.S. Hispanic population when examining rates of tobacco use and the receptivity to anti-tobacco messaging. Failing to do so can mask disparities in tobacco use among specific sub-groups and the reach of tobacco education campaigns.

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## POS2-189

### IMPLEMENTATION OF A PARTICIPATORY EVALUATION STRATEGY: A FEASIBLE APPROACH IN COMMUNITY-BASED PARTICIPATORY PROGRAMS ADDRESSING TOBACCO SMOKING DISPARITIES

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**INTRODUCTION:** Community-based participatory research (CBPR) has been posited as a promising methodology to address health concerns at the community level, including tobacco disparities. This paper describes the process of development and implementation of a participatory evaluation framework within a CBPR program to reduce cigarette and hookah smoking disparities among Arab Americans in Tampa and Jacksonville Florida, as well as lessons learned. **METHODS:** community is defined as our target population (Arab - Americans in the targeted cities in Virginia and Florida) which were represented by community partners in tobacco prevention project (CPTPP); i.e., community health advisors, Islamic centers and Arab based-based organizations, community leaders and agents of change such as ministers and Imams etc. The participatory process involved community partners and academicians in a fluid process to identify common ground activities and outcomes. The logic model, a lay friendly approach, was used as the template and clearly outlined the steps to be taken in the evaluation process without sacrificing the rigor of the evaluation process. **RESULTS:** For the CPTPP, those steps of the logic model translated into the following chain of activities: 1) network expansion; 2) capacity building; 3) needs/assets assessment; 4) development and implementation of a community action plan that would lead to; 5) increased smoking cessation activity, Arabic language smoking counseling and, ultimately, the reduction/elimination of smoking h disparities between Arab Americans and whites in targeted cities Jacksonville and Richmond. Once the Community Action Plan was finalized, partners renewed their commitment to the program and began its implementation. **DISCUSSION/CONCLUSION:** We have learned three major lessons in this process: 1) the importance of constant and open dialogue among partners; 2) flexibility to make changes in the evaluation plan and implementation; and 3) importance of evaluators playing the role of facilitators between the community and academicians. Despite the challenges, we offer a viable approach to evaluation of CBPR programs focusing on tobacco disparities.

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## POS2-190

### ARE STATE QUITLINES THE GREAT EQUALIZER? RACIAL DISPARITIES IN ACCESS TO STANDARD OF CARE TOBACCO CESSATION TREATMENT

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**SIGNIFICANCE:** Tobacco quitlines are available in every state in the U.S. Quitlines remain the greatest single population-based channel of delivering evidence-based treatment. These services are intended to reduce barriers (e.g., cost, transportation) in access to the standard of care for tobacco treatment (moderate to intense behavioral counseling plus 8-12 weeks of pharmacotherapy) and thus reduce tobacco-related disparities. Cessation rates are lower among African Americans compared to whites, and emerging evidence indicates a similar pattern within state quitlines. The purpose of this study was to examine racial/ethnic differences in access to standard of care tobacco cessation treatment among state quitline enrollees. **METHODS:** The sample was drawn from 2015 enrollees in five state quitlines (N=27,468) whose services include varying levels of telephone counseling (single vs. multiple calls) and nicotine replacement therapy (NRT) (none, 2-, 4-, 8-, or 12-weeks). Participants self-identified as white non-Hispanic (n=19,910; 73%), African American (n=7558, 27%), mostly female (62%), lower income (36% less than \$25,000/year), and middle aged (M=48 years, SD=14). They smoked an average of 17 daily cigarettes and had moderate-high nicotine dependence. Analyses included hierarchical logistic regression and analyses of covariance (adjusted for sex, income, education, age, and location). **RESULTS:** Compared to whites, African Americans were significantly less likely to be enrolled in multiple call vs. single call programs (p<.05). Of enrollees into a multiple call program, African Americans completed fewer coaching calls (p<.001). Of African Americans who were eligible for NRT, there was a greater likelihood of receiving a single, 2-week supply and a

lower likelihood of receiving 8 or 12-weeks (p<.01). **CONCLUSIONS:** Disparities in access to the standard of care for tobacco treatment were observed. These findings also have implications for cessation disparities. Quitlines are an important population-based channel of service delivery, yet future research is needed to understand these findings, so that access to evidence-based treatment is equitable.

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## POS2-191

### WEB-BASED TOBACCO CESSATION INTERVENTIONS AND THE DIGITAL DIVIDE

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**SIGNIFICANCE:** Access to the internet has become an important entrée to tobacco cessation interventions. Populations disadvantaged by racial/ethnic minority status and lower education levels have been historically less likely to have internet access (i.e., the digital divide). Given the high concentration of tobacco users in underserved populations, we examined the selection, enrollment, and uptake of a web-based cessation service across U.S. racial/ethnic groups. We expected to find digital divides in enrollment and utilization of a web-only tobacco cessation program. **METHODS:** The sample includes 2015 enrollees in five quitlines whose services include a web only cessation program (N=32,989). Participants self-identified as white non-Hispanic (60%), African American (23%), Hispanic (11.1%), Native American/Native Alaskan (3%), Asian/Asian American (.4%), or other race/ethnicity (2.5%). The sample was mostly female (61%), lower income (40% less than \$25,000/year), and middle aged (M=47 years, SD=14). Hierarchical logistic regression and analyses of covariance (adjusted for sex, income, education, age, and location) were conducted. **RESULTS:** Compared to whites, African Americans, Hispanics, Native Americans, and "others" were significantly less likely to enroll in the quitline via the web (ps<.01), request a web only program (ps<.01), or enroll in a web only program (ps<.01). Relative to whites, these groups preferred telephone counseling. No differences were found between whites and Asians/Asian Americans. Among participants who enrolled in the web only program, all racial/ethnic minority groups were significantly less likely than whites to have a Web Coach account (ps<.03), and African Americans were less likely than whites and Hispanics to log in to the web program (p<.01). There were no differences found across the other racial/ethnic groups. **CONCLUSIONS:** This study suggests that a digital divide remains in web tobacco cessation services. Research designed to understand the observed differences is needed. Findings have implications for the development and implementation of web-based tobacco interventions for racial/ethnic minority communities.

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## POS2-199

### VALIDATION OF PERCEPTIONS AND BEHAVIORAL INTENTIONS SURVEY: PSYCHOMETRIC EVALUATION OF TOBACCO-RELATED BEHAVIORAL INTENTIONS TO TRY, USE, DUAL USE, AND SWITCH

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**SIGNIFICANCE:** Establishing reliable and valid survey measures is critical to reduce measurement error, increase sensitivity, and allow for researchers to draw accurate conclusions from results. Currently reliable and valid measures of behavioral intentions to try, use, dual use and switch to a new tobacco product do not exist. In response to this gap in the literature, we developed and validated a Perceptions and Behavioral Intentions (PBI) survey. The primary purpose of this study was to evaluate the psychometric properties of the PBI survey. **METHODS:** A total of 2,943 participants (adult smokers planning to quit, adult smokers not planning to quit, EV users, former tobacco users, never tobacco users) were recruited to participate online. Cognitive interviewing was first conducted to ensure that try, use, dual use, and switch items were being interpreted by the participant as intended. Items were then subjected to quantitative psychometric analyses,



including evaluation of: rating scale functioning, item fit, dimensionality, model fit, item parameters, Rasch derived reliability, person-to-item targeting, internal consistency reliability, test-retest reliability, convergent/discriminant validity, and ability to detect change. Data were randomly split into Validation and Cross-Validation datasets. The psychometric analyses were performed on each dataset separately and results were compared to ensure stability across sampling. RESULTS: Results across the four behavioral intention constructs revealed that the 6-point rating scales were functioning as expected. Rasch modeling revealed unidimensionality, adequate fit and discrimination, and excellent reliability. Item difficulties indicated that items were ordered as expected, and person-to-item maps revealed excellent person-to-item targeting. Factor analytic approaches suggested that the scales were unidimensional and that the structures were similar across participant subgroups. Pearson correlations coefficients provided strong support for convergent and discriminant validity. Details of results will be presented. These data support the PBI survey as a reliable and valid tool to assess behavioral intentions.

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## POS2-200

### CHANGES IN SELF-REPORTED QUALITY OF LIFE AND HEALTH STATUS AMONG ENDS USERS WHO WERE CIGARETTE USERS

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The FDA recommends that manufacturers evaluate the risks of new tobacco products by assessing the effects of the products on human health. Recent survey research and clinical studies have identified improvements in self-reported quality of life (QOL) and health status among combustible cigarette (CC) users who switched to electronic nicotine delivery systems (ENDS). However, limited nationally representative analyses exist on the health impacts of switching from CC to ENDS. Data gathered from the first two annual waves of the Population Assessment of Tobacco and Health (PATH) Study, which uses a nationally representative longitudinal cohort design, was analyzed to explore changes in QOL and health status measures among wave 1 CC users who switched to ENDS by wave 2. Analyses of PATH data used population weights with variance estimates computed using Fay's balanced repeated replication ( $\rho=0.3$ ). Linear regression was used to examine associations between predictors and outcomes of interest (i.e., overall QOL and health status, ease of performing daily activities, social satisfaction, internalizing and externalizing problems, and physical and mental health). Wave 2 health state outcomes of interest were adjusted for smoking history, gender, age, and education, and health state at wave 1 to account for baseline health status differences. Along a scale where 1 was excellent and 5 was poor, results revealed that the adjusted mean overall QOL and health status scores at wave 2 for the CC users who switched to ENDS over the course of the year (adjusted means: QOL=2.54, health status=2.67) were significantly lower than the adjusted mean overall QOL and health status scores at wave 2 for CC users who did not switch (adjusted means: QOL=2.68, health status=2.84),  $p<.001$  for both. Other study outcomes of interest showed similar support of the harm reduction potential of switching from CC to ENDS. Analysis of PATH data suggests CC users who switched to ENDS experienced improvements in QOL and health status measures. These results are a foundation for ongoing analyses of future data waves to assess within-person changes in self-reported QOL and health status.

FUNDING: Tobacco Industry

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## POS2-201

### EFFECT OF PROMOTIONAL MATERIALS ON NONUSERS' INTENTIONS TO TRY AND USE A SPECIFIC E-VAPOR PRODUCT

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SIGNIFICANCE: The Family Smoking Prevention and Tobacco Control Act gave FDA the authority to regulate tobacco products. FDA issued Draft Guidance regarding the evidence manufacturers should provide to support new product applications, including data on the effects of marketing and advertising on tobacco

users and non-users' likelihood of trying and using the candidate tobacco product. This research examined whether promotional materials have an effect on non-users' intentions to try and use any of the e-vapor products associated with a specific brand (referred to here as "e-vapor products"). METHODS: A convenience sample of self-reported adult former ( $n = 841$ ) and never tobacco users ( $n = 840$ ), including a subsample of legal age (LA) to 24 year olds ( $n = 838$ ), were assigned to one of two conditions: full vs reduced exposure. In the full exposure condition, participants viewed print marketing materials, a digital video ad, and front pack shots representing the portfolio of e-vapor products. In the reduced exposure condition, participants viewed the front pack shots. Participants completed both a pre- and post-test survey measuring intentions to try and intentions to use e-vapor products. Separate Analyses of Variance (ANOVA) were employed to test the differential effect of exposure on intentions to try and use the e-vapor products. In each ANOVA, the factors included time (within-subjects; pre-exposure, post-exposure) and condition (between subjects; full exposure, reduced exposure), and time-X-condition interaction. RESULTS AND SIGNIFICANCE: Results revealed that promotional materials did not have a differential effect on non-users' intentions to try and/or use the e-vapor products. Specifically, there were no statistically significant interactions for tobacco never users, former users, or tobacco non-users aged LA-24. In conclusion, the promotional materials did not have a differential effect on increasing behavioral intentions among non-users. This suggests that exposure to promotional material minimally influences non-users' intentions to try and use any of the e-vapor products associated with this specific brand.

FUNDING: Tobacco Industry

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## POS2-202

### NICOTINE CONTENT OF E-CIGARETTES AND EFFORTS TO QUIT CIGARETTE SMOKING AMONG YOUTH: ANALYSIS OF US MONITORING THE FUTURE DATA

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SIGNIFICANCE: There are concerns that vapor products such as e-cigarettes introduce young people to nicotine. However, Monitoring the Future (MTF) survey data suggest that most high school students report using e-cigarettes that do not contain nicotine. A smaller proportion of youth report using nicotine-containing e-cigarettes and it could be the case that these young people are already smoking cigarettes and seek out vaporized nicotine to quit smoking. The purpose of the present analysis was to examine the relationship between the nicotine content of e-cigarettes and reported reasons for use among ever-smokers in the 2015 MTF survey. METHODS: MTF is a survey of substance use among a representative sample of 8<sup>th</sup>, 10<sup>th</sup>, and 12<sup>th</sup>-grade students in the United States. Data from 2015 were examined to determine the relationship between the reported nicotine content of e-cigarettes and reasons for e-cigarette use (e.g., to quit smoking, experimentation, to feel good, etc). The analysis focused on 1,577 high school students who had ever smoked cigarettes and reported have ever used e-cigarettes. The study sample only included 10<sup>th</sup> and 12<sup>th</sup> graders as the 8<sup>th</sup> grade sample size was inadequate for study analyses. Lastly, data from 10<sup>th</sup> and 12<sup>th</sup> graders were combined given that the pattern of results was statistically similar across grades ( $P_s > 0.05$ ). RESULTS: Ever-smoker 10<sup>th</sup> and 12<sup>th</sup> graders who reported using an e-cigarette that contained nicotine were several times more likely to report using e-cigarettes to quit smoking compared to other reasons for use (26.5% versus 7.9%; OR=4.18, 95% CI=2.59-6.76). CONCLUSIONS: Ever-smoking high school students who report using nicotine-containing e-cigarettes were more likely to report using e-cigarettes to quit cigarette smoking compared to other reasons for use. These findings correspond to the idea that some youth smokers might seek out nicotine-containing e-cigarettes to help with quitting cigarette smoking. Understanding why some youth might seek out nicotine products can improve our ability to minimize risks and maximize benefits associated with the availability of vaporized nicotine products.

FUNDING: Tobacco Industry

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## POS2-203

### COMPARISONS OF DEPENDENCE ON CIGARETTES AND E-CIGARETTES: DATA FROM THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY

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The prevalence of e-cigarette (ECIG) use has increased, raising questions about the degree to which users may develop dependence on ECIG, and how such dependence may compare to cigarette (SMOK) dependence. An Item-Response-Theory-based dependence scale, developed using PATH data, assesses ECIG dependence, and for the first time allows direct comparison of dependence across users of ECIG and SMOK. Data were collected from a representative sample of US adult established users of ECIG and/or SMOK (and no other tobacco) in PATH (Wave 1). Dependence on SMOK and ECIG (1-5 scale) was contrasted across groups, defined by history of use of each product type (current users or quit in past year, N=7,625). Analyses accounted for PATH's complex sampling scheme. Among established users of both SMOK and ECIG, dependence was much higher on SMOK; this was true both among current users (SMOK: mean=3.11 [SE=0.05] vs ECIG =1.61 [0.04],  $p<0.0001$ ) and former users (SMOK =1.59 [0.12] vs ECIG =1.11 [0.04],  $p=0.0001$ ). Current SMOK users who reported currently using ECIG were more SMOK-dependent than never-users of ECIG (ECIG =3.07 [0.03] vs never ECIG =2.69 [0.02],  $p<0.0001$ ). Among current ECIG users, those who had quit SMOK use in the past year reported greater ECIG dependence than those who were still SMOK users (former=2.23 [0.08] vs current=1.61 [0.04],  $p<0.0001$ ); however, their ECIG dependence was significantly lower than the SMOK dependence of current SMOK users, whether they currently used ECIG (3.11 [0.05]), had quit ECIG (3.12 [0.09]), or never used ECIG (2.69 [0.02], all  $ps<0.0001$ ). In direct within-person comparisons between cigarettes and e-cigarettes, e-cigarettes were associated with less dependence. Greater cigarette dependence was seen in smokers who used e-cigarettes than in those who did not; more dependent smokers may gravitate to and stay with e-cigarettes. The highest level of e-cigarette dependence was seen in those who had quit smoking in the past year; studies indicate that heavier e-cigarette use is associated with smoking cessation. These people may have transferred their dependence from cigarettes to e-cigarettes, as argued for by harm-reduction advocates.

FUNDING: Tobacco Industry

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## POS2-204

### THE EVOLVING CAREER LANDSCAPE FOR NICOTINE AND TOBACCO TRAINEES AND EARLY CAREER PROFESSIONALS: A REVIEW OF THE LITERATURE

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**SIGNIFICANCE:** The career landscape for junior scientists and clinicians in the field of nicotine and tobacco science has evolved considerably over the past two decades due to unprecedented social, economic, scientific, and technological changes. The purpose of this narrative review is to identify factors that have most impacted career opportunities in nicotine and tobacco science and to provide career guidance to trainees and early career professionals. **METHODS AND DATA SOURCES:** Evidence included in this review was obtained from PubMed and Google Scholar databases, as well as professional organization websites, with a focus on career planning specific to the field of nicotine and tobacco science. **RESULTS:** While few studies addressed career topics specific to nicotine and tobacco science, we found a considerable body of literature that examined changing career trajectories in science more generally. From this literature we identified four key factors that have been most influential to career planning in fields such as nicotine and tobacco science: 1) changing career landscape and opportunities (regulatory science growth, limited permanent/"tenure track" academic positions), 2) economic factors (budget cuts, student loans), 3) scientific and regulatory developments (novel nicotine products), and 4) evolving healthcare and clinical environments (value-based care). Additional issues identified included stigmatization associated with "non-traditional" career tracks, work/life balance concerns, workplace diversity, and "publish or perish" mentality in academia. **CONCLUSIONS:** This review identified key factors altering the career landscape for junior scientists/clinicians in nicotine and tobacco science. Trainees and early career professionals should be educated about this evolving career landscape so they can most effectively choose a career

that matches their unique skillsets, training background, and professional goals. Academic institutions, mentors, and professional organizations can support such efforts by facilitating exposure to career tracks inside and outside of academia such as careers within the government, private sector, or non-profit organizations.

FUNDING: Federal; Tobacco Industry

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## POS2-205

### ELEMENTS OF APPEAL AND EXPERIENCE THAT INFLUENCE TRIAL AND ADOPTION OR REJECTION OF E-VAPOR PRODUCTS AMONG CURRENT SMOKERS, CURRENT E-VAPERS, AND FORMER E-VAPERS: INSIGHTS FROM QUALITATIVE RESEARCH

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The *Family Smoking Prevention and Tobacco Control Act* gave FDA authority to regulate tobacco products. FDA issued Draft Guidance regarding the evidence manufacturers should provide to support new product applications, including data on appeal, attractiveness, and consumer perceptions. This study characterized the elements of appeal and perceptions that may play a role in tobacco product trial and behavioral transitions. Several focus group discussions centered on participants' reasons for transitions from e-vapor awareness to trial or non-trial, and from e-vapor trial to continued use or non-use. Twelve focus groups, 3 each of exclusive e-vapers (n=18), dual/poly e-vapers (n=17), former users/tryers of e-vapor (n=18), and cigarette smokers-never tryers of e-vapor (n=17) took place in three regions of the US. Transitions from awareness to trial required an *underlying motivator* (e.g., curiosity, social pressure, health issue) and *functional benefits* (e.g., no odor, convenience, cut down/stop smoking). Respondents identified needs that e-vapor products should meet for continued use: nicotine substitution, behavioral substitution (e.g., feel, drag), increase energy, relieve stress, and offer control over routine. Respondents described the decision to continue use as a cost-benefit analysis of e-vapor product strengths versus weaknesses (e.g., not satisfying, expensive). Exclusive e-vapers had transitioned away from cigarettes easily and the transition period was one to three months (and occurred subconsciously). As opposed to former users/tryers, the majority of exclusive e-vapers did not initially expect the e-vapor experience to mimic a cigarette, and they were more motivated to seek information to find the right "fit" for their needs. Dual/poly e-vapers either vaped or smoked primarily. Primary vapers reported that they preferred e-vapor to cigarettes and only smoked cigarettes in certain situations (e.g. at a party or bar). Primary smokers reported that they used e-vapor in situations where they could not smoke. These insights can inform the development/design of surveys/studies predictive of tobacco product trial and behavioral transitions.

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

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## POS2-206

### DEVELOPMENT OF A TOBACCO AND NICOTINE PRODUCTS DEPENDENCE INSTRUMENT

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**BACKGROUND:** Dependence on nicotine has historically been focusing on cigarette smokers. Today, various forms of tobacco and nicotine products (TNPs) are used widely, creating new challenges for public health, as currently there is no generally accepted instrument to measure dependence across TNPs. The development of an instrument was undertaken to quantify dependence on various TNPs, to ultimately allow for comparisons of single and poly-tobacco users with different levels of product use. **METHODS:** A review of existing dependence measures and discussions with 2 dependence experts supported developing a conceptual framework and subsequently a pilot version of the instrument. Open-ended concept elicitation combined with cognitive interviews (N=40) were then conducted in the USA among single tobacco product users (balanced across cigarettes, cigar/cigarillos, e-ciga-





rettes, and smokeless tobacco) and poly-tobacco users. RESULTS: The preliminary conceptual framework included 7 symptoms to best represent *lack of control* as the core concept of dependence (e.g., urgency to use, difficulty in ceasing product use, prioritising product use over other activities). A pilot version of the instrument was developed to include 9 items that characterized the "severity" of dependence on 3 different response scales (intensity, frequency, or duration) adapted to the characteristics of the individual symptoms. Interviews with the first 20 participants led to the removal of 2 problematic items; addition of 9 items based on concepts specifically elicited by the participants; and revisions of some items and response options to enhance comprehension. An additional 20 participants were cognitively debriefed on the revised version and saturation was reached by the end of the 40 interviews. CONCLUSIONS: The qualitative research findings extend previous conceptualizations of dependence on cigarettes, and suggest that the standardized measurement of dependence across different TNPs and use behaviors is achievable. The next step will be the psychometric testing of the instrument, aiming at item reduction and reliability and validity assessment of the instrument.

FUNDING: Tobacco Industry

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## POS2-207

### THE RELATIONSHIP BETWEEN INTENDED USE AND PERCEIVED HEALTH RISK FOR A NOVEL HEAT-NOT-BURN TOBACCO PRODUCT

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BACKGROUND: The most widely commercialized Heat-not-burn (HNB) tobacco product is the Tobacco Heating System (THS), commercialized as 'IQOS'. However, there are few data on risk perceptions and intended use of HNB products, or on their relationship. METHODS: 1,713 US adults were included from: 1. Smokers with No Intention to Quit cigarettes (S-NITQ), 2. Smokers with the Intention to Quit cigarettes (S-ITQ), 3. Former Smokers (FS), 4. Never Smokers (NS) and 5. Young Never Smokers (LA-25 NS). Participants were allocated to one of five arms corresponding to potential THS product messages. Computerized questionnaires were used to measure Intention to Use, and Perceived Health Risk. Within all smokers combined a logistic regression analysis was performed with Intention to Use THS regularly as the dependent variable and the difference in Perceived Health Risk score between CC and THS as the independent variable. Sex and age group were covariates. RESULTS: For all five arms, positive Intention to Use THS regularly was indicated by substantial proportions of S-NITQ (51%-65%) and S-ITQ (45%-62%) and low proportions of FS (4%-15%), NS (0%-3%) and LA-25 NS (0%-6%). For Perceived Health Risk, Cigarettes were rated highest, and THS was rated similar to E-cigarettes and higher than Cessation/Nicotine Replacement Therapies. Within all smokers and across all five messages 55% had a positive Intention to Use THS regularly. Within smokers with positive Intention to Use THS the mean Perceived Health Risk Scores was 46.4 for THS and 64.1 for CC. Within smokers with no positive Intention to Use THS the mean Perceived Health Risk Scores was 51.0 for THS and 64.5 for CC. After adjustment for sex and age group the logistic regression model showed an association between the difference in Perceived Health Risk and positive Intention to Use THS ( $p < 0.05$ ). The chance of a positive Intention to Use THS was 2% higher if the difference in the Perceived Health risk scores is increased by one unit. CONCLUSIONS: THS was associated with risk perceptions which were lower than CC and higher than the lowest comparators. Perceived Health Risk predicted intended use.

FUNDING: Tobacco Industry

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## POS2-208

### USE PATTERNS ASSOCIATED WITH SWITCHING AND DUAL USE AMONG CURRENT CONSUMERS OF MARKTEN<sup>®</sup>XL E-VAPOR PRODUCTS

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SIGNIFICANCE: The vast majority of e-vapor consumers have prior history using cigarettes. Understanding how consumers who have switched from cigarettes

to e-vapor products compare to those who use both and the impact of e-vapor use on cigarette use can provide useful insights for harm reduction. METHOD: We conducted an online cross-sectional survey in 2017 to characterize tobacco use patterns among adult ever-tryers of MarkTen<sup>®</sup>XL e-vapor products (MT). Using non-probability sampling methods, we recruited respondents from online panels and a consumer database. We report results on an unweighted basis among those who report using MT every day ( $n=876$ ) and some days ( $n=1,170$ ) and in the past 30 days (total  $N=2,046$  current MT users). RESULTS: Seventeen percent (17%) of current MT users report switching from cigarettes to e-cigarettes, and 72% report current use of e-cigarettes and cigarettes. Switchers report more frequent use of MT in the past 30 days ( $M=25$  days) than dual users ( $M=18$  days). They also report more consumption of MT than dual users: 48% report 20 or more use occasions on days used (vs. 32%) and 42% report using 7 or more MT cartridges per week (vs. 19%). Among dual users, those who report using MT every day tend to use more MT than those who report using MT on some days: 48% report 20 or more use occasions on days used (vs. 25%) and 36% report using 7 or more MT cartridges per week (vs. 11%). At the same time, dual users who use MT every day smoke cigarettes less frequently (49% smoke cigarettes on 30 of 30 days vs. 67%) and smoke less on days they smoke (41% smoke 5 or less cigarettes vs. 18%). Furthermore, 83% of dual users who use MT every day and smoked before they used e-vapor report "now smoking fewer cigarettes than before" compared to 64% of their counterparts who use MT some days. These patterns are consistent with the top reasons dual users cite for currently using MT: "to satisfy nicotine cravings" (71%) and "to help cut back or quit smoking" (65%). CONCLUSION: These results suggest that more frequent use of e-vapor products can facilitate reductions in cigarette consumption and may ultimately lead to complete transitions from smoking.

FUNDING: Tobacco Industry

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## POS2-209

### USING SYSTEM DYNAMICS MODELLING TO ASSESS THE IMPACT OF LAUNCHING E-CIGARETTES IN THE US MARKET

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INTRODUCTION: In 2012 the FDA suggested using mathematical models as tools for assessing the impact in terms of population health outcome of releasing new nicotine or tobacco products. As response to this guidance, BAT in collaboration with Ventana Systems UK has developed a compartmental model for two nicotine product categories. METHODS: A population model based on System Dynamics previously used to assess the effect of launching e-cigarettes in the UK has been adapted to represent the US population. This was achieved by incorporating compartments for race and ethnicity with respect of current smoking status, age, gender and time since quitting for smoking and vaping categories. Based on publicly available data, we created a baseline scenario where the e-cigarettes do not exist. This baseline scenario uses historical data up to 2008 for model calibration and projections are drawn up to 2050. Then the projections from the baseline scenario were compared to the factual scenario by introducing prevalence of e-cigarette use from 2008 to 2016. RESULTS: A full sensitivity analysis is presented, revealing tipping points for benefit/burden depending on the value of different parameters. We also evaluate the importance of the main assumptions introduced during modelling. We compare our results to other projections published in literature. CONCLUSIONS: Lack of data and differences on the definitions among data sources and data collection methodologies provided inconsistent inputs which made necessary the introduction of assumptions and calculation of some parameters through model calibration. With exception of extreme scenarios, the model suggests that the introduction of e-cigarettes in the US market is leading to an increasing benefit in terms of population health.

FUNDING: Tobacco Industry

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**POS2-210****USE PATTERNS AND TOBACCO USE HISTORIES AMONG USERS OF DIFFERENT VAPOR PRODUCTS: CIGALIKES, TANKS, AND OTHER VAPOR PRODUCTS**

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There are several types of vapor products, but few researchers have examined the different product types in terms of user demographics, use patterns, and/or tobacco use histories. We examined user characteristics and use patterns/histories for cigalikes, tanks, 'variant' vapor products (e-hookah, e-cigars, e-pipes), and multiple vapor product types in an ongoing national online cross-sectional survey of US adults. A total of 11,601 past-30-day users of vapor products were identified in the National Tobacco Behavior Monitor, from 2015 through 2016. Exclusive use of cigalikes was the most common use pattern (45%); exclusive tank use (23%) and concurrent cigalike and tank use (17%) were also common; and, exclusive use of variant products was least common (5%). User characteristics differed significantly by product type. Cigalike users and those using multiple product types tended to be male (60% and 62%, respectively). Users of cigalikes (63%), tanks (70%), or both (61%) tended to be White, whereas the proportion of Black (15%) or Hispanic (25%) users was highest for variant vapor products than for other product types. And while users of variant products were often young adults 18-24 (37%), users of cigalikes tended to be older (45+ yrs; 35%). Tank users had the highest rate of daily use (36%), and were the most likely to be previously established smokers who had quit (27% of tank users), especially if they used tanks daily (55% were former smokers). Users of multiple vapor products were least likely to be former smokers (10%). Variant product users were most likely to be very infrequent users (42% using less than 5 days/month), and least likely to have a history of established tobacco use (78%). Users of different types of vapor products differed in demographic characteristics, use patterns, and tobacco use histories. It is important to understand these differences in product use, and researchers should use caution when combining product types to examine vapor product use and/or users. Longitudinal data may further inform whether these patterns reflect migration between vapor products.

FUNDING: Tobacco Industry

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## POSTER SESSION 3

### POS3-1

#### **BASELINE HOMELESSNESS PREDICTS GREATER SMOKING URGES AND LOWER LONG-TERM TOBACCO OUTCOMES IN SMOKERS WITH SUBSTANCE USE DISORDER**

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This current paper reports on secondary analysis with homeless vs non-homeless smokers with substance use disorder (SUD) who were part of a trial of contingency management (CM) enhanced cognitive behavioral (CBT) tobacco treatment delivered concurrently with an intensive outpatient substance abuse program (IOP). Participants studied were smokers with (SUD) who were enrolled in a 3-week IOP and homeless at baseline (BL-H;  $n = 40$ ) vs non-homeless at baseline (BL-NH;  $n = 42$ ). All participants in the BL homeless group were sheltered during IOP and discharged to housing after IOP. Participants received voluntary concurrent tobacco treatment of 8 weeks nicotine patch, and 2 hours manualized CBT tobacco treatment (CBT+NRT); half the participants also received CM financial incentives for confirmed tobacco abstinence during treatment (CM+CBT+NRT). CM+CBT+NRT was associated with significantly greater short term tobacco abstinence (Cooney, et al, 2016). Tobacco quit rates were comparable for BL-H and BL-NH groups respectively at end of treatment (45%, 44%) and 1 month follow up (32%, 36%), but were significantly lower in BL-H (0%) compared to BL-NH (18%) participants ( $n=68$ ;  $t=2.54$ ;  $p=.013$ ) at 6 months. Current analyses explored for factors that could explain the lower long term smoking outcomes in BL-H smokers. There were no group differences in BL levels of nicotine dependence, number of cigarettes smoked, tobacco urges, depression and anxiety scores; nor treatment retention or post-treatment housing status. Results of a series of secondary mediational regression analyses revealed that urges measured at the one-month time point mediated the effect of BL-H status on tobacco outcome ( $\beta=0.14$ ,  $p=.009$ ), suggesting that BL-H smokers were experiencing smoking urges of greater intensity in long term follow up phase. These findings suggest that homeless smokers with SUD can benefit from enhanced CBT tobacco treatment but are highly vulnerable to smoking relapse. Future research may explore if homeless smokers may benefit from longer duration enhanced CBT tobacco treatment and ongoing support.

FUNDING: Federal

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### POS3-2

#### **MOBILE CONTINGENCY MANAGEMENT AS AN ADJUNCTIVE TREATMENT FOR CO-MORBID CANNABIS USE DISORDER AND CIGARETTE SMOKING**

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Cannabis is the most widely used illicit drug in the U.S. with 19.8 million current users. Population-based data indicate that almost all cannabis users (90%) have a lifetime history of tobacco smoking and the majority (74%) currently smoke tobacco. Among cannabis users, smoking tobacco is associated with increased frequency of cannabis use, increased morbidity, and poorer cannabis cessation outcomes. There is a lack of research, however, focused on addressing cessation of both substances simultaneously. The purpose of the current pilot study was to evaluate the feasibility and acceptability of a multi-component tobacco/cannabis abstinence treatment. Five participants completed the treatment (named Abstinence Reinforcement Therapy) that included five sessions of cognitive-behavioral telephone counseling for tobacco/cannabis, pharmacotherapy for smoking cessation, and five weeks of mobile contingency management to remain abstinent from tobacco and cannabis. Two of the five (40%) participants achieved early dual abstinence and 4 of the 5 participants were bioverified abstinent from cannabis at the end of the treatment phase. Three of the five (60%) achieved 7 days of abstinence from cigarettes or marijuana during treatment. At 6-month follow-up, one participant (20%) was bioverified abstinent from both tobacco smoking and cannabis and 2 of

the 5 (40%) were abstinent from cannabis. Among those not abstinent at 6 months, daily cigarette consumption was reduced by a mean of 47% from baseline, and 90-day cannabis use frequency decreased by a mean of 70% from baseline. Results support the feasibility of this approach with dual cannabis and tobacco users and suggest that further research in this area is warranted.

FUNDING: Academic Institution; Federal

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### POS3-3

#### **IMPLEMENTATION OF CONTINGENCY MANAGEMENT FOR SMOKING ABSTINENCE IN VHA SUBSTANCE USE DISORDER RESIDENTIAL TREATMENT PROGRAMS**

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Almost 80% of Veteran patients in Veterans Health Administration (VHA) substance use disorder (SUD) residential treatment programs have been identified as tobacco users. Patients with a SUD who smoke may be more heavily addicted to nicotine and likely require more intensive interventions to quit smoking. Contingency management (CM) is an intervention that provides a tangible reward or incentive based on performing a specific, objective behavior, and has been shown to be efficacious in supporting smoking abstinence. A pilot project was conducted to determine the feasibility of and barriers to implementing CM for smoking abstinence in VHA SUD residential treatment settings. Two sites implemented a 4-week prize CM program offered to current smokers admitted to the SUD residential treatment program, during which smoking abstinence was rewarded following verification by at least daily breath carbon monoxide (CO) measurements. Barriers to implementation, protocol feasibility, and adherence were assessed through coaching calls and a provider survey conducted pre-implementation. Smoking cessation interference in SUD treatment is commonly cited as a barrier to treating smoking, however 70% ( $n=14$ ) of provider respondents agreed or strongly agreed with the statement "stopping smoking increases the chance of successful recovery for substance or alcohol use." Lack of patient interest in quitting was reported to "considerably" or "extremely" limit the ability to offer CM for smoking by 45% ( $n=9$ ) of providers surveyed prior to initiating the CM intervention. However upon implementation, Site 1 reported 33% of eligible patients enrolling in CM and at Site 2, 53% of eligible patients enrolled in the program. Both sites adhered to their prescribed protocols and were able to conduct once or twice daily CO monitoring 7 days a week. A total of 23 patients had enrolled in CM after 10 weeks. These results support the feasibility of implementing CM for smoking abstinence in SUD residential treatment programs. Long-term sustainability of the CM protocol should be assessed and further evaluation of patient and provider attitudes and beliefs regarding smoking and smoking cessation is needed.

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### POS3-4

#### **DISTINCT BEHAVIORAL TREATMENT FIDELITY IN A SMOKING CESSATION TREATMENT STUDY**

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SIGNIFICANCE: Evaluating more than one behavioral treatment within the same study, as with the Multiphase Optimization Strategy (MOST), can be efficient, but has been underutilized with behavioral treatments due to perceptions that it may be too difficult to deliver multiple, distinct treatments with fidelity. Piper et al. (2017) evaluated two different types of manualized smoking cessation counseling: Recommended Usual Care (RUC; 1 in-person visit) and Abstinence-Optimized Treatment (AOT; 3 in-person visits + 8 phone calls). These were delivered to 623



adult daily smokers in primary care clinics, along with nicotine replacement. The present analysis assesses fidelity in behavioral treatment delivery in that study. **METHODS:** A total of 13 health counselors (primarily Bachelors-level) were trained to deliver both types of counseling. All counseling contacts were audio recorded. Each week a random counseling contact for each health counselor was reviewed by a licensed psychologist and scored for treatment fidelity based upon the specific contact's counseling protocol. Percent adherence to protocol was calculated as a function of (1) treatment group; (2) contact type; and (3) health counselor. **RESULTS:** A total of 426 counseling contacts were scored for treatment fidelity. RUC (single visit) fidelity was 96.9% vs. 95.9% in AOT visits. There was a significant difference ( $F(2,245)=4.01, p<.05$ ) in fidelity between AOT counseling delivered at visits (95.9% fidelity) and phone calls (98.5%); RUC fidelity did not differ from AOT calls or visits. There were no reliable differences in fidelity between different health counselors ( $F(11,425)=.72, n.s.$ ). Mean adherence for health counselors ranged from 94.8% to 98.5% across a range of 7 to 53 contacts. **CONCLUSIONS:** Multiple Bachelors-level health counselors were able to deliver two distinctly different behavioral smoking cessation treatments with fidelity rates of 94.8% or better. With appropriate treatment development and training, high levels of behavioral treatment fidelity can be achieved in efficient research designs.

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## POS3-5

### COMBINING MULTIPLE CONTEXT EXTINCTION WITH VERY LOW NICOTINE CONTENT PRETREATMENT: RESULTS OF A PRELIMINARY RANDOMIZED CONTROLLED TRIAL

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**SIGNIFICANCE:** Smoking very low nicotine content cigarettes (VLNCs) while wearing a nicotine patch has shown to reduce nicotine dependence, decrease smoking behavior, decrease brain reactivity to smoking cues and improve cessation outcomes. Here we examined whether smoking VLNCs while viewing both personal and generic smoking-related contexts (i.e. multiple context extinction; MCE) prior to quitting smoking would improve cessation outcomes by increasing the generalization of extinction learning. **METHODS:** Adult daily smokers ( $n=29$ ) participated in a cessation trial in which they smoked VLNC cigarettes while wearing nicotine patches for 3 weeks prior to making a quit attempt. During the pre-quit period, participants attended six, 60 min laboratory sessions, in which they smoked 4 VLNCs while viewing a series of images. Participants were randomly assigned to one of two conditions, which differed only in the content of the images presented during the laboratory sessions: personal and unfamiliar smoking-related contexts (MCE+,  $n=15$ ) vs. nature contexts (MCE-,  $n=14$ ). Cue-elicited craving was assessed at baseline (prior to randomization) and following 24hrs abstinence (post-quit) for all participants, and number of puffs taken during MCE sessions was recorded. Participants were provided with nicotine patches during the quit attempt and returned to the lab 1, 3, 6, and 10 weeks post-quit to assess smoking outcomes. **RESULTS:** Across time (baseline vs post-quit) there was a significant reduction in cue-elicited craving ( $p<0.001$ ) in both groups. However, there were no group differences in cue-elicited craving, and no group by time interaction. Smokers in the MCE+ group exhibited more puffs per MCE session than the MCE- group ( $p=0.018$ ). Both groups exhibited less puffs by the last MCE session ( $p=0.002$ ). During the quit attempt, 53% of smokers in the MCE+ group lapsed by week 10, compared with 71% in the MCE- group. **CONCLUSIONS:** These preliminary results suggest a promising intervention to improve smoking cessation outcomes. Further research in a larger sample is necessary to examine the specific effects smoking environments has on dependence and smoking cessation outcomes.

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## POS3-6

### PERSONAL SMOKING TOPOGRAPHY: SMOKERS DISPLAY A UNIQUE INDIVIDUAL SMOKING PROFILE

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**SIGNIFICANCE:** To date, little is known about individual smoking behavior and actual exposure to hazardous smoke components. Additionally, there is a lack of consensus concerning the methodology to determine human smoking behavior. The goal of this human study is to characterize natural human smoking topography, for use in future exposure-experiments and to optimize current methodology. **METHODS:** A prospective observational human pilot study included 5 healthy males (25-34 years), used to smoking 13-25 Marlboro cigarettes per day. Habitual smoking behavior was observed in a home-like-atmosphere apartment for 36 hours. For each smoked cigarette, smoking topography (i.e. puff volume, duration, frequency, flow and inter-puff-interval) was recorded with the CRESSmicro, a portable smoking topography measurement device. Puffing profiles were created by linear regression (least squares method). **RESULTS:** Participants smoked cigarettes random during the day and showed a significantly different puffing profile when compared to each other. Each participant showed only subtle differences between the single puff parameters per cigarette. When comparing all cigarettes of an individual participant, a constant trend of successive puff parameters could be observed. **CONCLUSIONS:** Each participant smoked all cigarettes with the same puff profile, enabling the creation of a personal smoking topography profile. We are the first to show that detailed data of 4 random cigarettes per individual are enough to create a personal smoking regime for future machine smoking exposure-measurements. Interestingly, the participants' puff profiles exceed the Health Canada Intense parameters used in regulatory machine smoking, underlining the need for appropriate cigarette smoke exposure-measurements based on human smoking.

**FUNDING:** Academic Institution

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## POS3-7

### ASSESSING THE READINESS FOR IMPLEMENTATION OF SMOKING-RELATED GENOMIC APPLICATIONS

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**SIGNIFICANCE:** The incorporation of genomic information in clinical and public health practice is a burgeoning area for investigation. The past decade has witnessed rapid advancements in knowledge of genetic biomarkers associated with smoking behaviors and tobacco-related morbidity and mortality, providing the basis for promising genomic applications in routine practice settings. We assessed the current state of readiness for implementing genomic applications involving variation in the alpha 5 nicotinic cholinergic receptor subunit gene *CHRNA5* and smoking outcomes (behaviors and related diseases) using a process that could be translatable to a wide range of genomic applications. **METHODS:** We reviewed the scientific literature involving *CHRNA5* genetic variation and smoking cessation, and then summarized and synthesized a chain of evidence according to analytic validity, clinical validity, clinical utility, and ethical, legal, and social implications (ACCE), a well-established set of criteria used to evaluate genomic applications. **RESULTS:** Our review identified at least three specific genomic applications for which implementation may be considered, including the use of *CHRNA5* genetic test results for informing disease risk, optimizing smoking cessation treatment, and motivating smoking behavior change. For these genomic applications, we rated analytic validity as *convincing*, clinical validity as *adequate*, and clinical utility and ethical, legal, and social implications as *inadequate*. **CONCLUSIONS:** For clinical genomic applications involving *CHRNA5* variation and smoking outcomes, research efforts now need to focus on establishing clinical utility. This approach is compatible with pre-implementation research, which is also needed to accelerate translation, improve innovation design, and understand and refine system processes involved in implementation. This study informs the readiness to incorporate smoking-relat-





ed genomic applications in real-world settings and facilitates cross-disciplinary collaboration to accelerate the integration of evidence-based genomics for smoking cessation.

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## POS3-8

### VAPING REINFORCEMENT EFFECTS ON SMOKING CESSATION PROPENSITY IN DUAL USERS

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**SIGNIFICANCE:** Most e-cigarette users who also smoke tobacco cigarettes (dual users) begin vaping to quit smoking, yet only a subset succeed. Thus, we examined characteristics of e-cigarette use (vaping) that are associated with smoking cessation propensity (CP). **METHODS AND RESULTS:** Baseline data from a national sample of dual users ( $N=2896$ ) in an ongoing smoking cessation trial were used to examine the effect of vaping reinforcement on the latent variable, CP. Vaping reinforcement was measured by 8 variables including frequency measures of vaping, characteristics of e-cigarette device, and positive e-cigarette expectancies. CP was represented by 5 variables including motivations to quit smoking, negative expectancies for cigarettes, and changes in smoking rate since initiating vaping. Half of the sample was randomly selected for an exploratory factor analysis. Four factors emerged: Vaping Propensity (frequency, positive expectancies), Vaping Enthusiasm (number of e-cig modifications, number of non-tobacco flavors used, puffs per vaping event), Nicotine/Tobacco (mg of nicotine used, number of tobacco flavor), and CP (negative expectancies, motivation to quit, change in smoking rate). A confirmatory factor analysis upheld the exploratory factor structure (RMSEA = .046, CFI = .91). Next, the full sample was used in a structural equation model with the 3 vaping latent variables directly effecting smoking CP. Model fit was acceptable (RMSEA = .046, CFI = .92) with a moderate positive effect of Vaping Propensity (.43,  $p < .001$ ), a small negative effect of Vaping Enthusiasm (-.21,  $p < .001$ ), and a small negative effect of Nicotine/Tobacco (-.16,  $p < .001$ ). **CONCLUSIONS:** The model suggests that frequent vaping combined with positive e-cig expectancies contribute to greater smoking CP. However, higher vaping enthusiasm (i.e., trying many e-juice flavors and device modifications), higher nicotine content, and use of tobacco flavored e-juice may detract from smoking CP. Future analyses will examine these variables as predictors of smoking status during the ongoing intervention study, with potential implications for treatment and policy.

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## POS3-9

### EVALUATION OF THE ACCURACY AND RELIABILITY OF COMMONLY AVAILABLE COTININE IMMUNOCHROMATOGRAPHIC TEST KIT

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There are several potential advantages of a simple, fast, and inexpensive screening method for measuring urinary cotinine in people. One issue is that advanced cotinine biomarker measurements involving both smokers and nonsmokers must accommodate a broad range of concentrations. For example, our laboratory applies two completely different complex and time-consuming LC/MS/MS methods to cover cotinine levels that can exceed six orders of magnitude. Thus, a preliminary classification of samples as being either "high" or "low" by a simple screening method could significantly improve the correct initial method selection. Inexpensive cotinine immunoassay test kits are now widely available, but there have been few studies of their reliability. Consequently, a screening assay using an immunochromatographic test kit (COT One-Step test cassettes with a reported 200 ng/ml cutoff) was examined using a representative group of 400 urine samples drawn from Wave 1 of the Population Assessment of Tobacco Health (PATH)

Study, covering the full range of cotinine concentrations in the general population. The results were compared with the known cotinine concentrations as previously determined by LC/MS/MS. These strips had no detectable cross-reactivity against cotinine-glucuronide, nicotine, or nicotine-glucuronide. They did show significant cross-reactivity against *trans*-3' hydroxycotinine and its glucuronide conjugate. Blinded analysis by two investigators resulted in a classification sensitivity and specificity of 99% and 93%, respectively, relative to the total cotinine concentrations measured by LC/MS/MS. Overall classification accuracy was 96%, and the misclassified samples all had cotinine concentrations near the test kit cutoff level. We conclude that these kits could provide a rapid, simple and inexpensive method for prescreening urine samples for large studies prior to quantitative LC/MS/MS measurements. This could substantially reduce the workload, cost, and time. In addition, the good reliability of these kits suggests that they may also prove to be useful for researchers for rapid and inexpensive smoker/nonsmoker classifications in the field.

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## POS3-10

### INITIAL EVALUATION OF LEVOMILNACIPRAN AS AN AID FOR SMOKING CESSATION

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**SIGNIFICANCE:** Based in part on nortriptyline's efficacy at increasing smoking cessation rates, noradrenergic medications are thought to be potentially effective aids for smoking cessation. The purpose of this study was to assess whether levomilnacipran, an agent that more potently inhibits the reuptake of norepinephrine than serotonin, may be effective at increasing cessation rates. **METHODS:** Using a short term, randomized, cross-over study design to assess efficacy for smoking cessation (based on Perkins et al. 2014) we conducted a trial in healthy adult smokers who were motivated to quit smoking. Subjects were evaluated during a three week period while receiving levomilnacipran and another 3 week period while receiving placebo. Active vs placebo medication was assessed in random order. The purpose of the first week of each three week evaluation period was to obtain baseline measures and the purpose of the second week was to titrate medication (20 mg levomilnacipran once daily for 2 days followed by 40 mg daily vs. matching placebo). During the third week subjects were asked to not smoke for each of five days. The number of days abstinent on levomilnacipran vs placebo were compared. Cessation was based on self-report and verified by exhaled carbon monoxide < 5 ppm. **RESULTS:** 40 subjects had data from both evaluation sessions and were included in the analysis. During levomilnacipran treatment, subjects were abstinent during an average of 47% of evaluation days whereas during placebo treatment, subjects were abstinent during an average of 42% of evaluation days. These differences were not statistically significant. **CONCLUSIONS:** These data suggest that if levomilnacipran has any effect on increasing smoking cessation rates, they are likely to be modest. Further research is needed on mechanisms by which an effective pharmacological agent, nortriptyline (an older drug with substantial norepinephrine reuptake inhibitor properties), increases cessation rates and to better understand the role of the noradrenergic system on nicotine dependence.

FUNDING: Academic Institution; Federal

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**POS3-11****BIOMARKER FEEDBACK PILOT INTERVENTION FOR TOBACCO CESSATION AMONG PREGNANT ALASKA NATIVE WOMEN**

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**SIGNIFICANCE:** Thirty percent of Alaska Native (AN) women smoke during pregnancy. Aside from health consequences to the mother such as lung cancer, heart disease and COPD, health consequences to the fetus include exposure to carcinogens, low birth weight, pre-term birth and risk of future tobacco use. A previous study with pregnant AN women tobacco users suggested specific information about fetal exposure to tobacco could influence cessation. We developed a biomarker feedback intervention and evaluated its feasibility, acceptability and effectiveness. **METHODS:** We enrolled 60 participants in a two group, randomized controlled 5-week intervention study (30 in each group). All participants received standard of care cessation counseling. The intervention group also received personalized biomarker feedback information. This involved testing women's urine cotinine levels and using an informational brochure that demonstrated how the cotinine level related to their infant's likely exposure to a tobacco specific carcinogen, NNAL. Tobacco-use assessments were obtained at baseline, post intervention, and at delivery. **RESULTS:** Per protocol analysis (i.e., women who completed week five of intervention and delivery assessments) demonstrated no significant difference between study groups for self-reported smoking abstinence post intervention ( $p=0.22$ ) or at delivery ( $p=1.0$ ). At delivery, 26% of participants in each group had quit smoking, which was biochemically confirmed. **CONCLUSIONS:** While the biomarker feedback intervention was feasible and acceptable, it was no more effective than current cessation counseling on smoking abstinence rates. However, the 26% abstinence rate is a vast improvement over a prior study in Alaska with an abstinence rate of 0% at delivery. The improved cessation rates could have been the consequence of several programmatic changes influenced by the study that involved more active outreach to pregnant women who use tobacco and placement of a cessation counselor in an accessible location in the clinic. Further formative work is needed to determine how best to communicate and use the biomarker feedback to encourage more women to quit tobacco use during pregnancy.

**FUNDING:** Federal

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**POS3-12****FEASIBILITY OF A PERIOPERATIVE TEXT MESSAGING SMOKING CESSATION PROGRAM IN SURGICAL PATIENTS**

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**SIGNIFICANCE:** Patients who smoke are at increased risk of surgical complications, including healing and cardiovascular complications. All smokers should maintain abstinence for as long as possible before and after surgery. Short-message service (SMS) interventions for smoking cessation are low-cost and have the potential for wide dissemination. The aim of this study was to determine the feasibility and acceptability of an SMS smoking cessation program to manage smoking behavior in the perioperative period. **METHODS:** This was an observational pilot study of 100 patients in the Preoperative Evaluation Clinic at Mayo Clinic, Rochester (POE), invited to enroll in the SMS service regardless of intent to quit smoking. Patients received a brief tobacco intervention emphasizing the importance of quitting smoking for surgery, then enrolled via mobile phone in a surgery-specific SMS service, receiving 1-3 messages per day about smoking and/or surgical recovery for 30 days. 24-hour abstinence inquiries were performed by text five times during the program, and a 30-day phone call by study staff asked about abstinence and satisfaction with the program. **RESULTS:** Of 370 smoking patients seen in the POE between June 2016 and April 2017, 138 patients were eligible, and 100 of those enrolled in the study (73% enrollment rate). 17 subjects un-enrolled during the study period; these subjects did not differ from those who remained in the program by sex, age or type of surgical procedure. The mean number of responses to prompts received from an enrollee was 11.6, and unrelated to participant age. Reported 24-hour abstinence rates ranged from 37.0% (34/92, Day 2 after surgery) to 70.5% (43/85, 14 days after surgery). Of the 95 participants contacted

at day 30, 29(30.5%) self-reported 7-day point prevalence abstinence. **CONCLUSIONS:** There is high interest in using a text messaging smoking cessation program among surgical patients in the perioperative period, and a potential for high engagement. With a higher-than-expected reported abstinence rate in patients who used the program, a future efficacy trial of text messaging smoking cessation support in surgical patients is warranted.

**FUNDING:** Academic Institution

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**POS3-13****THE EFFECT OF USUAL BRAND CIGARETTE ROD LENGTH ON COTININE LEVELS, SMOKING PATTERNS, AND SUBJECTIVE RATINGS OF CIGARETTE LIKING IN SMOKERS SWITCHING TO SPECTRUM RESEARCH CIGARETTES**

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**BACKGROUND:** Cigarettes are available in varying lengths with most smokers choosing long cigarettes ( $\geq 100$ mm), however research cigarettes used in many trials come in only one rod length, medium/king size ( $\sim 84$ mm). This study evaluates whether the length of research participants' usual brand cigarettes affects acceptability and use of the SPECTRUM research cigarettes (SPECTRUMs). **METHODS:** In a sample of 341 smokers, cigarettes per day (CPD), plasma cotinine, exhaled carbon monoxide (eCO) and cigarette favorability was assessed on own brand and 2 weeks after switching to regular nicotine content (11.2mg) medium length SPECTRUM cigarettes. Changes were evaluated using linear mixed effects models between the following groups: Usual length short (ULS, 72 mm), usual length medium/king (ULM, 84 mm), and usual length long ( $\geq 100$  mm). **RESULTS:** The proportion of cigarette length among all participants was 55% ULL, 40% ULM, and 5% ULS. When switching from usual brand to SPECTRUMs, smokers of ULL rated SPECTRUMs as less strong, harder to draw, lower in taste, and lower in enjoyment ( $p<0.03$ ) compared to usual brand. There were no significant differences in ratings for ULM and ULS. Among all three groups, satisfaction was significantly lower for SPECTRUMs ( $p<0.02$ ), and CPD increased on SPECTRUMs. CPD increased significantly more for ULL (+4.75 CPD) as compared to ULM (+1.38 CPD) and ULS (+3.56 CPD). When switching to SPECTRUMs, cotinine per cigarette decreased among all groups (all  $p<0.02$ ), and eCO increased, significantly in ULL and ULM ( $p<0.001$ ). However, CPD, cotinine per cigarette, and eCO were all similar in the three groups when smoking SPECTRUMs (all  $p>0.05$ ). **CONCLUSION:** Usual brand cigarette length affects likeability and use of SPECTRUM research cigarettes. Baseline cigarette length should be considered when interpreting changes in studies using SPECTRUM cigarettes.

**FUNDING:** Federal

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**POS3-14****ELECTRONIC CIGARETTES AND SMOKERS' CHOICE TO QUIT: A PILOT STUDY**

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**SIGNIFICANCE:** Many cigarette smokers report use of electronic cigarettes (ECIGs) as a cessation aid. However, there is concern that ECIG availability may hinder rather than facilitate a quit attempt. The aim of this study was to examine the influence of ECIGs on smokers' readiness and choice to quit, as well as cessation behavior. **METHODS:** Cigarette smokers interested in quitting in the next 30 days to 6 months were randomly assigned to use their own brand of cigarette (OWN;  $n=12$ ) or a tank-style ECIG (18 mg/mL;  $n=12$ ) *ad libitum* for four weeks. During this period, they used an electronic diary every day to record their product use and visited the laboratory weekly for assessment of expired air CO and readiness to quit. They were also given the opportunity to formally accept or reject an offer to make a quit attempt. Those who chose a quit attempt were enrolled in a cessation program, while continuing with all study requirements. All participants completed a one-month follow-up visit.



**RESULTS:** Among those smokers who chose to make a quit attempt (58.3% in each condition), the majority did so in Weeks 1-2 for OVN (57.2%) and in Weeks 3-4 for ECIG (71.4%). More OVN than ECIG participants moved towards quitting, as measured by the Stage of Change (i.e., from Contemplation to Preparation and/or to Action). For those who chose a quit attempt, the proportion who advanced at least one stage was 71% for OVN and 29% for ECIG. For those who declined an attempt, the proportion was 0% for OVN and 40% for ECIG. A significant reduction in self-reported cigarettes per day was observed from baseline to follow-up for ECIG ( $M \pm SEM$  difference score =  $-8.57 \pm 0.98$ ) and OVN ( $-12.67 \pm 0.65$ ) participants who chose to make a quit attempt, as well as for ECIG participants who declined an attempt ( $-13.0 \pm 0.53$ ) ( $p < .05$ ). Still, the proportion of smokers who met the CO cutoff of 7 ppm for confirmation of smoking abstinence at follow-up did not differ as a function of condition ( $p > .05$ ). **CONCLUSIONS:** ECIG use may reduce cigarette smoking significantly, but also delay quit attempts. Future work requires larger sample sizes, longer assessment periods, and alternative ECIG devices.

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## POS3-15

### ORAL CONTRACEPTIVE USE AND CIGARETTE SMOKING: A REVIEW OF THE LITERATURE

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**INTRODUCTION:** While evidence continues to grow for the effect of sex hormones on smoking-related outcomes, less is known about how oral contraceptives (OCs) may influence these outcomes. The goal of this review is to describe the current state of the literature on OCs and smoking and offer recommendations for future research. **METHODS:** In March, 2017, we used the following keywords to search seven databases (PubMed/MEDLINE, Wiley/Cochrane Library, EBSCO/PsycINFO, Elsevier/Embase, Elsevier/Scopus, Thompson Reuters/Web of Science, and EBS-CO/CINAHL): hormonal/oral contraceptives, nicotine, smoker(s), smoking, tobacco, cigarette, abstinence, withdrawal, and craving(s). Additional article identification was made by forward/backward citation tracking, as well as by the "Similar Articles" feature in PubMed. No restrictions were placed on publication date, publication type, or study design, though we did limit our search to articles written in English. **RESULTS:** A total of 11 studies were identified. Three studies observed faster nicotine metabolism in OC users compared to nonusers. Four studies indicated that OC users had heightened cardiovascular reactivity compared to nonusers. Three studies explored differences in cessation-related symptomatology (e.g., craving) by OC users, with mixed results. No studies were found on smoking cessation outcomes by OC use. **DISCUSSION:** Additional research is needed on the role of OCs in smoking cessation outcomes. Future research should also explore the differences in smoking cessation by OC use related to other smoking-related variables such as mood, weight gain, and brain function/connectivity. We also recommend future data collection efforts (e.g., Population Assess of Tobacco and Health) to collect information on the length of OC use and potential effect modifiers (e.g., history of depression), as well as to measure endogenous hormone levels. Understanding the effect of OC use on these outcomes may lead to the development of novel smoking cessation interventions designed for the specific needs of premenopausal women.

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## POS3-16

### EXAMINING THE ROLES OF COLLEGE STUDENTS' PEERS, NORMATIVE BELIEFS, AND ATTITUDES IN SOCIAL ENDS USE

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**SIGNIFICANCE:** The use of Electronic Nicotine Delivery Systems (ENDS) is increasingly prevalent among young adult college students. Like social cigarette smoking, social ENDS use, or use only in social contexts, may be common among

college students given the popularity of ENDS in this population. However, little is known about social ENDS use including the predictors of social ENDS use. We examined the roles of the peers (i.e., peer use), normative beliefs (i.e., social acceptability of ENDS), and attitudes (i.e., inclination to date someone using ENDS) in subsequent social ENDS use among a cohort of young adult college students. **METHODS:** Participants were 476, 18-29 years old ( $M \text{ age} = 20.4$ ,  $SD = 2.3$ ) current/past 30-day ENDS users from Texas colleges who participated in waves 1 (Fall 2014) and 4 (Spring 2016) of an online survey. Participants were categorized as social ENDS users at wave 4 if they only used ENDS with friends or in social contexts. The majority (62.8%) of participants identified as social ENDS users at wave 4. Social ENDS users were significantly more likely to be female and to ever use fewer other tobacco products than non-social ENDS users ( $p < .05$ ). A multi-variable, multilevel logistic regression model, accounting for clustering of students within colleges was used to assess if students' peers, normative beliefs, and attitudes, assessed at wave 1, predicted social ENDS use at wave 4, while adjusting for past 30-day ENDS use at wave 1. **RESULTS:** Multilevel logistic regression indicated that only inclination to date someone who uses ENDS predicted wave 4 social ENDS use. Students with a higher inclination to date an ENDS user had lower odds of subsequent social ENDS use, compared with other ENDS users. **CONCLUSION:** Consistent with studies on social cigarette use, social ENDS use is prevalent among young adult college students. Students with more positive attitudes towards ENDS (as reflected in their dating preferences) may use ENDS more regularly compared with social ENDS users, but further longitudinal research is warranted to examine the role of attitudes in regular use and determine the trajectories of social ENDS users.

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## POS3-17

### THE ASSOCIATIONS OF ADVERSE CHILDHOOD EXPERIENCES, QUALITY OF LIFE, DEPRESSION, AND ANXIETY WITH CO-USE OF CIGARETTES AND MARIJUANA

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Cigarette smoking remains the leading preventable cause of morbidity and mortality in the United States, however, marijuana use is on the rise. Research has shown that adverse childhood experiences (ACE's), quality of life (QOL), depression and anxiety are associated with substance use disorders. However, the literature is lacking evidence to show how these factors are associated with a unique group of co-users who smoke cigarettes (daily) and marijuana (non-daily). This study aims to show that ACE's, QOL, depression and anxiety are more strongly associated with co-users than cigarette-only smokers. Participants were men and women aged 18-60 years who were either co-users or cigarette-only smokers and were enrolled in a large tobacco cessation trial. All participants had to currently smoke  $\geq 5$  cigs/day. The co-user group had to be non-daily marijuana users ( $\leq 6$  days/week). During ad libitum smoking (baseline), participants completed the Adverse Childhood Experience (ACE) Questionnaire, a modified Quality of Life Scale (QOLS), State-Trait Anxiety Inventory (STAI) and the Beck Depression Inventory (BDI-II). Chi-Square or Fisher's Exact Tests were used to compare categorical variables between groups; ANOVA or Kruskal-Wallis tests were used to compare continuous variables. Co-users ( $n=40$ ) were more likely than cigarette-only smokers ( $n=199$ ) to be non-white (56.4% vs 38.6% respectively;  $p=.04$ ), consumed more alcoholic drinks per week ( $4.4 \pm 6.8$  vs  $2.9 \pm 5.4$ ,  $p=.03$ ) and had more cigarette quit attempts ( $8.3 \pm 9.5$  vs  $5.9 \pm 9.0$ ,  $p=.04$ ). Co-users scored higher on the BDI-II ( $8.7 \pm 7.5$  vs  $6.3 \pm 6.5$ ,  $p=.03$ ) and reported more ACE's ( $2.5 \pm 2.2$  vs  $1.7 \pm 2.0$ ,  $p=.02$ ). However, co-users also scored higher on the QOLS (# of perceived healthy days) than cigarette-only smokers ( $4.2 \pm 6.8$  vs  $2.1 \pm 5.9$ ,  $p=.01$ ). There was no significant difference in STAI scores between the two groups. Co-users of cigarettes (daily) and marijuana (non-daily) are a unique group of individuals who warrant further study. They may have endured more adverse childhood experiences and they may suffer from higher levels of depression. These findings could help direct future studies for this unique group of individuals.

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## POS3-18

### EXAMINING INTERRELATIONSHIPS BETWEEN DELAY DISCOUNTING AND SIMULATED DEMAND FOR CIGARETTES AMONG PREGNANT WOMEN

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**SIGNIFICANCE:** Two of the more common applications of behavioral economics tasks used in the study of cigarette smoking are delay discounting (discounting of the value of rewards as a function of delay to obtaining them) and simulated demand for cigarette smoking using the Cigarette Purchase Task (CPT). However, few studies have evaluated whether combining delay discounting and CPT performance may enhance understanding of smoking beyond observations with either alone. The current investigation served an initial evaluation of the interrelationship between delay discounting and CPT performance by examining associations with the likelihood of making quit attempts upon learning of a pregnancy. Antepartum quit attempts are a reliable predictor of successfully quitting smoking during antepartum and served as a marker for quitting in the present study. **METHODS:** Data from 114 women who were enrolled in a smoking-cessation trial were analyzed. Women were separated into 4 groups based on baseline CPT intensities (estimated consumption at \$0 cost) and discounting rates (i.e., high intensity, steep discounters; high intensity, shallow discounters; low intensity, steep discounters; low intensity, shallow discounters). Together, these categories were used to evaluate individual differences in the likelihood of making a quit attempt prior to entering prenatal care using a chi-square test and odds ratios to evaluate the magnitude of associations. **RESULTS:** Women with low intensity were significantly ( $\chi^2 (1) = 8.62, p < .01$ ; OR = 4.13, CI = 1.54 – 11.08) more likely to make a quit attempt during their current pregnancy than those with high intensity. Although shallow discounters were more likely than steep discounters to make a quit attempt, these findings were not statistically significant ( $p = .159$ ). Similarly, no statistically significant interaction between intensity and discounting was observed. **CONCLUSIONS:** Decisions about quitting smoking during early pregnancy appear to be dominated by the influence of factors controlling intensity for smoking, which is highly correlated with smoking rate. Any influence of discounting on quit attempts appears to be quite modest.

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## POS3-19

### IMPACT OF SRNT HEALTH DISPARITIES NETWORK'S SCHOLARSHIP ON PROFESSIONAL DEVELOPMENT OF ITS RECIPIENTS

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**SIGNIFICANCE:** Adverse health outcomes related to tobacco use disproportionately affect marginalized and minority groups. Thus a diverse research workforce equipped to address tobacco use health disparities is needed. Since 2007, the Society for Research on Nicotine and Tobacco (SRNT) Health Disparities Network has funded a travel scholarship to promote leadership development, diversity, and inclusivity among investigators interested in disparities research. This study examined indicators of professional development among former scholarship recipients. **METHODS:** On-line survey of scholarship recipients from the years 2007 to 2014. The survey captured data on demographic characteristics, scholarly productivity, current research foci, professional job status, and perceived professional benefit resulting from the scholarship. **RESULTS:** Of the 117 scholarships recipients, 89 (77%) participated. Respondents were 67% female and had a mean age of 38 years. Twenty eight percent identified as African-American, 25% as Asian, and 17% as Latino. Most respondents worked in academia (80%). Nearly three quarters (74%) reported publishing manuscripts that focused on tobacco-related disparities, with an average of 4 (+4) disparities-related publications since receiving the scholarship. Respondents' work focused on a wide range of health disparities with the majority of respondents focusing on racial and SES disparities. Nearly all respondents reported some sort of professional benefit from attending the SRNT conference for which they received the scholarship. Benefits included networking with colleagues (89%), collaborating with other conference attendees on research

projects (19%), academic papers (19%), and/or grants (10%). **CONCLUSIONS:** SRNT Health Disparities Network Travel Scholarship recipients comprise a diverse, productive group that continues to contribute to tobacco research focused on health disparities. This work provides a framework for other professional organizations interested in supporting career development, diversity and inclusivity.

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## POS3-20

### PERCEIVED BARRIERS TO SMOKING CESSATION AND PERCEPTIONS OF ELECTRONIC CIGARETTES AMONG PERSONS LIVING WITH HIV

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**SIGNIFICANCE:** Cigarette smoking is more prevalent (50-70%) in persons living with HIV (PLWH) than in the general population and is linked to increased morbidity and mortality among PLWH. Smoking cessation studies in PLWH have demonstrated disappointing outcomes, with low quit rates, modest effect sizes, poor adherence to pharmacologic therapy, and lack of sustained abstinence. Some have suggested that based on current knowledge of harms and benefits, it may be feasible for health care providers to advise smokers who are unable or unwilling to quit to switch to electronic cigarettes (EC) as a less harmful alternative to smoking. **METHODS:** We conducted 30 in-depth semi-structured qualitative interviews with PLWH to examine perceived barriers to smoking cessation and explore perceptions of EC. **RESULTS:** Twenty participants (66.7%) identified as current or past smokers. Participants identified nicotine dependence, lack of insurance coverage for nicotine replacement therapy, perceived stress, ambivalence, low readiness, and lack of self-efficacy for quitting as barriers to successful cessation. Having a social network of smokers was also a significant barrier. Further, data revealed that low knowledge, perceived cost, and uncertainty about safety and efficacy were barriers to EC uptake. However, current smokers indicated a willingness to try EC. **CONCLUSIONS:** Results of this study provide further evidence that PLWH who smoke face significant barriers to smoking cessation. Electronic cigarettes, as a method of harm reduction or path toward cessation, may have potential in this population; however, there is a significant need for education regarding their use, and relative safety/harm compared with combustible cigarettes.

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## POS3-21

### UTILIZATION OF A CLINICAL DECISION SUPPORT TOOL TO FACILITATE CHILD TOBACCO SMOKE EXPOSURE SCREENING AND COUNSELING IN THE URGENT CARE SETTING

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**SIGNIFICANCE:** Approximately one in every two children presenting to the Pediatric Emergency Department and Urgent Care settings are exposed to tobacco smoke (TSE). Clinical decision support systems may facilitate caregiver tobacco screening and counseling by pediatric Urgent Care nurses. **OBJECTIVE:** The aim of the present study was to assess the feasibility of a clinical decision support system to address caregivers' tobacco use and child TSE. **METHODS:** We conducted a 3-month prospective study on caregivers screened using a clinical decision support system. Nurses used the clinical decision support system to advise, assess, and assist caregivers to quit. We assessed caregiver sociodemographics, smoking habits, and child TSE. **RESULTS:** We screened 185 caregivers whose children were exposed to tobacco smoke for study inclusion; 155 (84%) met eligibility criteria, and 149 (80.5%) were included in the study. Study nurses advised 35.2% of the caregivers to quit, assessed 35.9% for readiness to quit, and assisted 32.4% of the caregivers. Of the 149 participants: 83.1% were female; 47.0% were white and 45.6% were African American; 84.6% had public insurance or were self-pay;





71.1% were highly nicotine dependent; 50.0% and 50.7% allowed smoking in the home and car, respectively; 81.3% of children were biochemically confirmed to be exposed to tobacco smoke. At follow-up (86.6% retention); 58.9% reported quit attempts at three months. There was a significant decrease in nicotine dependence, and a significant increase in motivation to quit. Self-reported quit rates were 7.8% at three months. CONCLUSIONS: An electronic health record-embedded clinical decision support system was feasible to incorporate into busy Urgent Care nurses' workloads, and was associated with encouraging changes in the smoking behavior of caregivers. More research on the use of clinical decision support systems to screen and counsel caregivers who smoke in the Urgent Care and other acute healthcare settings is warranted.

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## POS3-22

### SMOKING-RELATED WEIGHT AND APPETITE CONCERNS AND USE OF ELECTRONIC CIGARETTES

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SIGNIFICANCE: Weight control is a common motive for cigarette smoking because nicotine suppresses appetite and increases metabolism, and smoking is a behavioral alternative to eating. Emerging evidence suggests that electronic cigarettes (ECs) are also being used for weight control. In the current study, we hypothesized that having a greater tendency to smoke combustible cigarettes for reasons related to weight and appetite control would be associated with an increased likelihood of current EC use among daily combustible cigarette smokers. METHODS: Participants ( $n = 577$ ;  $M_{age} = 44.42$ ; 52.7% female) were adult daily smokers ( $\geq 5$  cigarettes/day) recruited through Qualtrics Online Sample to participate in an anonymous online survey. Smoking for weight/appetite control was assessed via the 10-item Smoking and Weight Eating Episodes Test (SWEET) (Adams et al., 2011). RESULTS: Results of logistic regression analyses supported our hypothesis, indicating that higher SWEET total scores predicted increased likelihood of current EC use (OR = 1.38 [CI<sub>95%</sub> = 1.124-1.702],  $p = .002$ ), above the effects of sex, age, compensatory eating behavior, body mass index (BMI), and tobacco dependence (FTCD). Effects were driven by the two SWEET subscales most directly related to weight/appetite control (smoking to suppress appetite and prevent overeating). Scores on the other two SWEET subscales (smoking to cope with body dissatisfaction and appetite-related withdrawal symptoms) were not related to likelihood of EC use. CONCLUSIONS: Smokers who reported a greater tendency to smoke combustible cigarettes for reasons related to weight and appetite control (appetite suppression and prevention of overeating) had an increased likelihood of using ECs. It is possible that individuals who utilize cigarettes to suppress their appetite and/or prevent overeating may find ECs especially appealing and believe that ECs will serve these functions as effectively as combustible cigarettes. Future research should evaluate whether ECs may have a role to play in weight management in the context of quitting smoking, and the effects of ECs on eating behavior relative to combustible cigarettes.

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## POS3-23

### SMOKING AND WEIGHT LOSS AMONG OVERWEIGHT AND OBESE SMOKERS IN LOOK AHEAD

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RATIONALE: Smoking cessation is associated with increases in body weight, however, little is known about the relationship between participation in a weight loss intervention and smoking. OBJECTIVE: To determine whether a) weight losses at 1 year differ as a function of baseline smoking status (never smoker, cur-

rent smoker, ex-smoker) and b) whether participation in a weight loss intervention affects smoking behavior. METHODS: This analysis addressed these questions using the publicly available database from Look AHEAD, a randomized trial comparing Intensive Lifestyle Intervention (ILI) and Diabetes Support and Education (DSE) (control condition) in overweight/obese individuals with Type 2 diabetes, and included 4387 participants who had self-reported smoking and objective weight measures available at baseline and at 1-year. RESULTS: Although participants in ILI lost a significantly greater percentage of weight than those in DSE at 1 year (ILI  $M = -8.8\%$ ,  $sd = 6.8$ ; DSE  $M = -0.7\%$ ,  $sd = 4.7$ ), there were no differences in weight loss outcomes between never smokers ( $N=2297$ ), ex-smokers ( $N=2115$ ), and current smokers ( $N=188$ ) within either condition. Participation in ILI was not associated with compensatory smoking or likelihood of quitting smoking or relapsing. CONCLUSIONS: Smokers in a weight loss intervention had reductions in weight that were comparable to individuals who did not smoke without any evidence of compensatory smoking to manage eating and appetite. Overweight or obese smokers should be encouraged to pursue weight loss without concerns regarding the impact on smoking behavior.

FUNDING: Federal

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## POS3-24

### HARM AND EXPOSURE BIOMARKERS FROM TWO REDUCED NICOTINE CONTENT CIGARETTE RANDOMIZED CONTROLLED TRIALS: PRELIMINARY RESULTS

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SIGNIFICANCE: Mandated reductions in the nicotine content of cigarettes is a prominent strategy for reducing harm from cigarette smoking. To examine the potential consequences of such a policy, we have examined a number of harm and exposure biomarkers among smokers in two randomized controlled trials of usual nicotine content (UNC) and reduced nicotine content (RNC) SPECTRUM research cigarettes. METHODS: Participants smoked UNC cigarettes (11 mg nicotine/cigarette) for two weeks prior to randomization to UNC or RNC cigarette groups for a further 18 weeks. Nicotine content in the RNC cigarettes reduced from 8 mg to 0.3 mg/cigarette over the 18 weeks. Participants ( $n=50$  randomized to UNC and 50 RNC) provided blood and urine samples at baseline and at the end of randomized phase, 18 weeks later. F2-isoprostanes and a subsample of urinary 4-(methyl-nitrosamino)-1-(3-pyridyl)-1-butanol (NNAL) and plasma cotinine samples were analyzed at baseline and at the end of the randomization period. Biomarkers were normalized to urinary creatinine. Differences in the change of NNAL and F2-isoprostanes by cigarette group were tested. RESULTS: NNAL significantly decreased from baseline to the end of the randomization phase for the RNC group, approximately 40% ( $P=0.009$ ). When results were analyzed in likely compliers only (as assessed by plasma cotinine levels), an even larger decrease in NNAL was observed (70%) in the RNC group ( $P<0.005$ ). There were no changes in F2-isoprostanes from baseline to the end of randomization for either group ( $P=0.38$ ), even with compliers only. CONCLUSIONS: The reduction in the tobacco-specific carcinogen biomarker, NNAL, provides further support towards the feasibility to reduce the nicotine content in cigarettes, a goal established to reduce the dependence and consequently harm from cigarettes. However, smoke exposure from a combustible product is still a concern according to some biomarkers of harm, such as F2-isoprostanes, indicating free radical exposure to the smoker.

FUNDING: Federal

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## POS3-25

### VALIDATION OF A BRIEF MEASURE TO ASSESS CRAVING FOR E-CIGARETTES: THE QUESTIONNAIRE OF VAPING CRAVING (QVC)

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**SIGNIFICANCE:** There is little research on the processes that motivate use of electronic cigarettes (e-cigarettes). Craving is a key feature of tobacco dependence and a central component in many psychological theories of addiction. Craving for e-cigarettes (vaping craving) may therefore be a critical factor supporting e-cigarette use. In an initial study, we developed a brief, practical measure to assess vaping craving, the Questionnaire of Vaping Craving (QVC). This research presents results of a follow-up study addressing further psychometrics and validation of the QVC. **METHODS:** We administered the 10-item QVC to 224 current e-cigarette users ( $M$  age = 32.8,  $SD$  = 8.9;  $M$  days vaped in past 30 days = 19.2,  $SD$  = 9.5) recruited from the Amazon Mechanical Turk community. Participants completed measures on their e-cigarette and tobacco cigarette use and history and the QVC in an online questionnaire format. We used confirmatory factor analysis (CFA) to determine if our latent vaping craving construct would predict observed QVC ratings. Correlations between QVC scores and e-cigarette and tobacco cigarette variables were examined to establish convergent and discriminant validity of the measure. **RESULTS:** Fit indices for the one factor solution indicated good model fit,  $\chi^2(35, N = 224) = 251.72, p < .0001$ , CFI = .92, SRMR = .03. All 10 items had strong factor loadings (.774 - .948) and were significantly predicted by the latent craving construct. Reliability of the QVC was excellent,  $\alpha = .97$ . Higher vaping craving was significantly associated with vaping more days in the past 30, vaping more cartridges or mL of e-liquid per day, less time since last vaped, lower confidence in one's ability to quit vaping, greater e-cigarette dependence, and greater negative mood. Higher vaping craving was also associated with greater tobacco and nicotine dependence. **CONCLUSIONS:** The QVC generates a highly reliable index of vaping craving with clear convergent and discriminant validity. This brief assessment of vaping craving can be used in clinical and laboratory studies to better understand the role of craving in supporting e-cigarette use and dependence.

**FUNDING:** None

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## POS3-26

### DYADIC COMMUNICATION SCALE ON SMOKING (DCS): A MEASURE OF FAMILY SUPPORT RECEIPT AND PROVISION FOR SMOKING CESSATION

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**SIGNIFICANCE:** Family is an important source of support to help smokers quit smoking but how to measure the impact of such support remains unclear. This study evaluated the psychometric properties of the Dyadic Communication Scale on Smoking (DCS), an 8-item measure designed to capture dyadic family support expressed via verbal communications. **METHODS:** Participants included 203 pairs of Chinese or Vietnamese American male smokers (mean cigarettes smoked/day = 8.0; 58% smoked within 30 minutes after waking; 35% in precontemplation) and their family members (93% female; 95% never smokers) enrolled in two smoking cessation intervention trials. DCS was collected at baseline. The development of DCS was guided by the Social Network Theory and dyadic and individual interviews with smokers and family members. The 4 subscales captured domains of Collaborative Discussion, Family Engagement, Resource Use, and Positive Support. The smoker version assesses how often each communication occurred with his family member in the past month (0=not at all to 4=all the time). The family version includes the same items on how often a family member initiated each communication with the smoker. **RESULTS:** Confirmatory factor analyses demonstrated good fit indices for the 4-factor model in smoker (RMSEA=0.00, CFI=1.00, TLI=1.00) and family versions (RMSEA=0.04, CFI=0.99, TLI=0.99). Subscales' internal consistency for both versions were acceptable (Cronbach's alphas range: 0.60-0.87,  $M=0.74$ ) with high item factor loadings (range: 0.57-0.96,  $M=0.81$ ). Discriminant and concurrent validity analyses demonstrated support for the subscales. For example, subscales were uncorrelated with smoking rate. Quit

intention was associated with both smokers' receipt and family's provision of Positive Support. Smokers with no recent quit attempt had lower subscale scores. Family member's commitment to assist smokers was positively correlated with the subscales. **CONCLUSIONS:** DCS demonstrated good reliability and validity in capturing verbal family support related to smoking cessation. DCS is a promising tool to assess and understand how family support helps smokers, particularly Asian Americans to quit smoking.

**FUNDING:** State; Federal

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## POS3-27

### EFFECTS OF RESISTANCE TRAINING ON SMOKING CESSATION: PRELIMINARY RESULTS FROM THE STRENGTH TO QUIT TRIAL

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**SIGNIFICANCE:** Exercise is frequently promoted as a method to aid smoking cessation; yet, most of the research has only shown marginal effects, and there has been a disproportionate reliance on testing aerobic exercise. To help move the field forward, this study examined the effects of resistance training (RT; i.e., weight lifting) on smoking cessation. **METHODS:** Adult smokers were randomized into a 12-week (2 sessions/week) RT or Control (wellness) group. Assessments were conducted at baseline and week 13 follow-up. All participants were given the option of using up to 10 weeks of Nicotine Replacement Therapy (NRT; patches). Smoking was measured as self-reported cigs/day, 7-day PPA, and 24-hr abstinence, with a breath carbon monoxide (CO) cutoff <6.0 ppm. **RESULTS:** 90 participants were randomized into each group ( $N=180$ ). The mean age was 49.2 ( $SD=10.0$ ); most were male (61%), Black/African American (60%), with an income less than \$25K/year (63%). Participants smoked an average of 16.2 cigs/day ( $SD=8.6$ ), with a mean nicotine dependence (FTND) of 4.2 ( $SD=2.2$ ). There were no between group differences on any baseline variables ( $p>.05$ ). Participants attended an average of 17.9 sessions ( $SD=7.0$ ; range 1-24) with no difference in attendance between groups ( $p>.05$ ). NRT was not different between groups ( $p>.05$ ). RT participants had an 87% reduction in cigs/day from baseline to follow-up [16.3 ( $SD=10.1$ ) to 1.9 ( $SD=2.8$ )], which was significantly greater ( $b=0.16$ ,  $SE=.04$ ,  $p<.01$ ) than the Control, which had a 71% reduction [16.2 ( $SD=6.9$ ) to 4.0 ( $SD=4.7$ )]. 7-day PPA was not significantly different between groups (37% for RT vs. 24% for Control,  $p=.09$ ), but there was a difference for 24-hr abstinence, 46% in RT vs. 25% in Control ( $p=.01$ ). **CONCLUSION:** The results suggest that RT can help smokers reduce the number of cigarettes smoked/day and achieve a 24-hr abstinence. In addition, although underpowered, this study showed a large effect size difference between the groups for 7-day PPA, suggesting that RT may help smokers quit. Future studies examining the effects of RT are needed.

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## POS3-28

### WHEN IS A CIGARETTE NOT A CIGARETTE? CHARACTERISTICS AND PATTERNS OF SMOKERS WHO RELIGHT THEIR CIGARETTES

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**SIGNIFICANCE:** Extinguishing and relighting cigarettes increases risk for lung cancer and chronic bronchitis especially among highly dependent smokers with low income. Relighting behavior is not captured in cigarette consumption mea-

tures (cigarettes per day [CPD]); an omission that underestimates nicotine intake and toxin exposure. This study examined characteristics of adult cigarette smokers who extinguished and relit their usual brand cigarettes. The effects of this study can guide future research and cigarette regulations. **METHODS:** In a cross-sectional analysis of two reduced nicotine content (RNC) cigarette trials, baseline assessments measured smoking characteristics, including relighting behavior, of 247 adult smokers of five or more CPD, with no intention to quit. Wilcoxon Rank Sum tests assessed differences in CPD, plasma cotinine, and time to first cigarette (TTFC) by relighting status. The Mantel-Haenszel chi-square test was used to analyze patterns of relighting with respect to total family income ("low" [\$0-19,999], "middle" [\$20,000-\$59,999], and "high" [ $>$ \$60,000]). **RESULTS:** 69.2% ( $n=171$ ) of participants reported relighting behavior, relighting an average of five cigarettes per pack of 20. Both relighters and non-relighters smoked an average of about 20 CPD ( $SD=10$ ,  $p=0.5$ ) with no significant difference in plasma cotinine (291.1 ng/mL, 278.2 ng/mL, respectively,  $p=0.8$ ). The median TTFC for relighters was 5 minutes v. 10 minutes for non-relighters ( $p=0.01$ ). The proportion of those reporting relighting behavior decreased as total family income increased from low to high (82.9%, 65.3%, 53.9%, respectively,  $p<0.001$ ). **CONCLUSIONS:** The majority of smokers in our sample extinguished and relit their cigarettes. Despite smoking a similar number of cigarettes, relighters were more nicotine dependent (TTFC), and had lower incomes, compared to those who did not relight. Nicotine exposure did not differ between groups. Evaluation of effects of regulations on cigarette smoking behavior should assess relighting behavior as well as CPD.

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## POS3-29

### PREDICTORS OF TOBACCO EXPOSURE AMONG PREGNANT WOMEN: FINDINGS FROM THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH STUDY

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**SIGNIFICANCE:** Exposure to tobacco smoke during pregnancy is associated with adverse health outcomes in pregnant women and their fetuses. Negative outcomes are not limited to the direct use by the mother, but extends to any maternal exposure to second hand smoke (SHS) during pregnancy. Yet, the factors influencing tobacco exposure among pregnant women is understudied. **METHODS:** Pregnant participants aged 18-54 years from wave 2 of the Population Assessment of Tobacco and Health (PATH) Study – a nationally representative, longitudinal cohort study of adults in the United States – were included in analyses, and categorized into groups of tobacco exposure (e.g. no exposure, primary exposure through recent tobacco use, secondary exposure through SHS exposure at home or work, and through both recent tobacco use and secondary exposure). Ordinal logistic regression models were conducted to determine how sociodemographic factors, tobacco advertising, and smoke-at-home policies influence tobacco exposure among pregnant women. **RESULTS:** Although most pregnant women (55.5%) reported no tobacco exposure, 7.3%, 26.9%, and 10.4% reported recent tobacco use, SHS exposure, and both, respectively. Black pregnant women were 1.58 (95% CI: 1.56, 1.61) times more likely to be recent tobacco users, but less likely to be exposed to SHS compared to White pregnant women. Pregnant women earning an income of between \$25,000 and \$49,999 were 1.32 (95% CI: 1.29, 1.34) times more likely to report recent tobacco use and 3.16 (95% CI: 3.11, 3.20) times more likely to be exposed to SHS, compared to those earning  $<$ \$10,000. Pregnant women allowing tobacco within the home were 14.04 (95% CI = 13.86, 14.24) times more likely to report recent tobacco use and SHS exposure, compared to those who did not. Exposure to tobacco advertisements also increased the likelihood of recent tobacco use and SHS exposure. **CONCLUSION:** Tobacco exposure during pregnancy is common among women within the United States, particularly among pregnant women with middle annual incomes and liberal smoke-at-home policies. Continued work is needed to reduce smoke exposure, especially among high risk groups such as pregnant women.

**FUNDING:** Academic Institution

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## POS3-29

### VERY LOW-NICOTINE CIGARETTES IN SMOKERS WITH SUD: SMOKING, SUBSTANCE USE EFFECTS

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**SIGNIFICANCE:** Very-low nicotine content cigarettes (VLNCC) have been shown to reduce craving and withdrawal for tobacco relative to abstinence with little or no compensatory smoking among the general population, suggesting that a mandated reduction in the nicotine yield of cigarettes could substantially reduce smoking rates. This may be a particularly effective method of reducing smoking and smoking-related disease in special populations that have very high rates of tobacco dependence, such as people with substance use disorders (SUD) if there are no harmful effects on substance use. **METHODS:** Smokers unmotivated to quit with current/past year SUD ( $N=95$ ) were recruited from the community and were randomized to VLNCC or normal nicotine content [NNC] cigarettes for 6 weeks while assessing effects at baseline, during the experimental period, and during 6-month follow-up. Smoking counseling was provided to encourage smokers to use this opportunity to quit smoking. Effects were assessed on measures related to smoking, on substance use, and cravings to use substances. **RESULTS:** There were no differences between conditions at baseline on smoking, substance use, or demographic variables. Most participants (89%) still used study cigarettes at 6 weeks with 87-92% of what they smoked being study product. On average, compliance with study cigarettes was high as measured by the ratio of cotinine to cigarettes smoked per day. During the experimental period, VLNCC use reduced craving, withdrawal symptoms, and dependence similar to NCC use (all  $p$ 's  $<$  .01 for time, ns for condition). The number of cigarettes smoked decreased over the experimental period with no differences between conditions. At 3 and 6-month follow-up conditions did not differ on percent heavy drinking or drug use days, urge to use drugs, or urge to drink. **CONCLUSIONS:** These preliminary findings indicate that: (1) VLNC cigarette use results in no compensatory smoking, no increased craving, withdrawal, or dependence compared with NNC cigarette use. Further, use of VLNCC did not increase frequency of substance (drug and alcohol) use and substance cravings, compared to NNC cigarettes.

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## POS3-30

### COMBINING REAL-TIME RATINGS WITH QUALITATIVE INTERVIEWS TO INFORM A SMOKING CESSATION TEXT MESSAGING PROGRAM FOR PRIMARY CARE PATIENTS

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**SIGNIFICANCE:** Little is known about the acceptability of text messaging interventions for smokers in primary care. We used a novel approach, combining real-time message ratings with qualitative interviews, to develop text messages targeting smokers in primary care. **METHODS:** From Feb-April 2017 we recruited 15 current and former smokers at 2 Boston area community health centers. Subjects were sent 4-5 text messages per day for 2 days. Messages were of 3 types: 1) messages for smokers not ready to quit with advice to practice quitting, 2) messages promoting nicotine replacement therapy (NRT), and 3) messages from SmokefreeTXT with features such as URL links. After each message, subjects were asked to rate its usefulness and clarity by text using a 2-item scale and also interviewed daily about message ratings, content, and design preferences. Transcripts were content analyzed using Nvivo 11 by 2 coders, iteratively reviewing discrepancies until kappa reached 0.8. **RESULTS:** Our sample included 2 former smokers, 9 daily and 4 less than daily smokers (mean 13 cigarettes/day), aged 28-61 years old, 40% women, 80% white, and 53% Medicaid or Medicare. Of 143 message ratings, 97% ( $n=139$ ) were positive. Yet, for most messages, subjects had ideas for improvement. Most subjects liked personalization with their name, but other examples, like their doctor's name, were perceived as 'creepy' or 'invasive.' Problematic language included the words slip, lozenge, and the practice quit attempt. Only one person reported clicking a URL link. Reasons for not clicking were lack of computer skills, internet access, being at work, or not seeking more information. Some subjects suggested that use of images with 'black lungs' or emojis would be helpful. Subjects expected e-cigarette content in messages about other tobacco products or treatments. **CONCLUSION:** Interviews yielded sever-





al suggestions for improvement with changes to language, personalization, URL links, and e-cigarette content. Subjects' real-time ratings were nearly all positive. Although the ratings alone provided little information, they may have been helpful in increasing subjects' attention to each message.

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## POS3-31

### RECRUITMENT AND DATA RETENTION METHODS FROM A RANDOMIZED TRIAL FOR WEB-BASED SMOKING CESSATION INTERVENTIONS: OUTCOMES AND IMPLICATIONS

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**BACKGROUND:** Despite their many advantages, online eHealth trials are not without challenges—notably, recruitment and data retention. Publications rarely provide detailed recruitment and retention methods or discuss implications of the methods for future studies. To address this need for empirical guidance regarding recruitment and retention planning, we aim to describe the methods and lessons learned from the recruitment and retention procedures used in the WebQuit trial. **METHODS:** The WebQuit trial compared effectiveness of two web-based smoking interventions. To ensure a demographically and geographically diverse sample, we utilized an adaptive recruitment strategy of traditional, web-based, and survey panel methods. The survey panel was utilized to boost minority recruitment. Participants indicated how they heard about the study and answered demographic questions. Four follow-up survey modalities (web, phone, mail, postcard) were sequentially timed; participants received an additional monetary bonus for completing the web survey within 24h. **RESULTS:** We randomized 2,637 smokers in 16 months and achieved 88% retention at 12-months. The majority of participants were recruited through Facebook (n=1229; 49%), followed by the survey panel (21%), free internet sources (14%), traditional media (11%), and Google Ads (4%). As intended, the survey panel recruited the greatest proportion of minority participants. Descriptively, these participants were also younger, more educated, and more likely to have a higher income than others. Participants recruited via Facebook were older and more likely to be female, heterosexual, and live in a small town or rural area than others. Most follow-up surveys were completed online (92%). Retention rates did not vary by recruitment source. **CONCLUSIONS:** Findings suggest the adaptive, multi-modal recruitment strategy and sequential, multi-modal outcome survey approach implemented in this study are effective. Thus, the recruitment and retention problems that have plagued the field of Internet interventions for smoking can be effectively addressed. Additional methodological details and implications for future trials will be discussed.

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## POS3-32

### FEASIBILITY OF A SUPPORT PERSON INTERVENTION TO PROMOTE QUITLINE SERVICES AMONG LOW-INCOME SMOKERS

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**SIGNIFICANCE:** Recent progress has been made to reduce cigarette smoking prevalence among adults in the US, but disparities remain with higher prevalence among under resourced individuals. Prior large, randomized trials conducted by our team demonstrated the efficacy of a support person (SP) intervention targeting nonsmokers for increasing smokers' utilization of a Quitline (QL). This pilot study evaluated the feasibility of translating the SP intervention to a low income population. **METHODS:** The intervention goal is for SPs to motivate their smoker to use free QL services. The study consists of 3 phases; for each, n=10 SP-smoker pairs are enrolled to iteratively adapt/refine the SP intervention. In Phase 1, the SP in-

tervention consists of one phone coaching call ~20 minutes and written materials. Assessments with the SP are conducted at baseline and 1 month follow-up to assess treatment acceptability. Assessments with the smokers are done at baseline and 3 months follow-up with biochemically confirmed abstinence. Smoker treatment utilization data is tracked by the QL. **RESULTS:** Phase 1 SP-smoker pairs were recruited in MN via face-to-face outreach at community organizations providing services to low income individuals. Recruitment was completed in one month, indicating high feasibility. 50% of SPs and 20% of the smokers were female. At baseline, smokers reported a mean score of 5.8 on the Contemplation Ladder, indicating moderate levels of readiness to quit. 80% of SPs completed the coaching call: mean duration=23.8 mins, range 7-39. SP follow-up retention was 80%. Feedback from SPs indicated high acceptability with no refinement needed to the coaching call. Information provided about the QL was reported as new and interesting. SPs were asked about adding a text messaging component to the SP intervention; 5 of 8 said texting should supplement but not replace the call. Smoker follow-up assessments are underway. **CONCLUSIONS:** Delivering a SP intervention targeting nonsmokers is feasible in under resourced populations. Phase 2 will evaluate the SP intervention comprising of one coaching call, supplemental texts, and a monetary incentive for smokers using QL services.

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## POS3-33

### HOUSEHOLD SMOKING BANS ARE ASSOCIATED WITH REDUCED NICOTINE EXPOSURE AND IMPROVED BIRTH OUTCOMES AMONG PREGNANT WOMEN

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**INTRODUCTION:** Household-smoking bans may be particularly important for pregnant smokers, as data suggests that pregnant smokers who also report secondhand smoke exposure (ShSE) are more likely to experience negative birth outcomes compared to pregnant smokers who do not report ShSE. The current study prospectively assessed smoking bans over the antepartum (AP) and postpartum (PP) period and examined their association with nicotine exposure and birth outcomes. **METHODS:** Participants (N = 289) were current smokers at the start of prenatal care who participated in controlled trials on smoking cessation. Participants were followed through 24-weeks PP. Household smoking rules and biochemically-validated nicotine exposure and smoking status were measured repeatedly. Birthweight was abstracted from the medical record. **RESULTS:** At baseline, approximately half of women reported a home smoking ban. Allowing smoking in the home was associated with less education, younger age of smoking initiation, and zero pre-pregnancy quit attempts. There was a strong effect of delivery on the use of smoking bans, such that prevalence increased from ~50% in AP to ~80% in PP. Having a ban in early/mid-pregnancy (but not baseline or late-pregnancy) was associated with lower urinary cotinine and increased birthweight, even after controlling for cigarettes per day and smoking status, respectively. **DISCUSSION:** The current data replicates and extends recent research indicating that home smoking bans are more prevalent in PP relative to AP. As smoking bans in early pregnancy were prospectively associated with birth outcomes, these data provide additional rationales for coaching pregnant smokers to adopt and maintain smoking bans.

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## POS3-34

### THE EFFECT OF PRE-TREATMENT MOTIVATION ON TREATMENT ADHERENCE AND ABSTINENCE IN TREATMENT-SEEKING SMOKERS

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**SIGNIFICANCE:** Motivation to quit (MTQ) is central in determining whether smokers engage in quit trial and subsequent quit outcome. Offering cessation treatment is recommended for smokers wishing to quit. Smoker's adherence to treatment, in turn, is highly correlated to quitting status. However, few study assessed the impact



of MTQ on adherence and cessation in treatment-seeking smokers. **METHODS:** We recruited 236 smokers who received the Taiwan Cessation Treatment Service (TCTS) from Jun 2013-May 2017. The TCTS covered physicians counseling and subsidized 8-week pharmacotherapy. Pre-treatment MTQ was measured on a 5-point Likert scale with 1=no motivation and 5=strongest motivation. Subjects with score  $\leq 3$  were coded as "Less MTQ" and  $\geq 4$  as "High". Primary treatment endpoint was CO-confirmed self-report of 6-month prolonged abstinence defined no smoking for  $\geq 30$  days before telephone survey. Adherent subjects should have  $\geq 3$  counseling sessions with the quantities of dispensed medications  $\geq 7$  weeks. We compared treatment adherence and prolonged abstinence rates between groups and used logistic regression to estimate ORs adjusted for demographics, tobacco use and quitting behavior. **RESULTS:** There were 60 and 176 subjects in Less and High MTQ groups. The adherence rates were 38.3% (23/60) and 52.8% (93/176) respectively with a difference of 14.5% (High vs. Less; 95% CI: -0.2%, 29.2%;  $p=0.052$ ). The crude ORs was 1.80 (95% CI: 0.99, 1.82;  $p=0.054$ ). The adjusted OR 1.86 (95% CI: 1.00, 3.45;  $p=0.048$ ) was statistically significant. The 6-month prolonged abstinence were 30.0% (18/60) and 33.5% (59/176) with an insignificant difference of 3.5% (95% CI: -10.3%, 17.4%). The crude and adjusted ORs were 1.18 (95% CI: 0.62, 2.22) and 1.18 (95% CI: 0.61, 2.28). The adjusted ORs of 6-month abstinence for adherent vs. non-adherent subjects was 3.30 (95% CI: 1.83, 5.94). **CONCLUSIONS:** The pre-treatment MTQ had a positive and substantial influence on treatment adherence in treatment-seeking smokers, but its impact on abstinence was not identified. Though the smoker's adherence to treatment was an important determinant on cessation outcome, this effect was not mediated from smoker's MTQ.

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## POS3-35

### CHARACTERIZING NICOTINE WITHDRAWAL ACROSS VULNERABLE POPULATIONS: DATA FROM A TRIAL EXAMINING REDUCED NICOTINE CONTENT CIGARETTES

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**SIGNIFICANCE:** Individuals with socioeconomic, psychiatric or other disadvantages bear a disproportionate burden of smoking and smoking-related consequences. Recent research by the UVM TCORS indicates that disadvantaged smokers may respond to reductions in the nicotine content of cigarettes with reductions in cigarette demand and other measures of addiction potential. However the withdrawal experienced by these vulnerable smokers has not been characterized. Here we examine withdrawal severity following acute exposure to cigarettes with varying nicotine content and its association with the characteristics widely associated with vulnerability to smoking (opioid dependence, anxiety, depression, education, gender). **METHODS:** Methadone- or buprenorphine-maintained patients ( $n=68$ ), individuals with affective disorders ( $n=80$ ) and economically-disadvantaged women ( $n=82$ ) completed five sessions in this within-subjects laboratory study. In each session, they smoked a single research cigarette varying in nicotine content (0.4, 2.4, 5.2, 15.8 mg/g) or their usual brand cigarette under double-blind, acute abstinence (CO $<50\%$  baseline) conditions. Participants completed the Minnesota Nicotine Withdrawal Scale (MNWS) before and every 15 minutes post-cigarette for the hour following smoking. Our primary aim was to characterize the contribution to withdrawal of individual characteristics often indicative of smoking risk (opioid dependence, anxiety, depression, education, gender). MNWS AUC scores were calculated across sessions using an ANOVA and then also analyzed using multivariate regression models that adjusted for several variables that have historically predicted withdrawal severity (i.e., nicotine dose, age, FTND score, and cigs/day). **RESULTS:** Depression was the only significant predictor of MNWS AUC scores ( $p<.001$ ) while opioid dependence approached significance ( $p=.07$ ). Additionally, there were significant anxiety x dose, depression x dose and gender x dose interactions on MNWS AUC ( $p<.05$ ). **CONCLUSIONS:** Depression severity may be associated with levels of nicotine withdrawal experienced by disadvantaged smokers across a range of nicotine content cigarettes.

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## POS3-36

### POSITIVE ASSOCIATION BETWEEN NUMBER OF SESSIONS ATTENDED AND CIGARETTE ABSTINENCE IN PATIENTS UNDERGOING CANCER SURGERY

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**SIGNIFICANCE:** About half of smokers who are diagnosed with cancer continue to smoke. Continued smoking increases the risk of complications from surgery, which is often a first-line treatment for newly diagnosed cancer patients. Thus, developing and optimizing novel treatments for these patients is imperative. **OBJECTIVE:** To establish whether attending a higher number of preoperative contingency management sessions leads to enhanced tobacco abstinence for individuals in a clinical trial undergoing cancer surgery. **METHODS:** In a secondary analysis from a multisite randomized pilot clinical trial, we analyzed data from 40 smokers with a confirmed or suspected diagnosis of any type of operable cancer who received tobacco dependence treatment 10 days to 5 weeks before surgery. Participants were randomized to Standard Care (SC) or Contingency Management (CM). All participants received counseling and nicotine patches. CM participants who were abstinent (self-report confirmed by breath CO  $\leq 6$ ppm) earned payments on an escalating schedule of reinforcement with a reset; SC participants had breath CO tests without payments. Breath CO tests were administered 3 times/week from the quit date until the surgery date. In the primary analysis, 7-day point prevalence abstinence was higher in the CM group (48%) than the SC group (16%). Abstinence was defined as 7-day point prevalence abstinence on the day of surgery. First, logistic regression was used to evaluate the association between number of CO monitoring visits and abstinence for the full sample ( $N=40$ ). Second, logistic regression was conducted for those in the CM group ( $n=20$ ) and those in the SC group ( $n=20$ ) as two distinct analyses. **RESULTS:** In the full sample, each additional session attended was associated with a higher odds of abstinence (OR=1.44, 95%CI: 1.15, 1.82,  $p=.002$ ). When looking at the 2 groups, significance was achieved for the CM group (OR=1.44, 95%CI: 1.05, 1.98,  $p=.023$ ) and for the SC group (OR=1.47, 95%CI: 1.01, 2.13,  $p=.045$ ). **CONCLUSIONS:** Attending a higher number of sessions increased the likelihood of abstinence. Further research is warranted to understand the benefit of CM over monitoring sessions.

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## POS3-37

### PSYCHOSOCIAL FACTORS AND ADHERENCE TO A COMBINED SMOKING AND ALCOHOL INTERVENTION AMONG HOMELESS SMOKERS

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**BACKGROUND:** Smoking prevalence exceeds 70% among homeless adults. Competing demands limit homeless smokers access and adherence to available treatments. Understanding factors that promote adherence to treatment is critical as smoking is the leading cause of morbidity and mortality in this population. This study sought to determine the relationship between psychosocial factors and adherence to a behavioral smoking and alcohol cessation intervention among homeless smokers. **METHODS:** Data were collected from an ongoing RCT examining the efficacy of integrating alcohol abuse treatment with smoking cessation treatment among homeless smokers. The first 164 participants completing the 12-week visit were included in this analysis. Baseline demographic, psychosocial, and tobacco and alcohol-use variables were self-reported. Adherence to behavioral treatment was measured as the number of counseling sessions attended (maximum=10 over 12 weeks). Multivariable regression models were used to evaluate associations between baseline factors and adherence to behavioral therapy overall, and after stratifying by smoking severity (Heaviness of Smoking Index). **RESULTS:** On average, participants (77% male; 77% African-American, 5% Hispanic, 8% white) were 47 years old (SD=11), smoked 17 cigarettes per day (SD=11), and 41% had been homeless just once in the past 3 years. Hispanic participants attended fewer counseling sessions than non-Hispanics (adjusted  $\beta \pm$  SE:



-2.9±1.1,  $p=0.007$ ). There was a positive association between perceived stress and counseling attendance among heavy smokers ( $\beta \pm SE$ : 0.3±0.1,  $p=0.037$ ), but not among lighter smokers. Among heavy smokers, more frequent homelessness (2-3 times vs. 1 time) was associated with fewer counseling sessions attended ( $\beta \pm SE$ : -2.8±1.0,  $p=0.013$ ). CONCLUSION: Heaviness of smoking may be related to more severe nicotine dependence, which makes adherence to treatment more difficult. Perceived stress and fewer episodes of recent homelessness were associated with greater adherence to counseling sessions but only among heavy smokers. Further research is needed to understand factors associated with adherence to behavioral therapy among this high-risk population.

FUNDING: Federal

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## POS3-38

### EXCLUSIVE CIGARETTE SMOKERS VS. CO-USERS OF MARIJUANA AND CIGARETTES: EXPOSURE TO TOXICANTS

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BACKGROUND: This study is a secondary analysis of a multi-site randomized control trial examining the effects of reduced nicotine cigarettes on smoking behavior. Co-users of marijuana (MJ) and tobacco were compared to exclusive cigarette smokers (ES) on levels of toxicant exposure during baseline. METHOD: Adult smokers ( $N=1250$ ,  $M_{age}=45.96$ ;  $SD=10.89$ , 44% female), completed a 3-week baseline phase prior to entering the clinical trial. Co-users were defined as those who tested positive for tetrahydrocannabinol (THC) at the first visit, smoked MJ  $\geq 1$ /wk, and smoked  $\geq 5$  cigarettes/day (cpd) for the past 3 months ( $n=175$ ). ES were defined as those who tested negative for THC at the first visit, and denied MJ use during the prior month and during baseline ( $n=909$ ). Urine samples to assess biomarkers of exposure were collected at the third baseline visit. Analyses: Urine samples were analyzed for total nicotine equivalents (TNE), 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanol and its glucuronides (total NNAL), 3-hydroxypropylmercapturic acid (3-HPMA), 2-cyanoethylmercapturic acid (CEMA), phenanthrene tetraol (PheT). ANCOVAs comparing co-users to ES were conducted controlling for age, gender, race/ethnicity, smoking duration, and TNE. RESULTS: Compared to ES, co-users were more likely to be white [62.8% ES vs 76.0% co-users;  $p=.001$ ], males [51.8% ES vs 66.3% co-users;  $p<.001$ ], younger (ES  $M=47.24$ ,  $SD=12.72$  vs co-users  $M=39.26$ ,  $SD=13.28$ ;  $p<.001$ ), and have a shorter smoking duration (ES  $M=15.06$ ,  $SD=12.99$  vs co-users  $M=11.98$ ,  $SD=11.27$ ;  $p=.001$ ). There were no differences between groups in TNE. Levels of total NNAL were significantly higher among ES [geometric mean (GM)=1.36 pmol/mg creatinine] compared to co-users (GM 0.84 pmol/mg creatinine;  $p<.001$ ). However, levels of 3-HPMA, CEMA, and PheT were significantly higher among co-users than ES (3-HPMA  $p=.005$ ; CEMA  $p<.001$ ; PheT  $p<.001$ ). CONCLUSION: Co-users of MJ and tobacco had lower levels of total NNAL, but higher levels of 3-HPMA, CEMA, and PheT, compared to ES. Given the increased exposure to toxicants experienced by co-users, it is important to accurately inform this group about the additive health risks of smoking both products.

FUNDING: Federal

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## POS3-39

### CAN ESTABLISHED VAPERS DISTINGUISH DIFFERENT PG:VG RATIOS?

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SIGNIFICANCE: Consumer perceptions about a product are influenced by product design and branding, which can in turn influence sensory response. Electronic nicotine delivery systems have two components (the device for vaporizing and the eliquid) that can each influence consumer use and perception. E-liquids can differ across a number of dimensions, including nicotine content, flavorings, and the ratio of solvents (vegetable glycerin (VG) and propylene glycol (PG)). This study aimed to evaluate whether established e-cigarette users can distinguish between different eliquid PG:VG ratios at fixed nicotine and flavor, to determine the extent to

which solvent is important to the sensory experience. METHODS: All eliquids used in this study were watermelon flavored and had a nicotine concentration of 16mg/mL. They differed in the ratio of propylene glycol to vegetable glycerin (Liquid A: 50:50; Liquid B: 70:30; Liquid C: 30:70). Participants were current users of e-cigarettes (tank-system). Participants were randomized to one of three possible study conditions (A v. B; A v. C; B v. C). A triangle test procedure was used to determine if participants could identify the liquid that was different from the other two. Three e-cigarette units were placed in front of the participant. Participants were then instructed to try each product in a standardized manner and pick the odd product. This process was done three times at each session, across a total of six sessions. RESULTS: Fourteen participants completed the study. Of these, 34.9% were able to determine the odd product in the Triangle Test. Between the different randomization groups, there were no significant differences in ability to determine correctly the odd product in the triangle test (A v. B: 34.5%, A v. C: 33.3%, B v. C: 37.5%;  $p$ -value = 0.853). CONCLUSIONS: The established e-cigarette users in this study were unable to consistently identify the odd product, even for a relatively large difference. This finding suggests that the PG:VG ratio is not as salient a feature of vaping as flavor or nicotine content, which were not varied. Solvent content could represent a starting point for product standards for e-liquids.

FUNDING: Academic Institution

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## POS3-40

### EVALUATION OF MENTHOL PER SE ON ACUTE PERCEPTIONS AND CHOICE OF CIGARETTES DIFFERING IN NICOTINE CONTENT

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Cigarette perceptions and self-administration are each very strongly influenced by nicotine intake. Non-nicotine flavorings, especially menthol, could also affect perceptions and self-administration of cigarettes, but menthol per se has not been tested under tightly controlled conditions. In one session, dependent menthol ( $n=44$ ) or non-menthol ( $n=29$ ) smokers abstained overnight and then acutely rated perceptions to each of two menthol or non-menthol (matched to preference) Spectrum cigarettes that were moderate (16-17 mg/g) vs very low (0.4 mg/g) in nicotine contents. Cigarette perceptions (each on 0-100 VAS) asked how much "nicotine", "flavor", and "liking" was experienced, and how "satisfying" and "strong" it was. Each exposure involved 4 carefully controlled puffs (via CReSS) under blind conditions. To ensure reliable responding, they received 5 exposures to each cigarette in random order, once every 15 mins, and then chose between them on two final trials. As intended, no differences in topography were found for menthol, nicotine content, and menthol x nicotine interaction (all  $p$ 's  $>.10$ ). Results showed that all perceptions and choice were greater for moderate vs. very low nicotine (both  $p <.001$ ), as expected. However, these differences in perceptions and choice due to nicotine did not vary at all by menthol, as the nicotine x menthol interaction was not significant (both  $p>.40$ ). Subsequent analyses related perceptions with choice behavior, showing that the difference between moderate vs very low nicotine cigarettes in perceptions was directly associated with greater choice of the moderate nicotine cigarette (Wald  $\chi^2(1) = 5.64$ ,  $p <.05$ ). Yet, again, neither a main effect of menthol ( $p = .33$ ), nor interaction of nicotine x menthol ( $p = .39$ ), was related to cigarette choice. Our results indicate perceptions and reinforcement from cigarettes do not differ due to menthol per se, i.e. when nicotine content and smoking topography are carefully controlled. Overall, our findings confirm that, regardless of menthol, perceptions of a cigarette's nicotine content directly predict self-administration.

FUNDING: Federal

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## POS3-41

### EXAMINING THE INFLUENCE OF MENTHOLATION ON RELATIVE REINFORCING EFFICACY OF CIGARETTES AT VARYING NICOTINE DOSES

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**SIGNIFICANCE:** When evaluating the potential of a nicotine reduction policy, it is important to examine the impact mentholation could have on the relative reinforcing efficacy of nicotine dose, as one-third of cigarette smokers report a mentholated product as their usual brand cigarette. We examine this in the present study using a concurrent choice task to determine if there are differences by menthol status in the relative reinforcing efficacy of cigarettes with varying nicotine doses. **METHODS:** Participants were 169 current smokers from three populations especially vulnerable to tobacco addiction dichotomized as menthol (n=59) or non-menthol (n=110) smokers. After brief exposure to four research cigarettes (Spectrum, 22<sup>nd</sup> Century Group; menthol status consistent with usual brand) varying in nicotine content (0.4mg/g, 2.4 mg/g, 5.2 mg/g, 15.8 mg/g), participants completed six 3-hr sessions in which they chose between two of the research cigarettes on a concurrent choice schedule (FR-10). All six possible dose combinations were tested once in separate sessions. A repeated measures ANOVA was used to examine differences in preference among all possible dose pairs by menthol status. Potentially confounding demographic variables were controlled for in the analyses. **RESULTS:** There was a main effect of dose ( $p < .0001$ ), indicating that the higher nicotine dose cigarette was chosen significantly more than the lower nicotine dose cigarette across dose pairs. There was no effect of menthol status ( $p = .94$ ) and no menthol status x dose interaction ( $p = .09$ ), suggesting that the menthol status did not have an impact on the relative reinforcing effects of nicotine dose. **CONCLUSIONS:** These results suggest that across the six different dose pairs both menthol and non-menthol smokers respond similarly, preferring the higher nicotine dose over the lower nicotine dose. This finding suggests that mentholation does not have an impact the relative reinforcing efficacy of nicotine dose and in both menthol and non-menthol smokers reducing nicotine content may reduce addiction potential of cigarettes.

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## POS3-42

### DISCRIMINATION OF NICOTINE CONTENT IN ELECTRONIC CIGARETTES

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Following a long program of assessing formal behavioral discrimination of nicotine administered by a non-smoked method (nasal spray), we developed and evaluated a revised procedure to test discrimination of nicotine via tobacco smoking, using the newly available Spectrum research cigarettes, which differ in nicotine content. Now, we explore applicability of this procedure to assess discrimination of nicotine dosing administered by e-cigarettes. Dependent adults were tested on ability to discriminate second generation e-cigarettes (using 650mAh KR808D-1 Type 3.7V battery) with nicotine contents of 36, 24, and 12 mg, one per session (in that order), from a placebo (0 mg), each identified only by letter code. Each 3-hr session, after overnight abstinence, involved 4 "training" trials to learn to discriminate between the two e-cigarettes presented in random order, followed by 8 "testing" trials to confirm acquisition of that discrimination. Exposure to each was just 4 puffs per trial to minimize satiation. Reliable discrimination was defined by accurately identifying which e-cigarette letter code was which (i.e. nicotine vs placebo) on >85% of trials (i.e.  $\geq 7$  of 8;  $p < .05$ ). Out of 14 participants (to date), discrimination from placebo was shown with 36 mg and with 24 mg nicotine in 13 subjects, but only 8 could discriminate between placebo and 12 mg nicotine. (The remaining subject failed with 0 vs 36 mg and excluded from further testing.) Similarly, subjective measures previously related to nicotine intake ("how much nicotine", "head rush/buzzed" on 0-100 VAS) showed dose-dependent effects, as expected. These preliminary results confirm feasibility of using our behavioral procedure to assess ability to discriminate nicotine administered via e-cigarettes, broadening the generalizability of this procedure beyond nicotine via nasal spray and tobacco cigarettes. They also suggest it could be applicable to testing discrimination of nicotine via other methods of rapid administration (e.g., hookah, novel

products). Further study may identify individual difference factors influencing nicotine discrimination administered via e-cigarettes and other methods.

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## POS3-43

### REINFORCEMENT ENHANCING EFFECTS OF NICOTINE VIA NASAL SPRAY VERSUS TRANSDERMAL PATCH

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Consistent with preclinical research, studies with humans show that nicotine (via tobacco smoking) acutely enhances reinforcement from rewards unrelated to the nicotine. Because these acute effects of smoked nicotine were also found with e-cigarettes, it is likely that nicotine per se, regardless of method of administration, has reinforcement enhancing effects in humans. Here, we examined whether nicotine via NRT products of nasal spray (Nicotrol) or patch (Nicoderm) would also enhance reinforcement from non-drug rewards, suggesting NRT may partly aid tobacco cessation by enhancing these effects on reinforced responding, along with relief of abstinence symptoms. Testing patch vs spray also allowed us to explore potential effects of slow vs fast (respectively) uptake of nicotine. Double-dummy, single blind procedures in this within-subjects study were adapted from our prior studies, one confirming equal plasma nicotine levels upon testing due to NRT via spray (2 x 1.0 mg) vs patch (14 mg; >2 hrs post-application), and others on reinforcement enhancing effects of nicotine via tobacco. Reinforced responding for different rewards were compared within-subjects across three different sessions, each after overnight abstinence (CO<10 ppm), involving NRT spray (+ placebo patch), NRT patch (+ placebo spray), or double placebo. In each session, subjects (N=31 dependent adults) responded on a simple operant task using a PR50% schedule to obtain small units of each reward type, available singly on four separate 15-min trials: music reward or video reward (30-sec clips each), monetary reward (\$10), or no reward (control). Results indicated greater responding for video reward, as expected, due to nicotine via spray or patch (both  $p < .005$ ). Surprisingly, and contrary to our prior studies of nicotine via smoking, the increase in responding for music was not significant due to spray or patch ( $p > .10$ ), and responding for money was increased by spray ( $p < .05$ ) but not patch ( $p > .30$ ). Future research should examine whether nicotine's reinforcement enhancing effects may be differentially sensitive to dose across the types of sensory rewards available.

**FUNDING:** Federal

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## POS3-44

### CONTINGENCY MANAGEMENT TREATMENT ENHANCES THE EFFECT OF BEHAVIORAL ACTIVATION FOR PREVENTING SMOKING RELAPSE IN SMOKERS WITH DEPRESSION: A 6-MONTH FOLLOW-UP STUDY

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**SIGNIFICANCE:** Depression is amongst the most prevalent mental-health comorbid conditions in the population of smokers. It is estimated that more than 45% of smokers achieving abstinence in formal treatments relapse within the first three months. Behavioral Activation (BA) is now considered a highly effective treatment for promoting abstinence with emerging evidence showing greater cessation rates when integrated into a smoking cessation treatment. Despite this, only one previous study has assessed its effectiveness for quitting smoking in depressed individuals and none previous attempt has been made to examine whether combining Contingency Management (CM) for reinforcing abstinence to a smoking cessation treatment enhances the effectiveness of BA. This study sought to: 1) analyze whether adding CM to a Cognitive Behavioral treatment (CBT) plus BA significantly enhances smoking cessation rates and improves depression at the end-of-treatment (EOT) and, 2) examine whether CBT+BA+CM prevents smoking relapse at both short-term (3 months) and long-term follow-up (6 months) compared to CBT+BA. **METHODS:** A sample of 94 smokers [72% female: BDI-II  $M=28.45$  ( $SD=9.43$ ); % with a major depression diagnosis= 75.6%] were randomly assigned to 2 treatments:





CBT+BA ( $n=49$ ), or CBT+BA+CM ( $n=45$ ). Smoking abstinence was verified through carbon monoxide and urinalyses. RESULTS: 69.1% gave up smoking at the end of treatment. Abstinence rates did not differ between CBT+BA and CBT+BA+CM at EOT (63.3% vs 75.6%). Participants showed an improvement in depressive symptoms with no differences across treatments (CBT+BA;  $M=11.73$  vs CBT+BA+CM;  $M=11.49$ ). Both conditions similarly prevented relapse rates at both 3-months (CBT+BA=93.9%; CBT+BA+CM=88.9%;  $p\geq 0.05$ ) and 6-months (CBT+BA=59.1%; CBT+BA+CM=66.7%;  $p\geq 0.05$ ). CONCLUSIONS: These results preliminary yield encouraging evidence of BA and CM for severely depressed smokers. Results suggest that including a CM protocol could increase smoking abstinence while ameliorating depression. Continued efforts aimed at developing effective smoking cessation treatments for this difficult to treat population are warranted.

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### POS3-45 EXAMINATION OF DIFFERENT MEASURES OF VARENICLINE ADHERENCE AND SMOKING ABSTINENCE

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SIGNIFICANCE: In smoking cessation trials, self-report pill counts have traditionally been used as an indirect measure of adherence; very few studies have examined biological measures of adherence. The aim of this study was to compare different measures of varenicline adherence, and their association with smoking abstinence. METHODS: Week 1 salivary varenicline levels, Week 1 3-, 7- and 14-day self-report pill counts, and multiple measures of biochemically-verified abstinence (exhaled carbon monoxide, salivary cotinine) were assessed in treatment-seeking adult smokers ( $N=376$ ) (NCT01314001). Receiver operating characteristic curve and logistic regression analyses were conducted to examine the relationship among adherence measures and between these measures and abstinence. RESULTS: 3-, 7-, and 14-day pill counts were very weakly correlated with salivary varenicline levels (Spearman's rhos ranging from .10 to .15,  $p's \leq .05$ ) and were not significant discriminators of adherence based on salivary varenicline levels. Salivary varenicline, but not pill counts, correctly classified Week 1 abstinence using CO and COT-verified abstinence (area under the curve [AUC] ranging from .585 to .608,  $p's \leq .008$ ). Salivary varenicline levels were significant predictors of abstinence at Week 1 (odds ratio [OR] ranging from 2.75 to 3.16,  $p's < .001$ ). In contrast, when using a traditional cut-point of 80% of pills taken in the preceding 3, 7, or 14 days (as determined by pill count) to classify adherence, there were no statistical differences in Week 1 abstinence rate between adherent and non-adherent individuals (ORs ranging from 1.402 to 2.96,  $p's \geq .05$ ). Salivary varenicline levels, but not pill counts, were significant predictors of abstinence 6 months following treatment. CONCLUSIONS: The concordance between pill counts and salivary varenicline levels is poor; pill counts did not predict abstinence while varenicline levels did. Incorporating biological measures of adherence in smoking cessation trials may enhance our ability to identify individuals who may experience difficulties quitting and require additional support.

FUNDING: Academic Institution; Federal

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### POS3-46 AN ANALYSIS OF JUUL DISCUSSIONS ON SOCIAL MEDIA: USING REDDIT TO UNDERSTAND PATTERNS OF USE AND PERCEPTIONS OF JUUL

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SIGNIFICANCE: Electronic cigarettes have continued to evolve rapidly in an unregulated market and a recent device, JUUL, seems to be gaining in popularity, though it is unlike most newer e-cigarettes in terms of size, shape, wattage, and nicotine content. JUUL is a small, closed system, rechargeable e-cigarette released in 2015 that utilizes flavored pods with very high nicotine concentrations (5-6% nicotine compared to other e-cigarettes) that can be interchanged with ease. The current study examined patterns of use and perceptions of JUUL using publicly available data from

Reddit.com, which remains one of the most popular websites worldwide and contains numerous forums dedicated to noncombustible tobacco products. METHODS: The current study obtained all submissions and comments posted on Reddit with the character string "juul" and removed posts that did not refer to JUUL the electronic cigarette product ( $n = 4,562$  posts removed). A final dataset with 11,507 posts was uploaded into NVivo 11 for further analysis. Search terms related to a priori themes of interest (flavors, references to youth, reasons for use, health-related posts, and polarity) were entered into NVivo to determine frequencies of topics related to JUUL and perceptions of JUUL. RESULTS: Overall, users tended to use positive language (83.9%) when discussing JUUL and were more likely to refer to its health-related benefits (83.4%), such as helping one to quit smoking, than its drawbacks, such as disease risk. Individuals also discussed nicotine "buzz" (35.1%) and addiction (8.4%) within posts related to reasons for JUUL use. Further, mint (47.8% of flavor-related posts) and mango (41.95%) were the most popular pod flavors discussed. CONCLUSIONS: Future research should conduct a full content analysis as well as use quantitative methods to examine JUUL use to strengthen existing conclusions and identify if patterns differ for youth specifically as compared to adults generally.

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### POS3-47 EXPECTATIONS OF DEPRESSION AND ANXIETY INTERFERING WITH SMOKING CESSATION: IMPACT ON 12-MONTH OUTCOMES IN A WEB-BASED TRIAL

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BACKGROUND: Depression and anxiety disorders are associated with lower abstinence rates in response to tobacco treatment. Some research suggests there is variability in quit rates of these smokers that may be driven by expectancies about the extent to which one's mental health condition will interfere with quitting. To extend this work, we examined whether smokers' expectations about their mental health condition interfering with their ability to quit was related to 12-month abstinence rates in response to a web-based intervention. We also examined associations between these expectancies and other factors that may influence cessation. METHODS: Participants were a subgroup of smokers enrolled in a RCT comparing two web-based smoking interventions ( $N=2,637$ ) who self-reported having a depression or anxiety disorder ( $n=942$ ). They reported if they believed the condition would interfere with their ability to quit or not. Outcome was 30-day point prevalence abstinence at 12-months follow-up. RESULTS: One-third (303/942) of smokers self-reporting anxiety or depression believed their disorder would interfere with quitting. At baseline, those endorsing this belief reported more past quit attempts ( $p=.024$ ), had greater mental health symptoms ( $p<.0001$ ), and were less committed to quitting ( $p<.0001$ ) compared to those who did not endorse the belief. During the study, although they reported a similar number of quit attempts and use of NRT, they logged in to the websites less ( $M[SD]: 6.6[14.9]$  vs  $5.1[6.7]$ ,  $p=.003$ ) and were significantly less likely to quit (13% vs 23%;  $p=.002$ ). CONCLUSIONS: Abstinence rates in response to web-based interventions among smokers self-reporting depression and anxiety are particularly low among those who believe their condition will interfere with their ability to quit. These smokers may benefit from targeted web-based interventions that not only encourage ongoing treatment engagement, but also address their expectancies, mental health symptoms, and commitment to quitting.

FUNDING: Federal

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### POS3-48 USING THE COMPLEX NETWORK APPROACH TO INFORM PERSONALIZED TREATMENT FOR TRAUMA-EXPOSED TOBACCO USERS

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SIGNIFICANCE: Tobacco use and PTSD are highly comorbid. Individuals with a history of trauma exposure smoke at twice the rate of the general population and





have poorer treatment outcomes, indicating a need for specialized interventions for trauma-exposed smokers. Identifying the mechanisms underlying the symptomatology of smokers with PTSD may facilitate tailored treatments. However, new tools may be required to uncover these mechanisms and locate appropriate points of inflection for tailored treatment. Recently, the complex network approach has emerged as a powerful tool for understanding drivers of psychopathology. In the present study, we examined the relative influence of various PTSD symptoms over the network dynamics of PTSD symptomatology for tobacco users and non-users in an effort to identify potential specific treatment targets for this population. **METHODS:** Eighty-one participants with scores on the PTSD Checklist for DSM-5 of  $\geq 38$  were included in the present analysis. Twenty-one participants reported current tobacco use. Separate concentration networks were estimated for those with and without current tobacco use using six symptoms of PTSD, including loss of interest/pleasure, difficulty feeling positive, irritable behavior, hypervigilance, being easily startled, and difficulty concentrating. Expected force (ExF), a metric that quantifies the relative influence of each symptom within a network, was then calculated for each node within each network. **RESULTS:** Tobacco users exhibited greater ExF for irritable behavior and hypervigilance, whereas non-users exhibited greater ExF for loss of interest/pleasure, difficulty feeling positive, and being easily startled. **CONCLUSIONS:** Results of the present analyses indicate that the most influential symptoms of PTSD differ between tobacco users (irritable behavior, hypervigilance) and non-users (loss of interest/pleasure, difficulty feeling positive, being easily startled). These preliminary findings highlight the importance of irritability and hypervigilance in trauma-exposed tobacco users, and suggest that interventions targeting these symptoms first may have increased effectiveness in this population.

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## POS3-49

### EFFECTS OF TRAINED HEALTH PROFESSIONALS' BEHAVIORAL COUNSELING SKILLS ON SMOKING CESSATION OUTCOMES

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**SIGNIFICANCE:** There is evidence that training health professionals in behavioral counseling skills can lead to greater success in helping their smokers to quit. However, it is still unknown how counseling skills relate to counseling effects. We established a method of skills evaluation of health professionals for smoking cessation counseling based on videotaped counseling sessions with a standardized smoker, and examined the relationship between skill levels and smoking cessation outcomes. **METHODS:** Twenty-three health professionals at Japanese workplaces underwent a training program. Their counseling skills were evaluated before and after the program using a structured evaluation form-based analysis of videotaped interactions between participants and a standardized smoker. A total of 858 smokers then received individual smoking cessation counseling by the trained health professionals at an annual health checkup. These patients were followed-up through surveys after one-year. **RESULTS:** On a scale from 0 to 24, Total skill scores, which ranged from 0 to 24, were significantly higher after the training ( $M = 16.1$ ) than before the training 11.6 ( $p < 0.001$ ). Multiple two-level logistic regression analysis adjusted for smokers' characteristics showed that the odds ratios of skill scores after the training for point prevalence and sustained abstinence rates among smokers who received counseling were 1.21 (95% confidence interval: 1.03–1.42) and 1.26 (1.05–1.50), respectively. **CONCLUSIONS:** This study demonstrates that higher behavioral counseling skills are associated with better smoking cessation outcomes. This research is of clinical importance in that it provides a tool for assessing counselling skills in a way that is demonstrably relevant to outcomes.

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## POS3-50

### ROMANCE VS. SEX: CAN MATING NARRATIVES CHANGE DISCOUNTING AND TOBACCO VALUATION?

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**SIGNIFICANCE:** Delay discounting is a candidate behavioral marker of addiction with excessive discounting being a trans-disease process contributing to addiction and other disease-related vulnerabilities. Hence, delay discounting is a valuable target for interventional therapies that aim to treating addiction. Previous research demonstrated that narratives might be utilized to alter rates of discounting. In addition, it has been suggested that evolutionarily-driven motives may trigger risk-taking behaviors. In this study, we investigated how delay discounting is influenced by mating (romance vs sex) narratives. **METHODS:** Two hundred and seventy-five smokers were recruited from an online crowdsourcing (Amazon Mechanical Turk, or MTurk) to assess the discounting of hypothetical delayed money after being randomly assigned to one of three different motivational scenarios (control, romance, and sex). The scenarios were primed via guided visualization exercises, in which each scenario consisted of about 800 words. **RESULTS:** Analysis showed that participants were more inclined to choose the delayed but larger rewards after reading the romance scenario ( $p=0.044$ ) compared to control. However, reading the sex scenarios increased their choice preference to the immediate but smaller rewards ( $p=0.040$ ). Moreover, reading the romance scenario significantly decreased craving cigarettes while reading the sex scenario increased cigarette's valuation. **CONCLUSION:** These findings suggest that mating narratives may be useful in manipulating rates of discounting, relevant for altering demand and craving, and may show potential as a component of future behavioral addiction interventions.

**FUNDING:** Federal

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## POS3-51

### ABSTINENCE SELF-EFFICACY MEDIATES THE RELATIONSHIP BETWEEN RACE AND NUMBER OF CIGARETTES SMOKED AT END OF TREATMENT

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Tobacco use continues to be the leading cause of preventable death in the United States, with over 480,000 cigarette smoking related deaths occurring annually. Smoking prevalence among individuals in the criminal justice system is particularly high, with 70-80% of these individuals qualifying as smokers. Despite this high smoking prevalence and need for effective interventions, there has been minimal research conducted on interventions for reducing cigarette use in this population. Previous research on self-efficacy for reducing number of cigarettes smoked has shown that greater abstinence self-efficacy is associated with smoking fewer cigarettes per day (CPD) at the end of treatment. The current study examined how abstinence self-efficacy mediates the relationship between race (Black v. White) and CPD. Participants were recruited from a community correctional facility in Birmingham, Alabama ( $N = 500$ ). The study included a 12-week clinical trial exploring the effectiveness of bupropion as a smoking reduction intervention. Participants received bupropion treatment for 12 weeks as well as behavioral counseling sessions. Questionnaires assessed smoking history, smoking characteristics, abstinence self-efficacy, and demographics. PROCESS macro for SPSS was utilized to explore abstinence self-efficacy as a mediator of the relationship between race and CPD at the end of the 12-week treatment. The indirect effect was estimated using bootstrapping of 20,000 samples. Results of the analysis indicated that participants' abstinence self-efficacy significantly mediated the relationship between race and CPD at the end of treatment, such that being African American led to higher abstinence self-efficacy, which led to smoking fewer cigarettes at the end of treatment ( $B = -0.372$ ,  $CI_{95}[-1.10, -0.04]$ ). These results suggest that for African American smokers, abstinence self-efficacy is an important factor for reducing cigarette use. Developing behavioral interventions that can increase abstinence self-efficacy may be particularly helpful for efforts to reduce cigarette use with African Americans.

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## POS3-52

### AUTOMATING A MOTIVATIONAL INTERVENTION FOR LOW-INCOME SMOKERS: A PILOT FEASIBILITY STUDY

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**SIGNIFICANCE:** People living in poverty smoke at a rate more than twice that of the overall population. Needed are interventions to motivate such smokers to engage in evidence-based cessation treatment, ideally in locales that they frequent. Community agency (CA) staff can provide such interventions. For example, when staff at Salvation Army (SA) sites provided a brief intervention (20 minutes) that addressed misperceptions about smoking and quitting and explored ambivalence about quitting, more clients called a quit line than those in a control group (12% vs. 2%). But relying on CA staff to deliver the interventions raises fidelity and staff burden concerns. The purpose of this pilot feasibility study was to test this brief, motivational intervention when automated on a tablet computer. **METHOD:** Study participants were 20 current smoking clients and 6 staff members from two SA sites in Wisconsin. SA clients received the intervention on the tablet after very brief instructions (2 minutes) on how to use it. Following its demonstration, SA staff practiced the intervention using the tablet twice, once as a CA staff person and once in the role of a CA client. **RESULTS:** The intervention took about 15 minutes. All SA clients successfully used the tablet; only 2 needed assistance. On a scale from 1 (very easy) to 5 (very hard) participants rated use of the tablet at mean=1.1. All stated that the tablet made the information easy to understand. When asked how much they learned on a scale from 1 (nothing) to 5 (a lot), the mean rating was 4.6. There was a strong preference for the tablet delivery over paper delivery (18 of 20). All SA staff believed that tablet delivery would be well received by clients. On a scale from 1 (very easy) to 5 (very hard), all rated ease of delivery as 1. They believed that the intervention would fit easily into their daily duties. All expressed a preference for tablet-guided over manual-based delivery. **CONCLUSION:** A brief motivational intervention automated on a tablet is acceptable to SA staff, feasible for SA clients, and holds promise to increase delivery fidelity while reducing staff burden.

**FUNDING:** Federal

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## POS3-53

### ADDITION MINDSET AND PROCESSES OF QUITTING CIGARETTE SMOKING

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**BACKGROUND:** Qualitative evidence suggests that smokers' beliefs about whether addiction is changeable will affect their efforts to quit smoking. However, no research has empirically tested this link. This study uses a novel construct, *mindset* of addiction (a fixed mindset refers to the belief that addiction is permanent; a growth mindset holds that addiction can change), to explore associations between smokers' mindsets and different processes of quitting smoking. **METHODS:** Participants (n = 200) were adult daily smokers (Age: M: 31.93, SD: 10.00, 49% Female; 84% Caucasian, smoking on average 10 cigarettes per day) participated in an online survey. They completed measures of addiction mindset, motivation to quit, commitment to quit, and self-efficacy to abstain, barriers to cessation and the extent to which they attributed their last failed quit attempt to a lack of ability to quit, or lack of effort. Linear regression was used to examine associations between mindset and these variables. All analyses controlled for age, number of cigarettes smoked daily, and number of previous quit attempts. **RESULTS:** Growth mindset (i.e. the belief that addiction can change) was significantly associated with higher motivation to quit (Beta = .16), higher commitment to quitting (Beta = .37), higher self-efficacy to abstain (Beta = .34), and reporting fewer barriers to cessation (Beta = -.33) (all p's < .05). Higher fixed mindset scores were associated with greater attribution of failure to a lack of ability (Beta = -.21, p < .05). **CONCLUSIONS:** Addiction mindset is associated with the processes of quitting smoking and how they evaluate failure to quit. This work adds to the literature on smokers' belief systems and highlights the need to explore mindset as a future area for targeting interventions for smoking cessation.

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## POS3-54

### EXERCISE AND SMOKING-RELATED SYMPTOMATOLOGY IN PREGNANT WOMEN

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Smoking during pregnancy continues to be a public health concern. Evidence-based interventions for smoking cessation during pregnancy are lacking, though exercise has yet to be thoroughly explored. This study's aim is to determine if there is a correlation between exercise and changes in smoking-related symptomatology (SRS; e.g., craving) from ad libitum smoking to overnight abstinence in pregnant smokers. We hypothesized that participants who reported higher exercise levels would have more favorable changes in SRS compared to participants who reported lower levels of exercise. Pregnant smokers (2nd or 3rd trimester; 16-22 weeks or 32-37 weeks; respectively) enrolled in an 8-day laboratory smoking cessation study completed the Leisure Time Exercise Questionnaire (LTEQ) and measures of SRS including the CES-D at baseline (ad lib smoking; day 0) and on day 8 (following overnight smoking abstinence). Pearson's correlation coefficients were calculated to test for a relationship between LTEQ and change in SRS from ad libitum smoking to overnight abstinence. Changes in SRS were also analyzed by comparing "low-level exercisers" (those with scores below the median) and "high-level exercisers" (those with scores above the median) with two-sample t-tests. Participants (n=79) were on average 26 +4.0 years old and smoked 11 +4.0 cigarettes/day while pregnant. Several SRS measures changed for the participants between ad lib smoking and overnight abstinence, but these changes did not correlate with LTEQ exercise levels (r coefficients <0.3). There was a larger increase in depressive symptoms for the high-level exercisers (+4.85 +1.37) compared to the low-level exercisers (+0.92 +1.12) after overnight abstinence (p=0.03). Several SRS items significantly increased from ad libitum smoking to overnight abstinence as expected. However, an association between exercise level and SRS was not seen. We observed a difference in depressive symptoms, with high-level exercisers reporting a greater increase in depressive symptoms than low-level exercisers. Future research should include more precise measures of exercise (e.g., actigraph) and a structured exercise program.

**FUNDING:** Federal

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## POS3-55

### THE ROLE OF NEGATIVE AFFECT AND THE ENVIRONMENT IN CIGARETTE SMOKERS WITH SCHIZOPHRENIA AND BIPOLAR DISORDER

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**INTRODUCTION:** High levels of negative affect and having many smokers in one's social network are associated with continued cigarette smoking. These constructs are of special relevance to individuals with severe mental illness, who are susceptible to both circumstances. Therefore, we predicted that negative affect and number of friends and family who smoked would be positively related to cigarettes per day and negatively related to time-to-first cigarette and motivation to quit smoking among smokers with schizophrenia and bipolar disorder. **METHODS:** This was a secondary data analysis of a study examining an adaption of motivational interviewing for smokers with serious mental illness. We used multiple regression analyses with negative affect and self-reported exposure to smokers within their friend/family group entered as independent variables. The number of cigarettes smoked per day, time-to-first cigarette after waking, and motivation to quit were entered as dependent variables. **RESULTS:** Individuals with higher levels of negative affect and with greater self-reported exposure to smokers within their friend/family group smoked more cigarettes per day (p=.001), and smoked their first cigarette earlier in the day (p=.033), however they were not less motivated to quit smoking (p=.288). **CONCLUSION:** Study findings indicate that cigarette smoking in smokers with serious mental illness is influenced by internal and external factors. Counseling interventions should focus both on teaching smokers more affect management techniques and to help them develop skills to navigate the difficulties of interacting with family and friends who smoke.

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**POS3-56****PRENATAL VS. POSTNATAL SMOKE EXPOSURE: IDENTIFYING PREDICTORS OF SCHOOL AGE ADHD SYMPTOMS**

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**SIGNIFICANCE:** Pre- and postnatal tobacco smoke exposure are associated with ADHD in childhood. However, existing studies are limited by self-reported smoke exposure and using parents as sole reporters of ADHD symptoms. The current study aimed to clarify this relationship by using cotinine collected prenatally from mothers and postnatally from children, and parent and teacher ratings of ADHD symptoms. **METHODS:** Participants were drawn from an ongoing prospective study of pregnant women and their children. Maternal prenatal blood samples and child saliva samples collected at follow-up were assayed for cotinine. Current analyses include 311 women (58% Black, 33.8% White, 7.4% Hispanic/Other) and children (mean age at follow-up=5.03y, SD=1.8, range=3-11, 48.2% male). Mothers and teachers (N=193) completed The Behavior Assessment System for Children, 2<sup>nd</sup> Edition or Preschool version; Hyperactivity and Attention Problem subscale scores were analyzed. **RESULTS:** Controlling for race, maternal education, gestational age, birth weight, and the age and sex of the child, multiple regression analyses revealed prenatal cotinine as a predictor of teacher rated Attention Problems, Beta=.17, *t*(169)=2.23, *p*=.03. However, after controlling for postnatal cotinine, the effect was no longer significant. Postnatal cotinine predicted parent reported Hyperactivity, Beta=.19, *t*(279)=3.11, *p*=.002, and Attention Problems rated by both parents, Beta=.16, *t*(281)=2.61, *p*=.01, and teachers, Beta=.18, *t*(181)=2.50, *p*=.013. **RESULTS:** remained significant after controlling for prenatal cotinine. **CONCLUSIONS:** Results underscore tobacco smoke exposure as a risk factor for childhood ADHD symptoms and indicate that early postnatal exposure may have a larger effect than prenatal exposure. Study strengths include using a biomarker of smoke exposure and both teacher and parent ratings of child behavior. Data can inform prevention efforts and guide health professionals to encourage the reduction of tobacco smoke exposure, even beyond pregnancy.

**FUNDING:** Federal

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**POS3-57****PROTOTYPE TESTING OF BREATHE FREE: A SMARTPHONE VIDEOGAME-BASED SMOKING CESSATION INTERVENTION**

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Cigarette smoking remains the number one cause of preventable morbidity and mortality in the U.S. One third to one half of smokers attempt to quit at least once; however, approximately 94% of quit attempts fail. One of the most powerful, evidence-based interventions is contingency management (CM), which consists of delivering incentives (typically money) contingent on objective evidence of smoking abstinence (e.g., exhaled carbon monoxide [CO]). We developed a prototype of a mobile videogame-based contingency management intervention for smoking cessation called *Breathe Free*. The goals of the game were to decrease costs, improve sustainability, and increase accessibility of CM for smoking cessation. To increase access, all aspects of the intervention were made to be available via Android or iOS smartphones used in conjunction with a small, portable breath CO monitor. To decrease costs and improve sustainability, the mobile game was developed to replace monetary incentives typically used in CM interventions with in-game "virtual rewards" that can immediately be used to help players meet game goals, as well as with social reinforcement, prompted and incentivized in the context of the game. We tested a prototype of the game with treatment seeking-smokers (N = 22) during a 1-hour session. Participants submitted a CO sample and then played several levels of the *Breathe Free* prototype. They were then given the choice to end the session or play one more level of the game. At the end of the session a user satisfaction survey was completed and participants were paid \$40. Participants rated the prototype favorably on the survey, with the majority reporting that they would play the fully developed game (90%), recommend it to a friend (95%), find it helpful in helping themselves (76%) or others quit (90%), and they thought the game was fun (100%). More than half of participants (58%) decided to play an extra level of the game, even though it

meant delaying access to getting paid and smoking their next cigarette. These results suggest that *Breathe Free* has great potential as an alternative, rigorous, yet enjoyable, smoking cessation intervention.

**FUNDING:** Federal

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**POS3-58****REFERRING TOBACCO CESSATION PROGRAM PARTICIPANTS TO LUNG CANCER SCREENING: PILOT INITIATIVE FINDINGS**

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**SIGNIFICANCE:** Lung cancer is the leading cause of cancer death and one-third of all cancer deaths can be prevented through smoking cessation. The American Lung Association (ALA), in collaboration with the Pennsylvania Department of Health, developed a pilot program to test the effectiveness of incorporating referrals to low-dose CT scan screenings into tobacco cessation programming. ALA also created a lung cancer risk-screening tool and identified/recruited partner organizations capable of implementing and evaluating the pilot's effectiveness. **METHODS:** A tobacco treatment specialist assessed all in-person tobacco cessation group counseling program participants between June 2016 and July 2017 using ALA's lung cancer risk screening tool. Participants who met these guidelines were referred to a physician specialist for education about the benefits and risks of completing a low-dose CT screening, allowing patients to ask questions, and provide them with a primary contact for further screening/treatment/discussions. The referral process was updated and expanded throughout the pilot time-period to address project challenges. The program's evaluators worked with the cessation counselor to track the number of referrals made and the number of patients referred who completed screenings. The evaluation team also conducted key informant interviews with program staff to discuss successes, challenges, and recommendations for future implementation. **RESULTS:** A total of 45 clients met the high-risk criteria and received referrals to low-dose CT screenings, 26 of who met with a healthcare provider to discuss the risks and benefits of screening, 20 received screenings, and 13 had results indicating a need for further screening or testing. **CONCLUSIONS:** This pilot shows the importance of developing a strong care coordination team that can efficiently process referrals and champion the benefits of screening. Recommendations for future implementation include addressing participation barriers by providing assistance in determining risk and offering free screenings when possible.

**FUNDING:** State

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**POS3-59****COMPARING INTERVENTION EFFECTS ON MOTIVATION AND INTEREST IN UTILIZING SMOKING CESSATION IN RESIDENTIAL SUBSTANCE ABUSE TREATMENT**

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**BACKGROUND:** Individuals with substance use disorders are susceptible to health risks and mortality given their increased frequency and intensity of smoking. Intervening with the completion of early stage of change tasks could increase their desire to engage in cessation services during treatment. The present study examined group differences of participating in a single Motivational Interviewing session on motivational constructs, interest in cessation aids/support, perceived risks/benefits of quitting, and information seeking behavior. **METHODS:** Participants (N = 71) recruited within two residential substance abuse treatment centers in Baltimore completed baseline self-report, posttest, and two-week follow-up questionnaires. Analysis of Covariance and Logistic Regressions were used to analyze data from 71 participants who met inclusion criteria and participated in the





three measurement points. RESULTS: Baseline measures suggest that there were no significant differences between participants in the intervention group ( $n = 40$ ) and the waitlist control ( $n = 31$ ) regarding key constructs. Desire to quit smoking increased significantly across the sample from baseline to follow up. This modest change is clinically relevant in a population characterized as not motivated to quit. Confidence to quit also significantly increased in the sample suggesting self-efficacy can be enhanced early in treatment. Related, sample cigarettes smoked per day dropped significantly and was found to be significantly related to confidence. CONCLUSIONS: There were significant stage of change differences by group. On average, intervention group participants were in Contemplation at the end of the study while individuals in the waitlist control remained in Precontemplation,  $F(1, 67) = 5.008$ ,  $p < .029$ , partial eta squared = .070. Intention to change behavior can be impacted by participation in an intervention enhancing motivation to quit early in treatment programming.

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## POS3-60

### DEMOGRAPHIC CHARACTERISTIC DIFFERENCES IN SELF-REPORTED NICOTINE DEPENDENCE IN A SAMPLE OF HIV POSITIVE SMOKERS LIVING IN NEW YORK

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People living with HIV (PLWH) smoke at rates three times greater than the general US population (~50 versus ~15%). Smoking in PLWH contributes to poor health outcomes. Thus, there has been a demand for more directed work on treating smoking among PLWH. A better understanding of differences in the smoking-related behaviors such as nicotine dependence (ND) among PLWH demographic subgroups may help to inform the development of more targeted cessation interventions. Demographic and clinical characteristics were collected from a sample of PLWH aged 40-59 living in New York (total  $n=97$ ) and analyses were conducted on the current cigarette smokers ( $n=50$ ). Contingency tables examined the relationship between demographic characteristics and the Fagerstrom Test for Nicotine Dependence (FTND; 6 items, dependence groups: 1-2=low, 3-4=low to moderate, 5-7=moderate, 8-10=high). The association between nicotine dependence (ND) levels and ethnicity (Latino  $M=6.10$ ,  $SD=1.84$ ; non-Latino  $M=4.55$ ,  $SD=2.21$ ) was significant ( $X^2=9.47$ ,  $p=0.02$ , Cramer's  $V=0.44$ ); higher percentages of Latinos endorsed smoking more cigarettes per day (CPD;  $X^2=6.87$ ,  $p=0.05$ , Cramer's  $V=0.34$ ) and smoking when ill ( $p=0.04$ ,  $\phi=-0.30$ ) than non-Latinos. The association between ND levels and sexual orientation (heterosexual  $M=4.83$ ,  $SD=2.14$ ; homosexual  $M=6.23$ ,  $SD=2.20$ ; bisexual  $M=5.00$ ,  $SD=2.18$ ) was significant ( $X^2=13.96$ ,  $p=0.03$ , Cramer's  $V=0.37$ ); higher percentage of those who identified as homosexual endorsed smoking when ill ( $X^2=8.05$ ,  $p=0.02$ ,  $\phi=0.40$ ) than those who identified as heterosexual or bisexual. The association between ND levels and gender (male  $M=5.55$ ,  $SD=2.18$ ; female  $M=4.71$ ,  $SD=2.19$ ) was not found to be significant; however, a higher percentage of men endorsed forbidden smoking ( $p=0.04$ ,  $\phi=-0.30$ ) and smoking when ill ( $p=0.02$ ,  $\phi=-0.38$ ) than women. Differences in ND levels were found by demographics, especially forbidden smoking and smoking when ill, which are related to behavioral aspects of ND. Thus, PLWH who smoke and identify as Latino, male, or homosexual may benefit from interventions that focus on these aspects of ND in addition to traditional cessation treatments.

FUNDING: Academic Institution

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## POS3-61

### PRACTICAL CONSIDERATIONS FOR DEVELOPING SUICIDE RISK MANAGEMENT PROTOCOLS IN NON-PSYCHIATRIC CLINICAL RESEARCH

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SIGNIFICANCE: Clinical trials involving pharmacologic or behavioral treatment often need to prospectively assess depression and suicidal ideation. If the underlying condition, for example tobacco dependence, is associated with depression assessment is particularly relevant. Even if depression severity is not a study outcome, it is often monitored using standardized instruments as potential moderators or mediators of treatment effect. Study participants may also spontaneously disclose suicidal ideation. Suicide risk management in the context of a clinical research poses significant ethical and practical challenges. These challenges can be mitigated using study-specific suicide risk management protocols (SRMPs). This review explores issues in developing SRMPs for use in non-psychiatric clinical research and describes instruments for measuring level of suicide risk in this setting, including in-person, telephone, and online assessment methods. METHODS: We searched Medline, PsychINFO, and Embase for publications between January 1975 and June 2017 evaluating suicide risk assessment instruments. A narrative synthesis approach was used to describe the features of these tools and their usability in SRMPs. RESULTS: Research setting, level of training of research staff, and regulatory guidelines are important factors in developing SRMPs. SRMPs may need specific tailoring for research in populations that include veterans, patients who are homeless or have mental health disorders, or minors. If depression assessments suggest suicidality, short instruments to assess suicide risk that can be easily scored can quickly guide non-professional research staff decision making for escalating participants with suicidal ideation to appropriate levels of care. While several instruments for the assessment of suicidal ideation and behavior have been published, none consistently predict suicidal behavior. CONCLUSIONS: Limited literature is available describing the outcomes of SRMPs or suicide risk assessment instruments deployed in the clinical research setting. Researchers should consider available resources for SRMPs during design and start-up phases of research.

FUNDING: None

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## POS3-62

### YOU DON'T KNOW UNTIL YOU TRY: TOBACCO PRODUCT APPEAL AND RISK PERCEPTIONS ARE INFLUENCED BY ACUTE PRODUCT USE

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SIGNIFICANCE: The evolving tobacco landscape and the FDA's regulatory authority over tobacco products have resulted in the introduction of new products like e-cigarettes (EC) and very low nicotine content (VLNC) cigarettes. EC have lower risk profiles than cigarettes, and research indicates that VLNCs may result in reduced smoking, dependence, and exposure to nicotine and toxicants. It is important to measure tobacco users' perceptions and attitudes of EC and VLNCs to assess the impact that they may have on the public health. However, prior research has relied on samples of smokers with no experience with such products. We hypothesize that experience with these products enables greater understanding of, and context in which to evaluate, the appeal and perceived harms associated with the use of these products. METHODS: This pilot study aimed to evaluate health risk and product perceptions of EC (0 mg/ml, 18 mg/ml) and VLNC cigarettes (0.4 mg/g). We recruited HIV-positive smokers with minimal EC/VLNC experience ( $n=6$ ) in Durham, NC. In a crossover laboratory study design, we assessed acceptability and perceived health risks prior to and following use of EC and VLNCs. RESULTS: After sampling, participants viewed 18 mg/g EC as being more favorable/cool ( $p=0.025$ ) and would be more comfortable using the product in public ( $p=0.004$ ) as compared to pre-sampling. Perceived risk of diabetes ( $p=0.025$ ), asthma ( $p=0.025$ ), and respiratory infections ( $p=0.042$ ) associated with use of 0 mg/ml EC decreased after sampling. The degree to which participants believed use of VLNCs resulted in harm to oneself decreased significantly after sampling ( $p=0.012$ ). CONCLUSIONS: Findings indicate that experience with tobacco products can influence one's perceptions of that product, including the perceived





risk associated with using the product. These findings have methodological implications in that existing studies that assess perceptions of EC and VLNC among never users likely underestimate the appeal and overestimate the perceived risk of such products. There are also implications for the creation and implementation of educational campaigns to elucidate the relative risk of EC and VLNCs.

FUNDING: Federal

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## POS3-63

### A PILOT RANDOMIZED CONTROLLED TRIAL OF TELEPHONE VIDEO-CALL VERSUS VOICE-CALL SMOKING CESSATION INTERVENTION FOR US WOMEN LIVING WITH HIV

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**SIGNIFICANCE:** This study is a two-arm pilot randomized controlled trial comparing the acceptability and feasibility of a telephone video-call to voice-call smoking cessation intervention for U.S. women living with HIV. Black women represent the majority of the women living with HIV followed by Latinas as the groups most disproportionately affected by HIV/AIDS. Women living with HIV smoke at a rate 3 times higher than that of the general U.S. female population. **METHODS:** The study is being conducted with 43 women. They were recruited from study fliers posted at HIV clinics, on Craigslist.com, and in a HIV/AIDS health magazine. Participants in both arms received weekly 30 minute individualized counseling sessions with active nicotine patches over 8 weeks. Recruitment and intervention are currently stopped and follow-up data is being collected. Three follow-up points for data collection were used: 1-, 3-, and 6-months from the target quit day. Self-reported abstinence at 3- and 6-month follow-ups are verified with a remote salivary cotinine test ( $\leq 10\text{ng/ml}$ ). Seven-day point prevalence abstinence rates at each point of follow-up and 6-month prolonged abstinence are compared between the two arms. **RESULTS:** Approximately 20% of otherwise eligible women could not participate in the study because of lack of smartphone access for the video-call application. Of the 43 women in the study, 39 (90.7%) were Black, including 10 Latinas. Using the data currently available and adopting the intent-to-treat analytic method, 5 out of 12 video-call arms (41.7%) and 0 out of 9 (0%) voice-call arms achieved biochemically verified abstinence at 6-month follow-up. **CONCLUSIONS:** Although findings are preliminary, video-call counseling seems to be more effective for smoking cessation in Black/Latina women living with HIV than voice-call counseling. This study supports the observation that these individuals who are most affected by HIV and smoke have relatively high rates of Smartphone usage. Subsequently the decision to provide smoking cessation interventions utilizing mobile technology is a reasonable decision with this group.

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## POS3-64

### CHARACTERIZING SMOKING, RECEIPT, AND PREFERENCES FOR CESSATION CARE AMONG CLIENTS OF ALCOHOL AND OTHER DRUG TREATMENT SERVICES

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**SIGNIFICANCE:** The majority of individuals engaging in alcohol and other drug (AOD) treatment are current tobacco smokers. While studies report AOD client quit interest, very little research has examined client receipt of SCC strategies and client preferences for quit smoking care during treatment. This study aimed to examine AOD client: i. smoking profile and quit history; ii. self-reported receipt of quit smoking strategies during treatment; and iii. quit strategies clients would like to receive. **METHODS:** An online cross-sectional survey was administered to clients who smoke tobacco from 31 AOD treatment services in four states and territories of Australia from February to August 2015. Smoking-related variables, quit history, preferred quit strategies, receipt of smoking cessation care during treatment and characteristics were assessed. **RESULTS:** Among 896 clients, nearly all (98%)

were daily tobacco users and had a moderate to high level of nicotine dependence (72%). Despite this, most (81%) had intentions to quit smoking and had attempted to quit in the last 12 months (99%). Self-efficacy to quit smoking was low though motivation to quit was moderate ( $M=7$ ,  $SD=3$ ). Clients were most interested in receiving free nicotine replacement therapy ( $n=712$ , 81%), support and encouragement ( $n=611$ , 70%) and verbal advice to quit ( $n=544$ , 62%) whilst engaged as a client of an AOD service. Clients reported receiving multiple strategies, including: written information about quitting and available pharmacological supports ( $n=698$ , 79%), advice to cut down or quit ( $n=634$ , 72%) and offered free or cheap nicotine replacement therapy ( $n=566$ , 64%). **CONCLUSIONS:** There is an observed motivation to quit and interest in receiving smoking cessation care during treatment. These findings identify several clinical targets that AOD services need to improve upon to ensure their client's tobacco smoking is addressed.

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## POS3-65

### SMOKERS' EXPERIENCES AND PERCEPTIONS OF THE ELECTRONIC WATERPIPE

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**SIGNIFICANCE:** The reduction of young adult waterpipe smoking remains a national public health priority. Although there has been expanding efforts to decrease traditional waterpipe (TW) use, there is a new waterpipe product on the market that has yet to be investigated. To date, there are no known studies investigating electronic waterpipe (e-waterpipe) smoking. As such, the proposed research will aid in the development of efforts to identify and evaluate the novel e-waterpipe. **METHODS:** Regular electronic cigarette users ( $n=26$ ) aged 18-34 were given twenty minutes to smoke an e-waterpipe in a laboratory setting where smoking behaviors were recorded. Subjective and objective measures were collected pre- and post-smoking. Measures included spirometry parameters and questionnaires on perceptions of use and likelihood of future use. **RESULTS:** Approximately 76.9% felt positive about smoking an e-waterpipe and 80.8% intended to speak positively about their smoking experience. Overall, 73.1% reported that e-waterpipe use was satisfying. When comparing the e-waterpipe to their personal electronic smoking devices, 42.3% believed that smoking e-waterpipe was safer and 30.8% thought e-waterpipe use was healthier. Over half of the participants reported more positive health effects from smoking the e-waterpipe compared to smoking their own electronic device. **CONCLUSION:** Findings suggest that e-waterpipe use has the potential to become popular within the emerging adult population. This pilot study demonstrated that users had positive perceptions toward willingness and likelihood of future use, attitudes, sensory beliefs and expected health outcomes. Further research is necessary to understand prevalence of use and the associated health risks and to compare the risks of e-waterpipe and traditional waterpipe smoking.

FUNDING: None

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## POS3-66

### PERCEIVED RISKS AND BENEFITS OF QUITTING SMOKING IN A SAMPLE OF ADULTS LIVING WITH HIV/AIDS

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**SIGNIFICANCE:** Persons living with HIV/AIDS (PLWH) smoke at much higher prevalences than people in the general population and experience significant smoking-related health consequences. Perceived risks and benefits of quitting smoking have been shown in community samples to be related to motivation to quit and smoking cessation outcomes. In addition, women more strongly endorse risks and benefits of quitting and show stronger relationships between risks and motivation to quit. The purpose of this study was to examine whether gender differences exist in the endorsement of perceived risks and benefits of quitting smoking or in the relationship between risks and benefits and quit motivation and confidence in a sample of PLWH. **METHODS:** A sample of 107 PLWH in New



York (US) who reported current cigarette smoking completed measures of demographics, smoking, perceived risks and benefits of quitting smoking (general and HIV-related), motivation to quit smoking, and confidence in ability to quit smoking. RESULTS: The highest endorsed risks of quitting smoking were cravings and weight gain and higher endorsement of craving risks was associated with lower confidence in the ability to quit smoking. With regard to HIV-related beliefs about quitting, participants endorsed that it was likely that their T-cell count would go up, they would be less likely to get infections, and they would be more committed to their HIV care if they quit smoking. Women endorsed overall risks and risks related to negative affect more highly than men. Women and men did not differ in their endorsement of the other risks, the benefits of quitting, or the relationship between risks and benefits and quit motivation or confidence. CONCLUSIONS: It may be useful for health care professionals to incorporate information about perceived risks and benefits of quitting smoking into treatment when working with PLWH who want to stop smoking.

FUNDING: Federal

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### POS3-67

#### SMOKING STATUS DECEPTION: WHAT DOES IT TAKE TO TELL THE TRUTH?

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SIGNIFICANCE: Denial of tobacco use is a well-documented problem worldwide. Failure to self-report as a smoker limits the medical professional in detecting vulnerable populations for smoking-related diseases. Recent studies indicate that >25% of pregnant women who are actually tobacco users may not self disclose. The development of an effective protocol suitable for use by physicians will be described. METHODS: The protocol was validated with allied-health students in a community-college setting over several years starting in 2010. Participants assessed their own smoking status in the previous 24 h using a two-dimensional experimental design of a questionnaire and rapid urinary cotinine immunoassay. RESULTS: Questionnaire responses and cotinine levels for nonsmokers were highly correlated. Participants who reported no environmental tobacco exposure (car or residence) in the previous 24 h exhibited cotinine immunoassay results similar to the zero cotinine standard. Although a correlation would be expected, such a result is not typical in the literature since smokers (as identified by their high urinary cotinine levels) often report as nonsmokers on questionnaires. RESULTS: for the smoking group were similar to either the high-level cotinine standard (>1000 ng cotinine/mL urine) or to the mid-level cotinine standard (>100 ng cotinine/mL urine). CONCLUSION: Based on data and written participant feedback, the study investigator suspected that the student population might be family members of an at-risk US population for premature mortality. The college responded to this concern by permanently incorporating the cotinine urinary biomarker laboratory into the curriculum required of all allied health students.

FUNDING: Academic Institution

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### POS3-68

#### HAND IN HAND: THE DEVELOPMENT OF A PARTNERS' GUIDE TO STOPPING SMOKING TOGETHER

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BACKGROUND: Research has demonstrated that dual smoking couple that stop smoking together are approximately 40% more likely to quit than those who try to stop without their partner. The Hand in Hand guide was developed for people who have a health condition and their partners so that they can support one another in their attempt to stop smoking. It describes the challenges that may occur and strategies to overcome these challenges. METHODS: The Hand in Hand guide was developed based upon a synthesis of findings from two separate qualitative studies. Researchers utilized datasets from research studies conducted by the first author. One qualitative study examined dual smoking couples experiencing a health condition. The other conducted focus groups to examine individual smoking behavior post health condition and the factors that influenced outcomes. Findings

were supplemented by a literature review of best practices. RESULTS: Challenges identified included: 1). Smoking being a tradition (or ritual) for the couple; 2) One partner wavering in his or her commitment to stopping 3). Stress due to the health condition making it difficult to stop smoking; 4). One partner feelings that he or she can stop smoking without the help of the other; 5). One partner remaining cigarette free when the other has returned to smoking. Strategies to address these challenges, as well as a couples smoking cessation worksheet, were also designed. CONCLUSIONS: There is a need for specific methods to address issues facing couples who have a health condition and who smoke. Next steps include an evaluation of this guide in practice with couples who smoke and who are coping with a health condition.

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### POS3-69

#### POLYTOBACCO USE PATTERNS AMONG NON-DAILY SMOKING YOUNG ADULTS

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The risks of polytobacco use among young adults are unclear because we know relatively little about total nicotine intake or consistency of multi-product patterns over time. The purpose of this study was to examine predictors of concurrent use of multiple tobacco products and of change in polytobacco frequency over nine months. Participants ( $N = 629$ ; 54% male) were 18-24 year-old non-daily cigarette smokers recruited from San Diego County. Polytobacco days (i.e., days on which two or more tobacco/nicotine products were used) were assessed quarterly for nine months. Results showed that 41.6% of tobacco use days were polytobacco use days. All hypothesized demographic variables (age, sex, race/ethnicity, student status, highest level of education) were significant predictors of polytobacco use days ( $p < .05$ ). A longitudinal negative binomial regression model showed a significant increase and decrease in polytobacco use days with curvilinear effects ( $z = -3.31, p < .001$ ) over the course of nine months. Findings suggest that individuals with specific identified characteristics are potentially at risk for greater nicotine intake and thus risk for chronic tobacco use and dependence.

FUNDING: Federal

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### POS3-70

#### IN-HOUSE OUTREACH: WHAT STRATEGIES WORK BEST TO PROMOTE AND ADVERTISE A SMOKING CESSATION PROGRAM IN A MEXICAN UNIVERSITY HOSPITAL

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SIGNIFICANCE: There is no much information on how to adapt a regular smoking cessation program to an Hospital with many specialties. That also applies to the different strategies to promote and advertise a smoking cessation program. AIMS: To describe the best strategies to promote and advertise the smoking cessation program in an large regional specialty University Hospital in Guadalajara, Mexico. METHODS: Our program is a combined medical & CBT program with part-time doctors, nurses and psychologists. To date we have attended over a 1600 clients in either 8 weeks or brief intervention programs. We started by sending letters to all heads of departments introducing and explaining the purpose of the program, the location and schedule. We designed a pamphlet with general and specific information about our program. Other actions within and outside our institution in the following years included: letters to the local addictions council, promotional yearly campaigns around the 31st of may, radio and TV interviews, distribution of prevention and treatment pamphlets, posting several types of "neutral" posters, flyers, handling bookmarkers with the paychecks and continued visiting and delivering pamphlets in the main departments including the outpatient building, cancer institute, employee medical service among others. RESULTS: the highest number of clients attending the program correspond to patients attending the Hospital for

medical reasons. Most of them (44 %) knew about the program through a poster, 26 % were referred by a specialist of which 10 % were from Psychiatry, 7.5 from internal medicine, 7.5 from the breast clinic, 6.6 % from the outpatient building; 5.6 % knew about the program through word of mouth. There is a correlation between the level of attendance to the program and the number of hand-made posters posted around the hospital and with the participation of an administrative employee or social worker in the program. CONCLUSIONS: The use of neutral promotional posters among other strategies is an economic and cost effective strategy to advertise a smoking cessation program in a highly specialized medical institution.

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## POS3-71

### THE IMPACT OF GRAPHIC WARNING LABELS ON DIFFERENT ETHNICITIES

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The 2009 Family Smoking Prevention and Tobacco Control Act mandated the Food and Drug Administration (FDA) to implement new graphic warning labels (GWLs). Tobacco companies then contested the labeling requirement on the grounds that it impinges on their freedom of speech. Multiple studies have shown that graphic warning labels on tobacco products, are an effective means of communicating the health risks of smoking. The current study examined if there were racial/ethnic differences in how smokers respond to GWLs. 881 current smokers in substance abuse treatment programs each rated three GWLs, randomly selected from among 9 FDA-approved labels. Each GWL was rated on 4 measures: factual, misleading, quit intention, and negative emotions. A multivariate regression model was applied to assess the relationship between each measure on all GWLs and race/ethnicity. Controlled variables included age, gender, education, marital status, primary drug use and controlling for nesting of participants within clinics. Results showed that Hispanics, African-Americans and Other races reacted to GWLs more strongly for all 4 measures, as compared to Whites. Results also call to attention that Whites could use more motivation and focus in regards to getting help for bad smoking habits.

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## POS3-72

### THE ASSOCIATION OF EXERCISE WITH SMOKING-RELATED SYMPTOMATOLOGY IN PREGNANT SMOKERS

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Smoking in pregnancy has been shown to have adverse effects on the mother and fetus (e.g., elevated risk of miscarriage, stillbirth and low birth weight). Pregnancy may be a strong motivator to quit, however many find it difficult due to nicotine dependence and smoking-related symptomatology (SRS; craving, withdrawal, negative mood and stress). Increasing evidence has shown that exercise may help reduce these symptoms. This study examines the correlation between self-reported exercise and SRS in pregnant women who smoke. Pregnant smokers in their 2<sup>nd</sup> or 3<sup>rd</sup> trimester (12-22 weeks or 32-37 weeks) who were currently enrolled in laboratory-based study were included in this analysis. All participants were 18-35 years of age, self-reported smoking  $\geq 5$  cigarettes per day for at least 1 year, and had a single gestation, non-complicated pregnancy. Participants self-reported the following measures: Leisure Time Exercise Questionnaire (LTEQ), nicotine dependence (FTND) and SRS (MNWS, QSU, mCEQ, PANAS, PSS and CES-D) during ad lib smoking. The associations between exercise and smoking behavior and symptomatology were assessed using Pearson's correlation coefficients. Participants (n=118) were 26.3 years of age (SD=4.4), smoked 11.6 cigarettes per day (SD=5.4), were mostly White (45%) and evenly split by trimester (50% in each). RESULTS: indicated exercise level was negatively correlated with nicotine dependence ( $r = -0.23$ ,  $p=.01$ ) and mCEQ craving reduction ( $r = -0.22$ ,  $p=.02$ ). No other significant correlations were found. The results of this study suggest that nicotine dependence may be associated with exercise in pregnant smokers. For pregnant women with higher levels of exercise, nicotine

dependence may be lower and the craving reducing qualities of smoking may be weaker. More research is needed to elucidate the role of exercise in smoking-related symptomatology for pregnant smokers.

FUNDING: Federal

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## POS3-73

### INCENTIVE-BASED INTERVENTION FOR PRENATAL SMOKING CESSATION IN AN OUTPATIENT SETTING

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In 2014-2015, over 9% of pregnant women admitted to the Christiana Care Health System (N = 11020) reported tobacco use, and 17% did not disclose their tobacco use status. Self-reported tobacco use is a significant predictor of preterm birth (<37 gestational weeks; AOR: 1.92[95%CI: 1.53, 2.40],  $p < 0.001$ ), low birth weight (<2500g; AOR: 2.28[95%CI: 1.82, 2.85],  $p < 0.001$ ), and NICU admission (AOR: 1.33[95%CI: 1.08, 1.63],  $p = 0.007$ ). The current program description provides an ongoing incentive-based intervention to promote prenatal smoking cessation in conjunction with outpatient, prenatal care at Christiana Care. The program was intended to improve a screening and brief education process for prenatal smoking cessation within an outpatient prenatal care setting and compare the rate of smoking reduction/abstinence, birth outcomes, and overall intervention and medical costs between an incentive group and control group. Pregnant patients identified as pregnant smokers by electronic medical records were approached during prenatal care by program staff. Consented patients were asked to provide breath and urine samples to verify smoking abstinence as well as provide self-reported, past 7-day smoking abstinence at every prenatal appointment. Biochemically verified smoking reduction or abstinence was reinforced with an escalating amount of financial incentives in the incentive group, while the control group received \$10 for sample provision. Ten pregnant smokers have been enrolled and randomized to this date, and two have delivered. The program is expected to continue for the next year and be integrated as standard of care within an outpatient, obstetric setting.

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## POS3-74

### TREATMENT-SEEKING SMOKERS WITH BIPOLAR DISORDER VERSUS NO MENTAL HEALTH CONDITION: COMPARISON OF BASELINE CHARACTERISTICS AND 12-MONTH OUTCOMES FOR WEB-BASED INTERVENTIONS

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SIGNIFICANCE: The extent to which smokers with bipolar disorder (BD) differ from smokers without mental health conditions (MHCs) in terms of their demographic and psychosocial characteristics and cessation outcomes is unknown. Using data from a large trial of two web-based smoking cessation treatments, we compared baseline characteristics and 12-month cessation outcomes for participants with BD versus no MHCs. METHOD: Participants (n=1,787) were a subsample of those enrolled in a web-delivered cessation intervention trial (n=2,637). Those selected for this analysis self-reported either a lifetime diagnosis of BD (n=221) or no lifetime diagnosis of a major MHC (depression, anxiety, psychotic, or substance use disorder) (n=1,566). Participants completed a survey to assess baseline characteristics and self-reported 30-day abstinence at 12 months post-randomization. RESULTS: Compared to smokers not reporting MHCs, smokers with BD were younger, less educated, had higher proportions of women and non-Caucasians, and were more likely to be unmarried, not working, and identify as LGBT (all p-values < .05). They were more likely to screen positive for current depression, generalized anxiety, panic disorder, PTSD, and social anxiety (all p-values < .05). Regarding smoking, they were more nicotine dependent and reported having more close friends who smoke as well as a higher number of adults in the home who smoke (all p-values < .05). At 12-month follow-up, their quit rate was lower than for smokers without





MHCs (20% vs. 29%, OR=0.61, 95% CI=0.41-0.89,  $p=.01$ ), and this finding held after controlling for differences in baseline characteristics. Interactions between treatment group and diagnostic group were non-significant. **CONCLUSIONS:** The demographic, mental health, and smoking characteristics of smokers with BD create a profile that can be expected to predict lower quit rates. Data from this trial with 12-month cessation outcomes fill a major gap in the literature, demonstrating for the first time in a long-term, prospective study that smokers with BD have greater difficulty quitting than smokers without MHCs, and that this effect is consistent across treatment conditions.

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## POS3-75

### SMOKING AND BEHAVIOR CHANGE FOR PARENTS WITH INFANTS IN THE NICU

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**SIGNIFICANCE:** Parents of infants in the NICU are often motivated to reduce risks to their infant related to pulmonary disease. These infants are at a higher risk of re-hospitalization when exposed to a variety of factors that affect lung function. A significant risk factor for these infants in the first year of life is exposure to smoking. Few published studies have addressed smoking of parents with an infant in the NICU. As a part of a larger project to reduce infant re-hospitalization, a pilot clinical trial is testing a broad-level multi-modal intervention to reduce exposure to tobacco use. This preliminary study examines initial baseline data of parents with an infant admitted to the NICU. **METHODS:** Parents who smoke and are willing to complete survey assessments at four points in time are eligible. Random assignment placed participants into treatment groups. Consented participants complete a baseline assessment. The survey includes: demographics, tobacco use variables, and ratings of home environment modifications. **RESULTS:** There are 20 participants; 40% have less than a HS education 70% live with their partner while 30% live with other adults; Number of cigarettes smoked per day = 13.7; 15 made past year quit attempts; 55% of partners smoke; 65% do not allow smoking in the home; 45% do not allow smoking in their car. Importance to quit (8.4/10) is higher than confidence to quit (6.4/10). From a list of 18 modifiable behaviors: quitting smoking is the lowest rated behavior, while choosing a nonsmoker for daycare, making a non-smoking rule for inside the home; and placing a clean sheet/blanket on the floor before baby is allowed on the floor are highest rated. Four parents have requested cessation assistance. **CONCLUSIONS:** This study is proving feasible for recruitment. Early indications are some participants will try to quit smoking. There is adequate awareness of secondhand smoke, but little awareness of thirdhand smoke. Confidence in quitting smoking is low in comparison to importance for quitting. Addressing tobacco use through a plan to make multiple changes to the home environment may prove to be an effective intervention approach for these parents.

FUNDING: Federal

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## POS3-76

### PILOT RANDOMIZED CLINICAL TRIAL OF AN AUTOMATED SMARTPHONE-BASED SMOKING CESSATION TREATMENT

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**SIGNIFICANCE:** Smoking among those in poverty is twice as high as those above the poverty threshold (26.1% vs. 13.9% smoke). Aided and unaided cessation attempts are less likely to be successful among lower socioeconomic status (SES) adults, due to a variety of psychosocial and contextual factors. Thus, smoking is becoming increasingly concentrated among individuals with the lowest levels of income, education, and occupational status. Highly flexible and low burden technology-based treatment approaches may overcome many of the barriers (e.g., transportation, time constraints) that have limited the use and effectiveness of traditional smoking cessation treatments among low SES adults. Research from our lab has indicated that momentary changes in key variables can be tracked

using ecological momentary assessments (EMA), and used to initiate interventions as they are needed (see Smart-T app). **METHODS:** The current pilot study is a 3-armed randomized clinical trial that aims to determine the initial utility of an automated smartphone based smoking cessation intervention (i.e., Smart-T2) compared with standard in-person smoking cessation clinic care and the free NCI QuitGuide smoking cessation app. Smokers who attend a clinic based tobacco cessation program are randomized to groups and followed for 13 weeks (1 week pre-quit through 12 weeks post-quit). All participants are asked to complete EMAs on study provided smartphones for 5 weeks. **RESULTS:** Smart-T2 app design considerations (e.g., which variables to intervene upon and when, proximal and distal outcome variables, on demand and prompted intervention content, compensation for completing EMAs, collection of geolocation data, IRB and ethics considerations) and app features (e.g., on demand tips for coping with lapse triggers, messages that are tailored in real-time to address level of lapse risk and present lapse triggers, medication refill request feature) will be discussed. Preliminary data and participant feedback about the app will also be discussed (current  $n=18$ ; final  $N=150$ ). **CONCLUSIONS:** Dynamic smartphone apps that tailor intervention content in real-time may reduce smoking in disparities populations.

FUNDING: Academic Institution

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## POS3-77

### ADAPTING A MULTI-BEHAVIORAL, GUIDED IMAGERY, MHEALTH APP FOR USE BY DIVERSE RACIAL/ETHNIC GROUPS

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Smoking and its health consequences disproportionately affects socioeconomically disadvantaged populations, including those with lower education, lower income, and less access to healthcare. In addition, tobacco use co-varies with poor dietary practices and a sedentary lifestyle. A growing body of literature suggests that a multi-behavioral approach, including improving diet and increasing physical activity, may be more effective at helping smokers to quit compared to interventions targeting only one behavior. MHealth apps may be an easy way to deliver such an intervention. The proposed study builds upon our preliminary work in which we developed and evaluated the See Me Smoke-Free (SMSF) mHealth app. The SMSF app was designed to address smoking, diet and physical activity among women smokers. SMSF included a combination of guided imagery audio files and behavioral strategies for quitting smoking and reducing weight gain. The use of SMSF was associated with significant reductions in self-reported tobacco use at 3 months (47.6% 7-day abstinence,  $p<.001$ ; and 33.3% 30-day abstinence,  $p<.001$ ), and no significant weight gain. **OBJECTIVE:** In this pilot study, we aimed to adapt the SMSF intervention for use by men and diverse racial/ethnic groups, including monolingual Spanish speakers. **METHODS:** We used a mixed-methods approach (quantitative data collection and iterative focus testing/interviews) with 20 male, racially/ethnically-diverse participants to elicit feedback on how to change the program content, functionality, and user interface to be appealing to men. We also explored how to adapt the content and user interface for Spanish speakers via interviews with 10 monolingual Spanish speakers. Finally, we user tested the existing SMSF app with 20 male, racially/ethnically-diverse participants. **RESULTS:** Specific themes related to use of mHealth programs, and those specific to SMSF program content, functionality, and the user interface were identified. **CONCLUSIONS:** The use of mixed methods and involving the target population during mHealth program development are crucial for developing interventions that are appealing, understandable, and usable.

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## POS3-78

### MOBILE CONTINGENCY MANAGEMENT FOR SMOKING CESSATION AMONG SOCIOECONOMICALLY DISADVANTAGED ADULTS

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**BACKGROUND:** Smoking prevalence rates are disproportionately high among those living below the poverty threshold. Offering small escalating financial incentives for smoking abstinence (i.e., Contingency Management [CM]) dramatically increases short-term cessation rates among socioeconomically disadvantaged smokers when incentives are included as an adjunct to clinic-based treatment. However, other approaches are needed for those who are unable to attend clinic visits due to rural residence or other limitations. **OBJECTIVE:** The purpose of the current project is to develop a fully automated mobile phone-based CM approach that allows individuals to remotely benefit from treatments that offer financial incentives for smoking cessation. A mobile CM app is in development that will remotely verify smoking abstinence, confirm participant identity, and automatically deliver financial incentives. The feasibility and preliminary effectiveness of this mobile CM approach will be evaluated after development is complete. **METHODS:** Existing technologies will be combined within a mobile phone app, including low-cost breath carbon monoxide monitors that connect with mobile phones to remotely verify smoking abstinence, facial recognition software to confirm the identity of participants as they are providing a breath sample, and a payment system that allows for the remote and automatic delivery of incentives. The feasibility of this mobile CM approach will be evaluated over 12 weeks among 20 socioeconomically disadvantaged adults as an adjunct to telephone counseling and nicotine replacement therapy. **RESULTS:** The development of this new mobile CM approach will be described, along with feasibility indicators including treatment uptake, smoking cessation rates, and follow-up rates. Findings will be compared with the traditional in-person CM approach evaluated in our previous and ongoing work. **CONCLUSIONS:** The CM approach will be extended to those who may be unable to travel to in-person appointments. The development of a fully automated CM approach to smoking cessation will facilitate the delivery of effective interventions to socioeconomically disadvantaged and rural populations.

**FUNDING:** Federal; State

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## POS3-79

### DEVELOPMENT AND EVALUATION OF MINDFULNESS-BASED SMOKING CESSATION TREATMENT ENHANCED WITH MOBILE TECHNOLOGY

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**SIGNIFICANCE:** Growing evidence supports the use of mindfulness-based interventions for smoking cessation among diverse populations. However, smokers receiving these interventions do not always practice suggested strategies in daily life. Mobile health technology presents unique opportunities for providing personalized, just-in-time support between sessions, which could increase intervention effectiveness. This presentation will describe the development and pilot evaluation of a mindfulness-based smoking cessation intervention that incorporates between-session text messaging ("iQuit Mindfully") among predominantly low-income, African American smokers. **METHODS:** Two qualitative studies (focus groups with 15 smokers interested in quitting and in-depth interviews with 10 smokers who received sample text messages) informed the development of the text messaging program. Based on participants' suggestions, texts were designed to be personalized (e.g., texts provided reminders of personal reasons for quitting), interactive (e.g., participants were asked questions and encouraged to text CRAVE, STRESS, or SLIP keywords), and to include motivating pictures and strategies for coping with cravings. Next, a pilot clinical trial was conducted among 72 adult smokers, most of whom were African American (75%) and reported total family income < \$24,000 (57%). Participants were randomly assigned to Mindfulness-based Addiction Treatment (MBAT; 8 weeks of in-person group counseling

and nicotine patches) or iQuit Mindfully (MBAT with between-session text messages). **RESULTS:** iQuit Mindfully participants evidenced high levels of engagement with text messages and provided suggestions for improvement. Primary outcomes (biochemically-confirmed 7-day abstinence at end of treatment and 1-month follow-up); associations between text messaging engagement and outcomes; and suggestions for increasing feasibility, engagement, and effectiveness will be discussed. **CONCLUSIONS:** Between-session text messaging could be a relatively low-cost, user-friendly method for increasing effectiveness of mindfulness-based smoking cessation treatment among predominantly low-income, African American smokers.

**FUNDING:** Federal

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## POS3-80

### REVISITING THE RELATIONSHIP BETWEEN ACCULTURATION AND SMOKING CESSATION AMONG MEXICAN AMERICANS

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**OBJECTIVE:** A well-established gender-differentiated association between acculturation and smoking status exists among Latino adults. There are far fewer studies on the potential influence of acculturation on smoking cessation, and extant findings are mixed. Using a multidimensional measure of acculturation, the current study examined the independent and interactive associations of gender and acculturation with smoking cessation among Mexican-American smokers engaged in a quit attempt. **METHODS:** Using a latent variable modeling approach to repeated measures analysis, the independent and interaction effects of acculturation in two cultural directions (American and Mexican) were examined for their prospective associations with smoking abstinence among 199 Mexican American smokers engaged in a quit attempt. Interactions of acculturation domains with gender were also examined. Acculturation was assessed at baseline and abstinence status was assessed at 3- and 26-weeks post quit. **RESULTS:** The interaction of American and Mexican cultural identity was significantly associated with smoking abstinence ( $b = 1.11$ ,  $SE\ b = .43$ ,  $p = .01$ ), such that greater American cultural identity was positively associated with abstinence only among those with high Mexican cultural identity. The interactions of language proficiency and language proficiency with gender were significant (English:  $b = .74$ ,  $SE\ b = .32$ ,  $p = .02$ ; Spanish:  $b = -.98$ ,  $SE\ b = .47$ ,  $p = .04$ ). English proficiency was positively associated, and Spanish proficiency was negatively associated with, abstinence among men but not women. **CONCLUSIONS:** Findings in the cultural identity domain are consistent with a "benefits of biculturalism" perspective, and may be particularly relevant to the adoption of an American cultural orientation among persons with an already-strong heritage-culture orientation. Findings also replicate a gender-differentiated association between acculturation and cessation. Findings may underscore the need for cultural tailoring of interventions and attention to culturally relevant risk and protective factors for relapse.

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## POS3-81

### EFFECT OF MENTHOL ON SMOKING TOPOGRAPHY AND SHORT-TERM ABSTINENCE IN BLACK AND WHITE SMOKERS

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**AIM:** Menthol is the only cigarette flavoring allowed in the United States. While previous research suggest that menthol in cigarettes increase smoke exposure and difficulty quitting, these studies are often confounded by race, as a higher proportion of Black smokers smoke menthol, compared to White smokers. The present study recruited Black and White menthol and non-menthol smokers to examine the effects of race and menthol on smoking topography and short-term abstinence. **METHODS:** Black (N=47; 63% menthol) and White (N=56; 48% menthol) smokers came into the laboratory for three sessions. In the first two session, subjects were



asked to smoke their preferred brand of cigarette either naturalistically (NS) or through a smoking topography device (TP), in counterbalanced order. Smoking urge and withdrawal were measured before and after each smoking session. At the end of the second session, subjects were asked to abstain from smoking for 24-hrs, with abstinence verified using breath CO levels in the third session. RESULTS: Menthol smokers reported a significantly greater reduction in urge after smoking their cigarette in both NS and TP condition ( $p < .05$ ). Menthol smokers also reported a significantly greater reduction in withdrawal symptoms in the TP condition, but not in the NS condition ( $p < .05$ ). Menthol smokers exhibited a marginally lower puff duration than non-menthol smokers ( $p = .051$ ), while no significant differences were found in the other topography variables. When analyzed by race, White menthol smokers had significantly lower total puff volume than non-menthol smokers ( $p < .05$ ), while this effect was absent in Black smokers. Among Black smokers, menthol smokers had a significantly lower puff duration ( $p < .01$ ), with no significant differences in the other topography variables. Black smokers were significantly more likely to successfully abstain for 24-hrs, compared to White smokers ( $HR = 0.26$ ,  $p < .005$ ), regardless of menthol preference. CONCLUSION: These results suggest that the effects of menthol may differ by race. Future studies should account for racial differences when investigating the effects of menthol to better inform policies regarding menthol cigarettes

FUNDING: Academic Institution

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## POS3-82

### USING IDIOGRAPHIC ASSESSMENT TO PERSONALIZE TREATMENTS FOR TOBACCO USERS

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AIMS: To provide proof of concept for an idiographic approach to personalizing the content and sequencing of tobacco use treatment. METHODS: Participants were adults who qualified for a diagnosis of Major Depressive Disorder (MDD) and/or Generalized Anxiety Disorder (GAD). After completing baseline measures, participants were repeatedly assessed for at least 30 days via smart-phone survey, completed at 4 random intervals during their reported wakeful hours. Each survey consisted of a limited subset of diagnostic measures related to MDD and GAD; many of which overlap with criteria for Tobacco Use Disorder. Participants who reported current tobacco use at baseline were compared to those without tobacco use in: (1) their compliance with daily assessment, (2) the latent factor structure of their psychopathology, and (3) their response to personalized treatment. RESULTS: A collection of cases will be presented to demonstrate the method through which personalized treatments for current smokers can be leveraged from an idiographic assessment paradigm. Participants reporting tobacco use did not differ from non-tobacco users in their compliance with daily assessment ( $t(1,38) = 0.61$ ,  $p = 0.54$ ). Reductions in depression and anxiety were statistically non different between tobacco users and non-users ( $ps > .10$ ). A selection of factor solutions and accompanying treatment outcome trajectories will be presented. CONCLUSIONS: Developing novel methods to personalize the content and sequencing of smoking cessation treatments is vital to supporting successful quit attempts. The present research provides data supporting the validity of a personalized-treatment approach for tobacco users with MDD/GAD, and suggests that an idiographic assessment approach could be applied to developing personalized smoking cessation treatments

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## POS3-83

### PHARMACOKINETICS OF A NEW ORALLY DISSOLVING NICOTINE FILM IN SMOKERS

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SIGNIFICANCE: Smokers typically make repeated unsuccessful quit attempts, even when using currently available nicotine replacement therapy (NRT). One potential new approach is to incorporate random nicotine delivery via NRT to allow

for dissociation of smoking behavior and cues from nicotine. This strategy could potentially be implemented using an orally dissolving nicotine film. This study aimed to examine the pharmacokinetics, safety, and subjective effects of an orally dissolving nicotine film. METHODS: This study evaluated 3 doses (0, 2, and 4 mg) of a nicotine film manufactured by Bionex Pharmaceuticals. Eligible participants had smoked at least 10 cigarettes per day for the past year, were not using any non-cigarette nicotine delivery products, and did not have any significant or unstable medical conditions. Participants were required to remain smoke free for 16 hours prior to the study visit. At the study visit, participants received one nicotine film (0, 2, or 4 mg) and were monitored for four hours during which they provided 10 blood samples as well as subjective ratings of the films assessed on a scale from 0 (not at all) to 7 (extremely) for each item. RESULTS: 12 participants, 4 in each dose group, completed the study. Participants were 58% male, 92% white, had a mean age of 37 years and smoked an average of 18 cigarettes per day. Peak plasma nicotine levels reached 5.8 ng/mL at 50 minutes post film administration in the 2 mg dose group and 20.5 ng/mL at 60 minutes post film administration in the 4 mg dose group. Participants in the 2 mg dose group had an average score of 1 for dizziness, 1 for nausea, and 4 for relieving the urge to smoke. Participants in the 4 mg dose group had an average score of 1.5 for dizziness, 2.5 for nausea, and 4 for relieving the urge to smoke. CONCLUSION: The nicotine film product evaluated in this study was well tolerated and produced peak plasma nicotine levels in a similar range to those achieved by existing NRT, with peak levels reached 50-60 minutes after film administration.

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## POS3-84

### CONCURRENT USE OF E-CIGARETTES WHILE ENROLLED IN A NRT PLUS COUNSELLING TREATMENT PROGRAM: ASSOCIATIONS BETWEEN PATTERNS OF USE AND SMOKING CESSATION AT 6 MONTHS

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BACKGROUND: E-cigarettes (e-cigs) may be an effective smoking cessation aid. The aim of this study was to assess e-cig use over time in a cohort of smokers enrolled in treatment program involving cost-free behavioural counseling and NRT. Data on the patterns of e-cig use while in treatment was collected and analyzed. Our research question was "Is concurrent e-cig use among smokers in treatment associated with quit outcomes?" METHODS: Data was drawn from a cohort of smokers enrolled in a cessation program implemented by primary care clinics and addictions facilities across Ontario who enrolled between April 2016 and January 2017 and completed both a baseline assessment and a 6-month follow up survey. E-cig use over the 6 months since enrolling was classified as follows: i) non-users (no e-cig use); ii) non-daily users (used an e-cig up to 2-3 times/week; iii) daily users (used an e-cig daily). The dichotomous outcome variable was self-reported quit status (7-day point prevalence abstinence) at 6 months. Multivariable logistic regression was used to determine the association between e-cig use and quit status at 6 months. Casewise deletion was implemented for individuals with missing observations. RESULTS: At 6-month follow-up, 12.9% ( $n = 997$ ) of the sample reported e-cig use in the past 6-months: 41.4% ( $n = 413$ ) were daily users and 58.6% ( $n = 584$ ) were non-daily users. Quit rates differed among groups: 32.6% of non-users quit compared to 29.1% of daily users and 21.6% of non-daily users. In the final model, the odds of quitting smoking for non-daily e-cig users was 0.607 ( $CI = 0.491-0.751$ ,  $p < 0.001$ ) times the odds of quitting in non-e-cig users. There was no significant difference in odds of quitting between daily e-cig users and non-users ( $OR = 0.959$ ,  $CI = 0.762-1.206$ ,  $p = 0.72$ ). CONCLUSION: Concurrent non-daily use of e-cigs while enrolled in a smoking cessation program offering standard treatment was a detriment to quitting, whereas daily e-cigarette use was neither detrimental nor beneficial. Further analysis exploring the role of NRT dose and duration of treatment as a potential modifier of smoking cessation among concurrent e-cig users will be presented.

FUNDING: State

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## POS3-85

### AN ECOLOGICAL MOMENTARY INTERVENTION FOR SMOKING CESSATION: THE ASSOCIATIONS OF JUST-IN-TIME, TAILORED MESSAGES WITH LAPSE RISK FACTORS

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**SIGNIFICANCE:** Smartphone apps can provide real-time, tailored interventions for smoking cessation. The current study examines the effectiveness of a smartphone-based smoking cessation application that assessed risk for imminent smoking lapse multiple times per day and provided messages tailored to current smoking lapse risk and specific lapse triggers. **METHODS:** Participants (N=59) recruited from a safety-net hospital smoking cessation clinic completed phone-based ecological momentary assessments (EMAs) 5 times/day for 3 consecutive weeks (1 week pre-quit, 2 weeks post-quit). Risk for smoking lapse was estimated in real-time using a novel weighted lapse risk estimator. With each EMA, participants received messages tailored to current level of risk for imminent smoking lapse and self-reported presence of smoking urge, stress, cigarette availability, and motivation to quit. Generalized linear mixed model analyses determined whether messages tailored to specific lapse risk factors were associated with greater reductions in these triggers than messages not tailored to specific triggers. **RESULTS:** Overall, messages tailored to smoking urge, cigarette availability, or stress corresponded with greater reductions in those triggers than messages that were not tailored to specific triggers ( $p$ 's=0.02 to  $<0.001$ ). Although messages tailored to stress were associated with greater reductions in stress than messages not tailored to stress, the association was non-significant ( $p=0.892$ ) when only moments of high stress were included in the analysis. **CONCLUSIONS:** Mobile technology can be used to conduct real-time smoking lapse risk assessment and provide tailored treatment content. Findings provide initial evidence that tailored content may impact users' urge to smoke, stress, and cigarette availability.

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## POS3-86

### FEASIBILITY AND ACCEPTABILITY OF A TECHNOLOGY-BASED INTERVENTION FOR FOSTER YOUTH CIGARETTE USE

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Although cigarette use has declined in recent years among U.S. adolescents and young adults, smoking remains highly prevalent among vulnerable populations. Youth exiting foster care are one such group, with daily smoking rates nearly four times the U.S. rate. Tobacco use has not been a strong research or clinical priority in this population, as the prevention of continued maltreatment remains paramount. Because foster youth are less likely than their non-foster care counterparts to seek health care using traditional means, interventions must be created that meet the needs of this population, while also proving acceptable and efficacious. The aim of this study was to test feasibility and acceptability of a computer- and mobile phone-based smoking cessation intervention among weekly smokers. Within a two-arm trial, feasibility was evaluated through eligibility and enrollment rates at baseline, and retention and intervention reach rates at the 1-, 3-, and 6-month interviews. Acceptability was measured through a 7-item satisfaction measure. Of 165 youth screened, 68 (41%) were smokers. Feasibility was excellent: 53 youth (78% of smokers) were eligible, of whom 40 (75%) enrolled. Ineligible smokers either did not smoke weekly ( $n=8$ ) or did not have a working cell phone ( $n=7$ ). Study retention was very good, with 100%, 94%, and 100% of interviews completed at 1, 3, and 6 months. Acceptability was strong, as over 85% of participants: liked the program; liked its animated narrator; thought it was easy to use; found it interesting; could understand everything; and felt it was respectful/non-judgmental. The two trial arms did not significantly differ on these items. Foster care youth represent a unique, at-risk population, in that they receive supportive health services while in foster care, but upon release, these services are taken away. Of the issues most salient to foster youth, tobacco use is among the more serious; however, little attention has been paid to screening, assessment, prevention, or treatment of tobacco use. Technology-based interventions such as iHeLP may be attractive to this population, promote quit attempts, and support efforts toward cessation.

**FUNDING:** Federal

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## POS3-87

### INTERNALIZED SMOKING STIGMA IN INDIVIDUALS WITH MENTAL ILLNESS: A NETWORK APPROACH

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**SIGNIFICANCE:** Public health campaigns aimed at de-normalizing smoking may result in shame and isolation in vulnerable groups of smokers (internalized smoking stigma [ISS]), particularly those with mental illness. ISS has three components: *self-stigma*, the incorporation of public stigma into self-perception, e.g., "I am ashamed that I am a smoker"; *felt-stigma*, awareness of devaluation in society, e.g., "others think I can't achieve much in life because I am a smoker"; *enacted-stigma*, perception of being the target of discrimination, e.g., "people discriminate against me because I am a smoker". As ISS has been shown to reduce quit efforts and treatment engagement, identifying ways to target ISS is of clinical importance. The network approach has emerged as a tool for identifying mechanisms that drive psychopathology. This study examined the relative influence of various aspects of ISS using the network approach in an effort to identify specific targets for reducing ISS. **METHODS:** Participants (N=956) were smokers hospitalized for treatment of mental illness, smoking  $M=17$  ( $SD=10$ ) cigarettes/day prior to hospitalization. A concentration network was estimating using 13 items from the Internalized Stigma of Smoking Inventory (including measures of *self*-, *felt*-, and *enacted-stigma*) on a 1 (strongly disagree)-4 (strongly agree) scale. Centrality metrics, which quantify the relative influence of each node in a network, were calculated for each item. **RESULTS:** ISS ratings were moderate ( $M=2.19$ ,  $SD=0.57$ ). Higher ISS was related to heavier smoking ( $b=.12$ ,  $p<.001$ ), more severe nicotine dependence ( $b=.97$ ,  $p<.001$ ), and higher perceived difficulty of quitting ( $b=.33$ ,  $p<.05$ ). The item "I am embarrassed or ashamed I am a smoker" exhibited the highest centrality within the estimated network. **CONCLUSIONS:** The present results indicate that ISS is positively related to smoking severity, and that ISS items associated with increased *self-stigma* (versus *felt-stigma* and *enacted-stigma*) are the most influential. These preliminary findings suggest that these experiences may potentiate early treatment targets for this population that may help reduce stigma and increase tobacco treatment engagement.

**FUNDING:** Federal

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## POS3-89

### USING AN INTERACTIVE VOICE RESPONSE RELAPSE PREVENTION PROTOCOL DURING SMOKING CESSATION TREATMENT: WHO ENGAGES AND WHAT PREDICTS OUTCOMES?

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The majority of smokers relapse after a quit attempt. Just-in-time (JIT) interventions are intended to detect vulnerability to relapse and deliver treatment at the time of need. While JIT interventions show promise for improving smoking cessation treatments, the success of JIT interventions lies in our ability to appropriately identify and engage smokers attempting to quit. Telephone-based tobacco cessation quitlines offer a promising setting for scalable JIT interventions. We describe adherence to a quitline-based, interactive voice recording (IVR)-delivered relapse risk screening and JIT intervention protocol, examine whether risk screening data predict quit outcomes beyond standard quitline data, and describe predictors of engaging in a counseling call triggered by a positive risk screen. **METHODS:** We recruited 1785 enrollees in employer- and health plan-based tobacco quitline programs who reported being quit for at least 24 hours during the five call program. A total of 1193 participants were randomized to receive either 10 or 20 relapse risk screens over 8 weeks. Risk screens assessed smoking lapses, cravings, stress, depression, motivation, and confidence. Participants meeting positive risk screen thresholds were transferred to a quit counselor for JIT intervention. Smoking abstinence outcomes were collected at 6 and 12 months. **RESULTS:** While 70.4% had 1 or more positive risk screens, only 30.3% completed an IVR-transferred counseling call. In models including demographics and baseline assessment data, positive risk screens for smoking lapses and low motivation were significant predictors of relapse to smoking at 6- and 12- months. Participants with a smoking or craving positive screen and older participants were more likely to





complete the JIT intervention call following a positive screen. **CONCLUSIONS:** Technology-delivered risk assessments may identify smokers in need of relapse prevention support; however, attention is needed to ensure those at risk for relapse engage with JIT intervention procedures. Future research should examine the utility of specific risk screening items and test ways to improve engagement with treatment at the time of relapse risk.

**FUNDING:** Federal

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## POS3-90

### A MIXED METHODS EVALUATION OF THE LUNG ASSOCIATION'S NOT-ON-TOBACCO (N-O-T) YOUTH CESSATION PROGRAM PILOTS IN ONTARIO

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**SIGNIFICANCE:** Not-On-Tobacco (N-O-T) is a school-based program developed by the American Lung Association (ALA) to assist young people who smoke with developing the skills, confidence, and support needed to quit. The Youth Advocacy Training Institute (YATI), a program of The Lung Association-Ontario, modified N-O-T for the provincial context. We present findings from a mixed methods evaluation of 9 N-O-T pilot programs in Ontario secondary schools from 2014-2016. **METHODS:** Program participants completed surveys at intake (n=109), end of program (n=43) and 6-month follow-up (n=31). Satisfaction surveys were completed by participants and facilitators. In-depth interviews were conducted with 10 facilitators to better understand factors that enabled and impeded implementation and participant success. **RESULTS:** Facilitators felt the N-O-T program reached priority youth populations, including Indigenous youth, and those with varied learning abilities and life challenges. Most participants (60%) and facilitators (79%) felt the program was very/extremely important in helping students quit or reduce smoking. At end of program, 89% of respondents were thinking about how to change their smoking patterns or quit, compared to 41% at intake. Overall, 5 (12%) survey respondents were not smoking at the end of the 10 week program; those who continued to smoke reduced their mean number of cigarettes smoked per day by half (p<0.001). Peer support in a safe environment, knowledge about health effects of smoking and tobacco industry practices, and managing stress were factors enabling smoking behaviour change. Lack of support, social exposure to smoking, and concerns about friendships with smoking peers impeded behaviour change. Factors enabling implementation included tailoring programs to school, social and cultural contexts; organizational buy-in, student champions, support for food and NRT, and program scheduling during class time. **CONCLUSIONS:** YATI's modified N-O-T program resulted in significantly reduced cigarette consumption among respondents, and positively impacted participants' ability to handle stress, manage personal and school relationships, and engage in community initiatives.

**FUNDING:** Ontario Lung Association

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## POS3-91

### KNOWLEDGE AND USE OF ALTERNATIVE TOBACCO PRODUCTS AMONG HOMELESS YOUTH: A QUALITATIVE INVESTIGATION

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**SIGNIFICANCE:** Approximately 70% of unaccompanied homeless youth are current cigarette smokers. Of these homeless youth smokers, a recent survey found that 72% also use alternative tobacco products (ATPs) – a rate that is substantially higher than national estimates for adolescents and young adults. Yet virtually nothing is known about how or why homeless young people use ATPs, or how best to reduce the use of these products in this particularly vulnerable population. **METHODS:** We conducted four focus groups (N=30 participants; 80% male, 87% non-white), at three drop-in centers for homeless youth in the Los Angeles area, to better understand their ATP-related knowledge, behaviors, and attitudes. Youth were eligible if they were currently homeless and had used

any type of tobacco product in the past 30 days. **RESULTS:** A brief survey administered prior to the focus group indicated that most participants had used one or more ATPs in the past 30 days, with the most commonly used products including e-cigarettes (76%) and vape mods (61%), little cigars or cigarillos (71%), cigars (54%), and chewing tobacco (17%). Nearly three-quarters (72%) of the participants had used an e-cig/vape to smoke/vaporize marijuana in the past 30 days. Key themes that emerged from the focus groups included: (a) youth's extensive knowledge of and experience with a wide range of ATPs; (b) how their limited resources influenced the types of ATPs they used, how they obtained these products, and the non-conventional ways in which they sometimes used them; (c) the role of marijuana in ATP use, including the pervasiveness of tobacco and marijuana co-administration; and (d) peer dynamics on the street that influenced access to and use of ATPs. This presentation will also discuss the perceived pros and cons of different ATPs among homeless youth, as well as their exposure to ATP advertising and marketing. **CONCLUSIONS:** Unaccompanied homeless youth deserve greater attention in efforts to reduce the use of all tobacco products among adolescents and young adults. These focus group findings highlight factors unique to homeless youth that may be important to consider when working with this population.

**FUNDING:** Federal

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## POS3-92

### HEALTH VULNERABILITY MODERATES SMOKING OUTCOMES AFTER FORCED ABSTINENCE FROM SMOKING IN PRISON

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**SIGNIFICANCE:** Smokers consistently identify health concerns as a major reason for quitting. This risk perception is not well understood in settings of complete forced abstinence such as correctional facilities. Understanding smokers' risk perceptions under such bans and their experience post-release would have a significant impact on potential policies and interventions. **METHODS:** Incarcerated adults (N=247) were enrolled who smoked prior to incarceration and were scheduled for release within eight weeks. Participants were asked about risk perception using five established measures of perceived vulnerability: Future Precaution, Future Effectiveness, Relative Pessimism, Future Pessimism, and Current Vulnerability. Smoking status was assessed 3 weeks post-release. **RESULTS:** Demographic variables were generally not related to risk perception. Smoking-related medical conditions, family history of smoking-related illness, age started smoking, stress, and depressive symptoms all had a significant association with measures of perceived vulnerability. Current and Future Vulnerability predicted smoking plans after release: participants more concerned about their current health favored smoke-free plans (OR=1.71) as did participants concerned about their future health (OR=1.09). Higher Current Vulnerability and Future Precaution, however, were associated with less smoking post-release and Relative Pessimism was associated with more smoking post-release. Future perceived vulnerability moderated the effect of the WISE intervention such that the odds of smoking after release are reduced by the WISE intervention. **CONCLUSIONS:** In a population undergoing forced abstinence from smoking, health-related concerns remain important. Further study is needed to confirm this association and use of specific measures to help in stratifying motivation for and likelihood of persistent cessation after forced abstinence.

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**POS3-93****ONLINE PROGRAMS INCORPORATING BEHAVIOUR CHANGE TECHNIQUES (BCTS) ARE ASSOCIATED WITH INCREASED SMOKING CESSATION IN THE GENERAL POPULATION: A SYSTEMATIC REVIEW AND META-ANALYSIS**

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**SIGNIFICANCE:** The behaviour change techniques (BCTs) used by effective online smoking cessation interventions are not well known. This study aims to examine the effectiveness of online smoking cessation programs; describe the number and type of BCTs employed; and explore whether BCTs are related to effectiveness. **METHODS:** A systematic review of MEDLINE, CINAHL, EMBASE, PsycINFO, and CENTRAL databases was conducted. Randomised controlled trials were included if they: described the study of a smoking cessation program delivered via the internet; included current adult tobacco smokers from the general population; and were written in English. All data was independently screened and extracted by two review authors. **RESULTS:** Results from 25 studies were included. Intervention effectiveness was found in the short-term only for 'prolonged abstinence' (OR = 1.50, 95% CI 1.00, 2.24,  $p = 0.048$ ). Online programs increased the odds of smoking cessation in the long-term (greater than six months) for all outcome measures (overall OR = 1.23, 95% CI = 1.06, 1.42,  $p = 0.006$ ) and 'prolonged abstinence' (OR = 1.48, 95% CI = 1.28, 1.70,  $p < 0.001$ ). On average, interventions used more BCTs than comparison groups (7 versus 3,  $p = 0.0018$ ); this was found to increase program effectiveness in the long-term (4.2% increase in treatment effect per additional BCT,  $p = 0.021$ ). The impact of specific BCTs on effectiveness were found. **CONCLUSIONS:** Online smoking cessation interventions increased long-term smoking cessation rates by 23%. Using more BCTs was found to increase the odds of smoking cessation by 4.2%. Online smoking cessation intervention development should incorporate BCTs to increase effectiveness.

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**POS3-94****UNDERSTANDING THE ROLE OF ALCOHOL CONSUMPTION IN WATERPIPE TOBACCO SMOKING TOPOGRAPHY, TOXICANT EXPOSURE, AND SMOKING EXPERIENCE**

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**SIGNIFICANCE:** Concurrent alcohol consumption and waterpipe (WP) tobacco smoking is common. WP smokers are more than twice as likely to use alcohol and alcohol use during WP sessions is associated with greater smoke exposure. However, no research has directly examined the impact of alcohol consumption on WP smoking topography, toxicant exposure, and subjective smoking experience in a controlled laboratory setting. **METHODS:** Dyads of WP smokers ( $N = 32$ ) completed two in-laboratory smoking sessions (placebo vs. active drink [sustained BrAC = .08]) in a randomized crossover design. Following drink consumption, participants smoked WP for up to 2 hours. Exhaled carbon monoxide (eCO) was assessed pre- and post-smoking session. Questionnaires assessed subjective smoking experience at post-session during each visit and smoking topography was measured continuously throughout each smoking session. **RESULTS:** When consuming active drinks, participants reported a greater desire/urge and need to experience the session again ( $ps < .05$ ) compared to when consuming placebo drinks. While eCO boost did not differ significantly between sessions, participants smoked significantly longer during the active session ( $p = .001$ ). While not significant, measures of total number of puffs, average flow rate, and total inhaled volume were also approaching significance ( $ps < .10$ ) such that all measures were greater during the active drinks session compared to the placebo drinks session. **CONCLUSIONS:** The current study is the first to assess the impact of alcohol consumption on WP smoking topography, toxicant exposure, and subjective smoking experience. Findings that alcohol consumption was consistently associated with an enhanced and longer smoking experience, indicate a potential need for regulations of alcohol sales in WP lounges. The

findings also have implications for individual interventions targeting WP smoking and may suggest a need to incorporate a discussion of alcohol use during WP smoking sessions.

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**POS3-95****E-CIGARETTE USE AND PERCEIVED BENEFITS AMONG CURRENT COLLEGE STUDENT PROBLEMATIC DRINKERS**

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**SIGNIFICANCE:** E-cigarette (e-cig) use continues to be a concern among college students, with increasing rates of use and favorable social perception, despite health consequences (Littlefield et al., 2015; Trumbo & Harper 2013). Present research indicates that a large portion of college students using e-cigs do not smoke conventional cigarette presenting a need for potential intervention (Tavolacci et al., 2016). This is especially true among college students endorsing hazardous drinking, as e-cig use has been associated with risky behaviors and lower harm perceptions (Saddelson et al., 2015). The present study sought to elucidate the relationship between use and views of e-cigs among current college students identified as problematic drinkers. **METHODS:** Current undergraduate students ( $n = 1,820$ ) completed an online assessment, including the Alcohol Use Disorders Identification Test (AUDIT), the Risk and Benefits of E-Cigarettes (RABE), and questions of current/past e-cigarette use. **RESULTS:** Among identified problematic drinkers (39.8%; AUDIT score  $\geq 8$ ), 52.2% reported ever trying an e-cig in their lives. Additionally, 26.3% endorsed trying an e-cig over the past year and 12.4% reported using an e-cig within the past month; this was higher than reports from their counterparts [Chi Square (3) = 55.06,  $p < 0.01$ ]. Only 6.6% of these individuals reported ever using an e-cig daily, with 2.8% reporting daily e-cig use in the past month, which was higher than non-problematic drinkers [Chi Square (3) = 8.01,  $p = 0.05$ ]. Problematic drinkers endorsed perceived benefits of e-cigs [ $F(1,1307) = 19.10$ ,  $p = 0.01$ ]. However, there were no differences regarding the perceived risks of e-cigs. **CONCLUSIONS:** Results indicate that college students engaging in hazardous drinking behaviors are more likely to try and use e-cigs than non-problematic drinking counterparts. Further, these individuals endorse more perceived benefits of e-cigs use. Given the risks associated with e-cig use, including its role in initiation of conventional cigarettes and risky behaviors, it is important to develop targeted interventions to provide information regarding the effects of e-cigs.

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**POS3-96****DEVELOPMENT OF A TARGETED SMOKING CESSATION INTERVENTION FOR PATIENTS UNDERGOING LUNG CANCER SCREENING: CAPITALIZING ON A TEACHABLE MOMENT**

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Screening individuals with low-dose computer tomography (LDCT) scans can significantly reduce lung cancer mortality. Lung cancer screening may be an ideal teachable moment for smoking cessation. Cessation success can be enhanced by combining lung cancer screening with effective cessation interventions. The primary goal of the current study was to develop a self-help smoking cessation intervention targeted to the teachable moment of smokers undergoing lung cancer screening. We used a multi-phase qualitative approach, including four focus groups ( $N = 15$ ) and learner verification interviews ( $N = 16$ ) to develop a targeted intervention by extending and modifying a previously validated self-help intervention titled *Stop Smoking For Good* (SSFG). Participants included two subgroups, smokers who have previously received a negative LDCT result, and those who received a positive result. Verbatim transcripts were created for content analysis. Several key themes emerged from the focus group findings that provided



new content for the intervention. Themes included: counterproductive thoughts regarding a negative lung screen result; the desire to enjoy a healthy retirement; a lack of smoking cessation self-efficacy; and the desire to see statistics regarding post-cessation survival rate. Based on these findings, an additional booklet was developed for the SSFG series to motivate smoking cessation regardless of LDCT results. Once an initial draft was developed, learner verification interviews assessed acceptability, comprehension, and visual appeal of the new and revised content. Most responses to the new and revised content were favorable. Suggestions resulted in changes to a graph of post-cessation mortality reduction to improve comprehension, addition of "Myths about CT scans," and enhancement of self-efficacy and motivation messages. These results were used to develop the new booklet titled, "Lung Cancer Screening & Quitting Smoking: Taking Control of Your Health," as well as modify the existing SSFG pamphlets for relevance to LDCT screening patients. The new intervention is being pilot tested for acceptability and receptivity by patients undergoing lung cancer screening.

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### POS3-97

#### SEIZING ELECTRONIC HEALTH RECORD TECHNOLOGY TO PROMOTE TOBACCO CESSATION: A RANDOMIZED TRIAL OF PRIMARY CARE CLOSED-LOOP REFERRAL ("EREFERRAL") TO A STATE QUITLINE

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Primary care clinics have great potential to engage patients who smoke in evidence-based care. Most smokers (70%) visit primary care each year and health concerns addressed during such visits may make quitting highly salient. Electronic health records (EHR) and systems changes have enhanced smoking status documentation in primary care, but rates of treatment engagement and tobacco quitline referral remain low. The current project evaluated an EHR-enabled electronic referral (eReferral) integrated into clinic workflows to connect more patients with evidence-based quitline care. For all patients identified as tobacco users during the rooming process, clinicians are prompted to ask those who smoke if they are ready to quit and agree to a quitline referral. After ordered by the clinician, the referral is securely transmitted electronically to the quitline who then contacts the patient and attempts to enroll them in quitline services. As part of the eReferral's "closed-loop" functionality, the quitline then sends a referral outcome report to the clinician electronically within 5-14 days, embedding the outcome into the individual patients EHR. Twenty-four clinics from two health care systems (12 per system) were randomized to implement either eReferral or fax-to-quit (FTQ) referral for all patients who smoked and were willing to set a quit date within 30 days. All clinic staff received training from tobacco outreach specialists prior to launch of the referral program, explaining the functionality of each of the two referral systems. Results indicated that referral rates were much higher in the eReferral clinics than in the fax-to-quit control clinics (3.7 patients per week in eReferral vs. 0.6 patients per week in FTQ clinics in System A; 5.5 patients per week in eReferral vs. 1.8 patients per week in FTQ clinics in System B). This pattern persisted when adjusting for clinic size and patient flow. This study demonstrates that eReferral may be a feasible way to enhance primary care patient engagement in evidence-based tobacco treatment. The study also highlights the importance of workflow considerations and system customization of EHR tools such as eReferral.

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### POS3-98

#### THE ACUTE AND CHRONIC EFFECTS OF NICOTINE ON BRAIN REWARD FUNCTION: INTERACTIONS WITH NICOTINE DEPENDENCE SEVERITY

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**SIGNIFICANCE:** The influence of nicotine and tobacco use on the reward-related brain response to nondrug rewards could provide a better understanding of the acquisition and maintenance of tobacco addiction. This study investigated the acute and chronic effects of nicotine/tobacco on neural activation during performance of a monetary incentivized delay task. **METHODS:** Prior to each scan, nonsmokers received nicotine or placebo nasal spray and smokers were smoking satiated or 24-hours withdrawn. During the scan, participants made timed responses to reward-related cues and received feedback. Parameter estimates from cue- and feedback-related activation in the medial prefrontal cortex and nucleus accumbens were extracted and underwent within- and between-group analyses. Smokers' nicotine dependence severity was included as a continuous predictor variable for neural activation. **RESULTS:** Among smokers, withdrawal decreased cue-related activation in the prefrontal cortex, and the difference in activation (satiety > withdrawal) in these regions negatively correlated with nicotine dependence severity. Among nonsmokers, nicotine decreased the difference in nucleus accumbens activation between rewarded and non-rewarded feedback conditions. Tobacco withdrawal and acute nicotine also had widespread effects on feedback-related activation throughout the brain. **CONCLUSIONS:** Overall, tobacco satiety was associated with greater activation than withdrawal in the medial prefrontal cortex and nucleus accumbens, but as nicotine dependence severity increased, there was increasingly greater activation during withdrawal. This interaction with nicotine dependence may account for some of the discrepancies shown in previous studies.

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### POS3-99

#### AN ASSESSMENT OF CORTICOSTRIATAL GLUTAMATE CIRCUITS AND THEIR CONTRIBUTION TO SMOKING RELAPSE VULNERABILITY

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**SIGNIFICANCE:** In animal models of nicotine addiction, chronic nicotine exposure produces glutamatergic-mediated neuroplasticity in the medial prefrontal cortex (mPFC—a region coding for relevant stimuli) and nucleus accumbens (NAc—a region coding for reward prediction); henceforth corticostriatal circuitry. Dysregulated corticostriatal glutamate mediates cue-induced reinstatement and thus may provide a biomarker for translating into treatment development for tobacco use disorder. Consistent with rodent models, human fMRI research demonstrates that drug cue-induced craving is associated with greater fMRI-BOLD response in corticostriatal circuitry—the magnitude of which predicts relapse. With regard to systems level analysis, the strength of corticostriatal resting-state functional connectivity (rsFC) is weaker among smokers, and the magnitude of dysregulation is associated with dependence severity and smoking lapses following a quit attempt. Despite convergence of findings from rodents and humans, associations between corticostriatal rsFC, glutamate, craving and relapse vulnerability remains unknown. **METHODS:** The current study used multi-modal imaging (fMRI-BOLD, <sup>1</sup>H-MRS) to assess corticostriatal rsFC and glutamate concentrations, along with a laboratory model of cue-induced relapse (SRT) in order to examine associations between glutamatergic corticostriatal circuitry function and relapse vulnerability in adult smokers (N=22). **RESULTS:** The strength of corticostriatal rsFC was negatively associated with: a) <sup>1</sup>H-MRS glutamate concentration in mPFC ( $r = -.824$ ,  $p = .02$ ), b) lower cue-induced self-reported craving ( $r = -.49$ ,  $p = .025$ ), and 3) longer delay to initiate *ad lib* smoking during the SRT ( $r = .37$ ,  $p = .04$ ). **CONCLUSION:** These results conform with preclinical models of glutamatergic, corticostriatal-mediated cue-induced reinstatement and further bolster the importance of evaluating therapeutic strategies to treat corticostriatal pathophysiology in tobacco use disorder. Findings will be discussed in the context of potential glutamatergic medications for treating tobacco use disorder.

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## POS3-100

### TECHNOLOGY-DELIVERED INTERVENTIONS TAILORED FOR YOUNG ADULT SMOKERS WITH SMI

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**SIGNIFICANCE:** Little research has evaluated technology-based interventions in young smokers with serious mental illness (SMI). We developed a theory-based motivational decision support system for smoking cessation (Let's Talk About Smoking [LTAS]) and tested it among young adult smokers with SMI. **METHODS:** We enrolled 81 young adult daily smokers with SMI (mean age 24 years). 48 were randomly assigned to LTAS vs. computerized NCI patient pamphlet (NCI); and a quasi-experimental group of 23 received no intervention (NI). Subjects were assessed for smoking behaviors and Theory of Planned Behavior constructs (attitudes, social norms, perceived behavioral control, intention) at baseline, post-intervention and at 3-month follow-up. Analyses addressed main outcomes and explored mechanisms of action. **RESULTS:** The LTAS group was more likely to have biologically-verified abstinence at 3 months (15% LTAS, 0% NCI, 0% NI;  $p<.05$ ), whereas the NCI pamphlet subjects were most likely to self-report quit attempts (38% LTAS, 53% NCI, 15% NI;  $p<.05$ ). Contrary to our hypothesis, only 5% of subjects used cessation treatment, whereas 22% reported talking to a friend to assist with a quitting. Subjects who were abstinent at follow-up did not use treatment, but 50% reported talking to a friend. Greater perceptions of stigma were associated with intention to quit and self-reported quit attempts, whereas gender, SMI diagnosis, and attitudes about smoking were not. Post-intervention attitudes, social norms and perceived behavioral control for cessation treatment correlated with intentions to use cessation treatment. The pattern of scores showed that, overall attitudes, beliefs, social norms and perceived behavioral control about cessation treatments were mildly positive, but intentions to use cessation treatments were low. Beliefs about treatments improved post-intervention. Social norms for cessation treatment improved post-intervention. Beliefs about treatments improved post-intervention, favoring LTAS. **CONCLUSIONS:** Further research is warranted to test the efficacy and mechanisms of action for brief, technology-delivered interventions such as LTAS in young adult smokers with SMI.

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## POS3-101

### PROVIDER PERSPECTIVES ON THE NEEDS OF RURAL SMOKERS WITH SERIOUS MENTAL ILLNESS

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**BACKGROUND:** Individuals living in rural areas are disproportionately affected by mental illness and tobacco use. Barriers to successful tobacco cessation include health-system resources such as lack of medical and financial resources and limited cessation programs. Consequently, receiving tobacco cessation counseling at routine health visits is essential. The goal of this research was to inform the development of a tobacco dependence treatment program for smokers with mental illness and a training program for healthcare providers at rural behavioral health clinics. **METHODS:** The research was conducted in three rural Appalachian Ohio clinics that deliver integrated healthcare. Through structured interviews, healthcare providers (counselors, social workers, nurses, doctors) were asked about their attitudes regarding tobacco cessation, whether they regularly delivered cessation counseling, and barriers to delivering brief cessation counseling to smokers with mental illness. **RESULTS:** Findings from the structured interviews suggest that providers at these clinics face several barriers to delivering brief cessation counseling. Specific to the rural location of the clinics, providers reported difficulties getting patients to therapy. Other reported barriers include the perceived ineffectiveness of pharmacotherapy, time constraints, lack of resources available at the clinic to help smokers quit, lack of control, low confidence, and lack of training (both in general and specific to those with mental illness). **DISCUSSION:** This study evaluated factors associated with tobacco dependence treatment from the perspective of healthcare providers in rural behavioral health clinics. The results suggest that not all providers are delivering tobacco dependence treatment. Difficulties accessing healthcare due to transportation and distance to a provider, factors associated with the rural nature of the clinics and patient population, emphasize the importance of delivering ces-

sation counseling at routine visits. Our findings provide useful information and supportive evidence for training providers who treat smokers with mental illness as well as suggesting clinic-wide changes.

**FUNDING:** State; Academic Institution

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## POS3-102

### PSILOCYBIN MEDIATED REDUCTIONS IN SMOKING URGES

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**SIGNIFICANCE:** In a prior open-label pilot study (N=15), the serotonin 2A (5-HT<sub>2A</sub>) receptor agonist hallucinogen psilocybin was found to be a safe and feasible adjunct to standard smoking cessation counseling, with 80% (n=12) of participants exhibiting biochemically verified smoking abstinence at 6-months post-treatment, and 67% (n=10) still abstinent at 12-month follow-up. **METHODS:** An ongoing randomized clinical trial is underway to assess comparative smoking cessation efficacy between groups receiving matched counseling with either a single high dose of psilocybin (30mg/70kg), or a standard 8-10 week course of nicotine patch (current n=20). **RESULTS:** Preliminary results found participants in both groups exhibited significantly reduced Questionnaire on Smoking Urges (QSU) scores ( $p<0.005$ ), and significantly increased smoking abstinence self-efficacy from baseline to 1 week, and 8 weeks post-quit ( $p<0.005$ ). No significant change in withdrawal scores were observed between groups or across time. Participants who received psilocybin (n=10) showed significantly reduced QSU desire to smoke 8-weeks post-quit ( $p<0.05$ ), and significantly decreased QSU anticipation of relief from withdrawal 1 and 8-weeks post-quit compared to baseline ( $p<0.05$ ), while nicotine patch participants did not. Participants in the psilocybin group showed significantly greater reductions in total QSU score and QSU intention to smoke 24 hours post-psilocybin administration compared to patch group ( $p<0.05$ ). **CONCLUSIONS:** In combination with counseling, both psilocybin and nicotine patch can facilitate decreased smoking urges and increased smoking abstinence self-efficacy. However, a single high dose of psilocybin appears to confer additional benefits over nicotine patch in decreasing smoking urges in the short-term, and reducing desire and intention to smoke, indicating important potential 5-HT<sub>2A</sub> receptor mediated mechanisms related to smoking cessation efficacy. Preliminary findings suggest psilocybin-facilitated treatment may serve as a novel second-line smoking cessation intervention that warrants further investigation.

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## POS3-103

### DISTAL MEASUREMENTS CAN PRODUCE FALSE NEGATIVE RESULTS: A SECONDARY ANALYSIS OF A NATURAL HISTORY STUDY

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**SIGNIFICANCE:** Most naturalistic prospective studies of quit attempts (QA) or abstinence measure the predictor several weeks prior to measuring quitting. This allows recall and other biases to occur. Our recent natural history study measures changes in cigarettes per day (CPD) on a daily basis as a proximal predictor of making a QA the next day. The present secondary analysis compares these findings with those when changes in CPD are measured once every 6 weeks. **METHODS:** Daily smokers not currently trying to quit reported CPD and QAs nightly for 12 weeks. We provided no treatment. In our daily analysis, we identified episodes of  $\geq 10\%$  reduction in CPD and tested whether reduction during these episodes predicted making a QA on the day after the reduction episode. In the 6 week analysis we tested whether reduction in CPD between baseline and 6 weeks predicted making a QA during the following 6 weeks. In both the daily and 6 week measurement analyses we tested 1) percent and 2) absolute magnitude of reduction as well as 3) CPD at the end of reduction as predictors of making a QA. **RESULTS:** In the daily measurement analysis of reduction, there were 1,179 reduction episodes that began without an intention to quit. The probability of making a QA following any reduction episodes was greater than that after days of no reduction (7.9% vs 2.9%;  $F=47.2$ ,  $p<.001$ ). Greater percent reduction, greater absolute reduction, and





fewer CPD on the final day of an episode predicted making a QA the next day (all  $p < .001$ ). In the 6 week measurement analysis the probability of making a QA was not significantly different between those who reduced (66%) vs did not reduce (53%). Neither percent reduction, absolute reduction, nor mean CPD at week 6 predicted making a QA during the 6-week follow-up. CONCLUSIONS: Analyses based on distal measurements failed to detect a relationship evident with daily measurements. Relying on distal measurements may result in false negatives while more proximal measurements can identify important predictors of quitting.

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## POS3-104

### SMOKING RELAPSE-PREVENTION INTERVENTION FOR CANCER PATIENTS: A RANDOMIZED CONTROLLED TRIAL

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Continued smoking after a cancer diagnosis contributes to several negative health outcomes, including reduced survival. The current study tested the efficacy of an empirically-based, smoking relapse-prevention intervention developed specifically for cancer patients. Eligible participants (N=381) were newly diagnosed cancer patients, who had quit smoking post-diagnosis (1-90 days abstinent at screening), randomized to one of two conditions: Usual Care (UC) or Smoking Relapse Prevention (SRP). The UC patients received the institution's standard of care. The Smoking Relapse Prevention (SRP) patients received standard of care plus 8 relapse-prevention booklets mailed over a 3 month period and an educational DVD developed specifically for cancer patients. The primary outcomes were 7-day point prevalence abstinence at 2 and 6 months. Multiple imputation was used to manage missing data. Abstinence rates were 75% and 69% for the SRP group and 71% and 64% for the UC however, greater abstinence rates for the SRP group were not statistically significant ( $p > .34$ ). Analyses of prospective moderators found a marginally significant effect of the SRP intervention at 6 months for patients who were married or had a life partner (78% versus 65%, AOR=1.82,  $p=.082$ ). To explore potential targets for future interventions, the groups were combined to examine any demographic, smoking history, and cessation attitude/belief variables as a predictor of smoking relapse. Smoking rates at 6 months were higher for those having quit less than 7 days prior to enrollment (OR=2.44,  $p=.001$ ), younger (OR=1.02,  $p=.033$ ), not married/partnered (OR=1.70,  $p=.021$ ), employed (OR=1.88,  $p=.012$ ), with a lower perceived risk of continued smoking (OR=1.06,  $p=.044$ ), and with lower self-efficacy (OR=1.08,  $p<.001$ ). Due to the negative impact of continued smoking, cancer patients represent a priority population. Despite the lack of significant intervention results, this study represents one of the largest trials conducted with cancer patients, helps to identify those individuals at higher risk of relapse, and advances our knowledge of at-risk populations to target relapse-prevention interventions.

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## POS3-105

### ACCEPTABILITY OF A TOBACCO-FREE POLICY IN INPATIENT ADDICTION SERVICES AND ASSOCIATED SMOKING-RELATED OUTCOMES

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SIGNIFICANCE: Cigarette smoking is widespread among individuals receiving inpatient treatment for other substance use disorders (SUDs). In a newly tobacco-free inpatient addictions unit, we explored views of and reported adherence to the tobacco-free policy. Furthermore, changes in smoking-related outcomes during SUD treatment were explored. METHODS: Using an observational design, inpatients completed a computer-based survey in the unit when admitted and ~2 weeks later when discharged. Self-report measures included SUD symptoms,

substance use and craving, mental health symptoms, impressions of and adherence to the tobacco-free policy, and motivation to quit smoking. RESULTS: At admission (n=102), current cigarette smokers reported higher alcohol-related problems (AUDIT;  $p=.04$ ) and emotional distress than non-smokers (KESSLER-10;  $p=.02$ ), and there was a similar trend for other drug-related problems (DAST;  $p=.06$ ). More than 1/3 of smokers at admission wanted treatment for their tobacco use (37%), and the majority had tried to quit smoking in their lifetime (68%). Most of the smokers reported using nicotine patch (77%), gum (25%), inhaler (57%), and/or lozenge (18%) during their admission. Upon discharge (relative to admission), smokers (n=36) demonstrated a significant reduction in their self-reported cigarette craving ( $p<.001$ ) and withdrawal (MNWS;  $p<.001$ ). At discharge, smokers and non-smokers alike rated the tobacco-free policy positively. Only a subset of smokers self-reported non-adherence (i.e., cigarette smoking during admission) to the tobacco-free policy (n=5; 14%), and most smokers and non-smokers (79% of 100) reported that other patients complied well or very well with the policy. CONCLUSIONS: The results highlight the importance of addressing cigarette smoking in inpatient addictions treatment. The tobacco-free policy was generally well received. During treatment in a setting where tobacco use was prevented, cigarette craving and withdrawal diminished. Future research is needed to follow-up with smokers after discharge to determine long-term changes in smoking outcomes.

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## POS3-106

### EXAMINING THE ABILITY OF PURCHASE TASKS IN DISTINGUISHING RISKY POPULATIONS OF SUBSTANCE USERS

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SIGNIFICANCE: Purchase Tasks (PT) are behavioral economic instruments that identify the reinforcing value of a commodity. These hypothetical tasks have been increasingly utilized in substance use research and show promise in distinguishing populations that have increased risk for problematic use, are more vulnerable to adverse outcomes (e.g., health, interpersonal, or psychological), and have poor response to interventions or regulatory policy. The primary aim of this review is to investigate which PT indices are more sensitive in distinguishing populations with these risk factors. METHODS: Reports were identified using PubMed and entering the search term "purchase task". For inclusion, reports had to be in English, be published in a peer-reviewed journal through July 2017, and examine PT indices and their relationship to the aforementioned risk factors. Two authors reviewed search results to determine study inclusion. RESULTS: 37 reports met inclusion criteria and identified significant associations between PT indices and problematic use, adverse outcomes, and poor response to interventions and regulatory policy. Intensity (consumption at zero price) was the most frequently reported index, with 83% of the articles reporting significant associations with the aforementioned risk factors ( $p < .05$ ). Omax (maximum expenditure) was the second most reported index, with significant associations found in 57% of the articles ( $p < .05$ ). Elasticity (sensitivity to changes in price) was the third most reported index, with significant associations found in 50% of the articles ( $p < .05$ ). Breakpoint (last price with any demand) and Pmax (price with maximum response output) only yielded significant associations in 28% and 13% of the articles, respectively. CONCLUSIONS: These preliminary results suggest that volumetric measures of demand (i.e. Intensity and Omax) and overall sensitivity to price (i.e. Elasticity) may have the most predictive utility in identifying risky populations. Overall, PT indices have the potential to provide insightful information about the association of demand for substances and socially important outcomes.

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**POS3-107****COGNITIVE AND EMOTIONAL ILLNESS REPRESENTATIONS OF HEAD AND NECK CANCER EXPERIENCE BY SOUTH ASIAN SURVIVORS: A QUALITATIVE STUDY**

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**SIGNIFICANCE:** Tobacco use contributes significantly to head and neck cancers (HNCs). South Asians are at heightened risk of HNCs because of a higher prevalence of smokeless tobacco (SLT) use, particularly different types of indigenous products including betel quid, zarda, and khaini. HNC survivors face unique challenges because HNC treatment affects general health, mental health, appearance, employment, social functioning, and family interactions as well as upper aerodigestive tract functioning. South Asians face unique challenges in this regard that merits attention and might yield insights into the HNC disparities experienced by this population. **METHODS:** We conducted in-depth interviews with South Asian HNC survivors (n=15) about their experiences with SLT and cigarette smoking and cancer treatment. The majority of participants were male (93.3%), and SLT users (73.3%). The interviews were analyzed on two primary themes: cognitive representation, i.e., patients' beliefs and expectations about their illness; and emotional representation, i.e., the range of emotions that patient experiences regarding their illness. **RESULTS:** Under cognitive representation, participants reported several perceived causes of HNC including tobacco use (SLT, cigarette smoking, polytobacco use), alcohol use, and bad luck. Physical (fatigue, pain, speech and swallowing difficulties, and disfigurement) and psychosocial (limited life expectancy and changes in affect) consequences were described. Participants shared beliefs about personal control over their illness by citing specific treatments they completed, importance of self-advocacy, and uptake of SLT or smoking cessation services, participation in other health improvement strategies (oral therapy and exercise), and the role of religion and faith. Emotional representation of their HNC experience included negative (anger, anxiety, fear, guilt, and sadness), positive (hope, trust, and gratitude), and mixed and neutral emotions. **DISCUSSION:** These findings suggest that South Asian HNC survivors have unique tobacco cessation treatment and cancer coping needs that must be addressed to reduce the disparities experienced by this population.

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**POS3-108****ASSOCIATION AND CIS-MQTL ANALYSIS OF VARIANTS IN CHRNA3-A5, CHRNA7, CHRN2, AND CHRN4 WITH NICOTINE DEPENDENCE IN CHINESE HAN POPULATION**

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Numerous genetic studies have demonstrated significant association of variants in nicotinic acetylcholine receptors (nAChRs) with smoking behaviors. However, most of these studies were concentrated on subjects of European or African ancestry. In this study, we performed both association and interaction analysis for 67 single nucleotide polymorphisms (SNPs) in *CHRNA3-A5*, *CHRNA7*, *CHRN2* and *CHRN4* genes with ND in a Chinese Han population (N = 5,055). We further analyzed methylation quantitative trait loci (cis-mQTL) for three most significant SNPs and 5,580 potential methylation loci located within these target gene regions. We found that SNPs rs1948 and rs7178270 in *CHRN4* and rs3743075 in *CHRNA3* were significantly associated with FTND ( $p = 6.6 \times 10^{-5}$ ,  $p = 2.0 \times 10^{-4}$ , and  $p = 7.0 \times 10^{-4}$ , respectively). Haplotype-based association analysis revealed that two major haplotypes T-G and C-A formed by rs3743075-rs3743074 in *CHRNA3*, and the other two major haplotypes A-G-C and G-C-C formed by rs1948-rs7178270-rs17487223 in *CHRN4* were significantly associated with FTND ( $p \leq 8.0 \times 10^{-4}$ ). Further, we provided evidence for the presence of significant interaction among variants within *CHRNA3/B4/A5*, *CHRNA4/B2/A5* and *CHRNA7* in affecting ND, with the corresponding P values of  $5.8 \times 10^{-6}$ ,  $8.0 \times 10^{-5}$  and 0.012, respectively. Finally, we identified 2 CpG sites (CpG\_2975 and CpG\_3007) in *CHRNA3* that are significantly associated with 3 cis-mQTL SNPs (rs1948, rs7178270, rs3743075) in *CHRNA5/A3/B4* gene cluster ( $p \leq 1.9 \times 10^{-6}$ ), which formed 4 significant CpG-SNP pairs for our sample. In sum, we revealed at least three novel SNPs in *CHRNA3* and *CHRN4* to be significantly associated with FTND. Further, we showed that

these significant variants contribute to ND via two methylated sites. Moreover, we showed there existed significant interaction in affecting ND among variants in *CHRNA5/A3/B4*, *CHRNA7* and *CHRNA4/B2/A5*. Together, our findings provide strong evidences supporting that SNPs in nAChR subunit genes convey risk to ND in Chinese Han population.

**FUNDING:** Academic Institution

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**POS3-109****CROSS-SPECIES EVIDENCE FOR NICOTINE-INDUCED FACILITATION OF BROAD MONITORING**

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The ability to spread attention broadly over many items or locations is as important for everyday functioning as the ability to focus narrowly on a single item. Previous studies suggest that people with schizophrenia (PSZ) have broad monitoring deficits. For example, in the Spatial Attentional Resource Allocation Task (SARAT), target stimuli appear randomly in 1 of 4 peripheral locations. A central cue predicts the target location. Compared with predictive cues, target detection in PSZ was most impaired relative to control subjects when the cue was non-predictive and all 4 locations were monitored. In a rat model of kynurenic acid elevation, a phenomenon observed in PSZ, similar broad monitoring deficits were seen in the 5-Choice Serial Reaction Time Task (5-CSRTT), a rodent paradigm of attention requiring the detection of stimuli in 1 of 5 horizontally arranged locations. Using the SARAT in healthy never-smokers and the 5-CSRTT in rats, we tested whether nicotine facilitates the ability to spread attention broadly. Data were pooled across 2 human studies (N=44), in which the SARAT was performed after wearing a nicotine (7 mg/24 hrs) or placebo patch for 5 hrs. Nicotine reduced reaction time (RT) and omission errors. The effect on RT was more pronounced when all 4 locations were cued than when a single location was cued. In a subsample of the data, the nicotinic acetylcholine receptor (nAChR) antagonist mecamylamine (7.5 mg p.o.) selectively slowed RT when all 4 locations were cued. In rats (N=20), nicotine attenuated the decline in stimulus detection with greater target eccentricity, creating more equal detection at the center and outer locations. All findings were supported by significant interactions and constitute cross-species evidence that, in the unimpaired organism, nAChR activation is critical for the ability to spread attention broadly. Unexpectedly, rats with prenatal kynurenine exposure (N=17), which augments brain kynurenic acid reducing nAChR neurotransmission, did not display this effect of nicotine. Thus, nAChR hypofunction may be central to broad monitoring deficits but, at the same time, may prevent remediation by nAChR agonist treatment.

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**POS3-110****CHEMOSENSORY IMPAIRMENT AND TOBACCO PRODUCT USE**

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**SIGNIFICANCE:** About 23 percent of adults in the United States (US) who are 40 years and older report problems with their ability to smell and 19 percent report problems with their ability to taste. A potential risk factor of smell and taste dysfunction is smoking and use of other nicotine products. This study aims to assess the prevalence of taste and smell alterations according to participants smoking status, tobacco product use, and menthol cigarette use, using NHANES 2013-2014. **METHODS:** NHANES 2013-2014 participants included in this analyses were 40 years and older, completed the taste and smell examination, and reported on smoking behavior. A total of 3,706 participants completed the smell test and 3,113 participants completed the taste test. Taste impairment was identified as inability to identify quinine as bitter in the whole mouth taste test. Impairment of smell was defined as failing to identify six or more of the eight odors. Adjustment was made for age, gender and race/ethnicity. **RESULTS:** Relative to daily smokers, people showing smell impairment are more likely to be some day smokers (OR=2.43, 95% CI: 1.38, 4.26), while noncurrent ever smokers were less likely to show smell



impairment (OR=0.63, 95% CI: 0.54, 0.75). Those who never smoked 100 cigarettes were less likely than daily smokers to show taste impairment (OR=0.74, 95% CI 0.55, 0.98). Mentholated cigarette users were more likely to have smell impairments (OR=1.88, 95% CI: 1.32, 2.68). Recent (past 5 day) use of cigarettes (OR=1.23, 95% CI: 1.04, 1.45) and cigars (OR=1.70, 95% CI: 1.26, 2.30) were both associated with smell, but not taste, impairment. These effects were attenuated after adjustment for age, sex, and race. CONCLUSIONS: These preliminary findings suggest that the use of tobacco products may be affecting older adults' ability to taste and smell. Age appears to be an important effect modifier with respect to use of nicotine products and smell impairments.

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## POS3-111

### EVALUATING THE IMPACT OF GROUP BEHAVIORAL COUNSELING AND IVR CALLS ON SMOKING CESSATION IN PSYCHIATRIC INPATIENTS

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**SIGNIFICANCE:** In the psychiatric patient population the prevalence of smoking is significantly higher than in a non-psychiatric patient population in the United States. Moreover, literature has demonstrated decreased quit rates and less motivation to attempt cessation in this population. Treatment modalities for these patients, while needed, are not well defined or understood. **OBJECTIVE:** To examine the reach and impact of an opt-out inpatient psychiatry tobacco treatment program. Reach is defined as total number of individuals reached by a counselor in a group format and by phone or by phone alone post discharge. The primary outcome evaluated is the last known self-reported smoking status at 1 month. **METHODS:** Between July 2014 and May 2015, 1202 adults were admitted to the Medical University of South Carolina Institute of Psychiatry Hospital. Eligible current cigarette smokers were referred to the Tobacco Treatment Program. The program is comprised of group counseling sessions addressing coping skills and enrollment in a Interactive Voice Response (IVR) phone based follow-up program. The IVR contacts patients at 3, 14, and 30 days after hospital discharge. We compared patients who engaged in Group + IVR to IVR alone. **RESULTS:** Reach rate for group was low at 12.6% (152/1202). An ITT analysis showed that 6.3% (7/111) of the Group + IVR group were abstinent at 1 month follow-up, while 0.6% (3/505) of the IVR group were abstinent (OR=10.6, 95%CI: 2.79, 40.40,  $p < .05$ ). A responder analysis revealed that 23% (7/30) of the Group + IVR group were abstinent at 1 month follow-up, while 3.4% (3/89) of the IVR group were abstinent (OR=8.4, 95%CI: 4.47, 14.94,  $p < .05$ ). **CONCLUSIONS:** Attendance in a group counseling session combined with IVR calls resulted in higher abstinence rates than IVR alone. Reach was low overall, showing that novel interventions are needed to engage these patients in tobacco treatment.

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## POS3-112

### LIGHTER VS. HEAVIER SMOKERS IN A WEB-ASSISTED TOBACCO INTERVENTION (WATI) STUDY WITH COMMUNITY COLLEGE STUDENTS

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**SIGNIFICANCE:** Smoking among community college (CC) students is higher than that of four-year college students. Better understanding this population can further stimulate reduction in smoking among young adults. Web-Assisted Tobacco Intervention (WATI) with CC students, is a randomized controlled trial comparing static to interactive online features. The objective of the present analysis was to examine differences between lighter vs. heavier smokers in 1) use of WATI features, and 2) 6-month cessation rates. **METHODS:** Lighter smokers (10 or fewer cigs/day,  $n=859$ ) were compared to heavier smokers ( $> 10$ /day,  $n=553$ ). Covariates were examined for inclusion. Utilization and quit-rate outcome variables were regressed

to identify differences between groups. Self-reported 6-month abstinence was biochemically verified with a subset of respondents who were heavier ( $n=31$ ) and lighter ( $n=71$ ) smokers. **RESULTS:** No statistically significant associations were found with use of specific interactive online features between lighter and heavier smokers. For 30-day point prevalence cessation (not including e-cigarettes), the model with the treatment group interaction term indicated a trend towards significance ( $p=0.054$ ) with heavier smokers having reduced odds of quitting (OR: 0.40; 95% CI: 0.15 - 1.02). For 30-day point-prevalence abstinence (including e-cigarettes) with the treatment group interaction term, a statistically significant association was found ( $p=0.016$ ) indicating that heavier smokers had substantially lower odds of quitting (OR 0.36; 95% CI: 0.15 - 0.83). Biochemically verified differences in abstinence between groups was not statistically significant ( $p=0.093$ ). **CONCLUSIONS:** Statistically significant differences were found between lighter and heavier smokers with respect to 30 day point-prevalence abstinence; lighter smokers were more likely to have quit. Heavier smokers were less likely to quit in the more interactive treatment condition, however no differences were observed between lighter vs. heavier smokers in use of specific features. Heavier smokers may require different offline interventions, or differently interactive online cessation interventions.

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## POS3-113

### USING THE ELECTRONIC HEALTH RECORD TO DETERMINE SMOKING STATUS AFTER HOSPITAL DISCHARGE

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**SIGNIFICANCE:** Smokers admitted to the hospital with long-bone fractures are advised to stop smoking, yet use of nicotine replacement therapy (NRT) remains controversial in this population, and smoking cessation after discharge is understudied. Because these high risk orthopedic smokers have regular scheduled follow up, the electronic health record (EHR) could be a pragmatic tool to track cessation after discharge. **METHOD:** Adult daily smokers who were admitted between 6/1/14-5/31/15 to the hospital with a long-bone fracture and counseled to stop smoking were sampled from the EHR. Analyses were restricted to those with adequate follow up (3+ months) and documentation of smoking status (2+ timepoints). Patient characteristics and NRT use during hospitalization and at discharge were also abstracted. We describe factors associated with inpatient NRT use and document the prevalence of post-discharge cessation (2+ consecutive non-smoking assessments). **RESULTS:** Of 319 discharged patients with long bone fractures, 104 (33%) had insufficient follow-up to determine smoking cessation. Among the remaining ( $n=215$ ), mean age was 45 years (SD 15) and 53% were male, 82% White, 14% African American, and 92% insured. NRT was used by 24% during admission, while only 12% were prescribed NRT at discharge. Patients who used NRT during admission (vs those who did not) had longer hospital stays (7.5 (IQR 4-12) vs 5 (IQR 2-9) days,  $p=.002$ ), and higher rates of NRT discharge orders (40% vs 3%,  $p<0.001$ ). Self-reported cessation after discharge as documented by clinical staff was 29%. **CONCLUSIONS:** EHR data offer a practical method to track outcomes of smoking treatment in orthopedic patients at high risk of smoking-related wound and fracture healing complications, with missing data similar to that seen in smoking cessation RCTs. NRT was infrequently prescribed, and over two-thirds of patients were still smoking at follow up. Future research should identify ways to enhance smoking cessation treatment in this population, including facilitating greater use of cessation pharmacotherapy.

FUNDING: None

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## POS3-114

### PREDICTORS OF SMOKING CESSATION AMONG INDIVIDUALS WITH SYMPTOMS OF DEPRESSION

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**SIGNIFICANCE:** Epidemiological evidence has shown that people with depression are less likely to achieve smoking cessation compared to individuals without depression. While correlates associated with smoking cessation are well established within the general population, less is known about factors that influence tobacco cessation among individuals with depression. The purpose of this study is to determine factors associated with smoking cessation among individuals with symptoms of depression. **METHODS:** The Smoking Treatment for Ontario Patients (STOP) Program is a smoking cessation program implemented across the province of Ontario that provides behavioural counselling and nicotine replacement therapy at no cost to tobacco users. Patients receive personalized doses of nicotine replacement therapy every 2 to 4 weeks for a maximum of 26 weeks. Symptoms of depression over the 2 week period prior to baseline were assessed using the PHQ-9. The sample included approximately 1,800 daily smokers who were enrolled in STOP between April 11, 2016 and December 15, 2016 that had obtained a PHQ-9 score of >10. **RESULTS:** Preliminary findings showed that 40% of individuals experienced minor symptoms (PHQ-9 score 10-14), while 36 and 25% of daily smokers demonstrated moderately severe (PHQ-9 score 15-19) and severe symptoms of depression (PHQ-9 score >20), respectively. Bivariate analysis showed that gender was not associated with symptoms of depression, however individuals with minor symptoms of depression were significantly older ( $47.0 \pm 14.0$ ) compared to individuals moderately severe ( $43.9 \pm 14.2$ ,  $p < 0.01$ ) and severe symptoms of depression ( $43.8 \pm 12.8$ ,  $p < 0.01$ ). Approximately 45, 53, 52% of individuals with minor, moderately severe, and severe symptoms of depression, respectively drank above Canadian Cancer Society guidelines ( $p = 0.02$ ). No significant association was observed between abstinence at the 6 month follow-up and severity of PHQ-9 symptoms. **CONCLUSIONS:** Additional analyses will be presented examining potential associations with medication use, substance use, and additional mental health diagnoses using regression models.

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## POS3-115

### EVIDENCE FOR THE IMMEDIATE IMPACT OF LUNG CANCER SCREENING ON SMOKING-RELATED OUTCOMES

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**SIGNIFICANCE:** Although the literature regarding the impact of lung cancer screening (LCS) on smoking-related outcomes has been mixed, there is some evidence that LCS may provide a "teachable moment" in which smokers may have higher rates of quit attempts and abstinence, increased motivation to quit, and changes in perceptions of LC risk. Among a sample of smokers undergoing LCS, we describe the impact of screening on smoking-related variables and the potential for abstinence in this context. **METHODS:** Current smokers ( $N = 87$ , 61.5% baseline participation rate) registered to undergo LCS completed telephone interviews pre- and post-LCS. Pre-LCS interviews assessed demographic characteristics, screening variables, and interest in cessation interventions. Both interviews assessed perceptions of LC risk, tobacco use, and readiness to quit. **RESULTS:** Participants ( $M = 60.3$  years old,  $SD = 5.3$ ; 56.3% female; 96.6% Caucasian) reported an average of 47.8 ( $SD = 22.6$ ) pack-years. Most endorsed undergoing screening for peace of mind about LC (83.9%) and due to health professional recommendations (82.8%). Participants reported minimal use of non-cigarette tobacco products. Frequent interest in cessation interventions included counseling with a health professional (76.7%), hypnosis or acupuncture (74.4%), nicotine replacement therapy (69.8%), and telephone counseling (65.5%). At baseline, 48.3% reported higher perceived LC risk compared to other smokers, 81.4% smoked fewer than 20 cigarettes per day, and 29.9% reported readiness to quit in the next 30 days. Compared to the baseline ratings, at post-LCS, 12.8% reported

increased perceived risk (chi-square (1) = 15.1,  $p < .001$ ), 30.2% smoked fewer cigarettes per day, and 24.6% reported increased readiness to quit (chi-square (1) = 20.8,  $p < .001$ ). **CONCLUSIONS:** Among smokers undergoing LCS, the potential for abstinence was evident from participants' interest in several evidence-based cessation methods, as well as the trends indicating a change in variables associated with quitting. These findings provide evidence that LCS may be utilized as a "teachable moment" to address tobacco use when combined with evidence-based interventions.

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## POS3-116

### DESCRIPTIVE AND INJUNCTIVE NORMS OF WATERPIPE TOBACCO SMOKING AMONG COLLEGE STUDENTS

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**SIGNIFICANCE:** Smoking tobacco via a waterpipe (WP) is on the rise, particularly among college students. One reason for this may be normative perceptions of WP tobacco smoking among this population. The current study examined the perceived and actual descriptive and injunctive norms of WP tobacco smoking among a college student sample. **METHODS:** Participants were 894 college students enrolled at a large, Midwestern university. Participants completed measures of WP smoking frequency and quantity and perceived/actual descriptive and injunctive norms of WP tobacco smoking. **RESULTS:** Over one-third of the sample reported ever trying WP smoking, while only 2% reported current (past month) use. When comparing ever and never WP smokers, ever WP smokers reported greater perceived peer approval of WP tobacco smoking. Both males and females overestimated WP smoking frequency of same-sex students at their university. **CONCLUSIONS:** The current study is one of the first to investigate descriptive and injunctive norms of WP smoking among college students. Students who report WP smoking are more likely to overestimate descriptive norms of WP smoking among their peers, suggesting corrective normative feedback regarding actual use by peers may be an important target for WP intervention among college students. Future research should investigate the temporal association between normative perceptions and WP smoking behaviors among college students.

**FUNDING:** None

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## POS3-117

### SEX DIFFERENCES IN SELF-REPORTED EXERCISE DURING A SMOKING CESSATION TRIAL

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**SIGNIFICANCE:** Associations between smoking cessation (SC) and health benefits have been extensively studied, identifying lower risks of lung cancer, heart disease and stroke with cessation. Another potential health benefit of SC is a positive change in exercise levels. Although previous studies have analyzed the effects of exercise programs on SC attempts; it is unknown how exercise habits naturally change during a SC attempt. This study aimed to assess whether exercise levels change during a smoking cessation attempt, and to examine if these changes differ by sex. **METHODS:** Participants were men and women aged 18-60 who were enrolled in a tobacco cessation clinical trial. Godin Leisure-Time Exercise Questionnaire (LTEQ), which assesses physical activity over the past 7 days, was obtained on quit day (Week 0) and at the end of the study (Week 12). Smoking abstinence was assessed by self-report of 7-day point prevalence at Week 12. Paired t-tests were used to assess change in exercise overall, for men and women separately and for abstinent and non-abstinent participants from Week 0 to Week





12. Differences by sex and smoking status were examined using two-sample t-tests for the change in exercise. RESULTS: Participants ( $n=124$ ) were  $36 \pm 9.0$  years of age and smoked  $14 \pm 5.7$  cigs/day. Self-reported exercise level significantly increased from Week 0 to Week 12 for all participants ( $p=0.031$ ). Of those who achieved abstinence during the 12-week trial, exercise levels significantly increased ( $p=0.012$ ) while non-abstinent participants showed no change. For men and women who achieved abstinence, women showed a significant increase in exercise ( $p=0.014$ ) while men did not. Further, abstinent women compared to non-abstinent women showed a significant increase in level of exercise ( $p=0.014$ ). CONCLUSIONS: These findings suggest a positive association between smoking cessation and exercise level, particularly among women. A larger powered study is needed to confirm this relationship and possible sex differences. This study contributes to our understanding of the relationships between smoking cessation, exercise habits and sex differences.

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## POS3-118

### EFFECTIVENESS OF A BRIEF COUNSELING AND BEHAVIORAL INTERVENTION FOR TOBACCO CESSATION IN PRIMARY CARE

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SIGNIFICANCE: Tobacco use remains the most established cause of chronic diseases<sup>1</sup>. The use of behavioral intervention models for tobacco cessation that can help tobacco users and the study of its impact in primary care constitute a public health priority. The present study aims to examine the effectiveness of tobacco cessation counseling intervention on intention to quit among patients in primary care settings in India. METHODS: A quasi-experimental study was conducted among 1382 patients visiting primary care facilities in two states of India in 2016. This study compared: the intervention arm which comprising intensive counseling (5As: Ask, Advise, Assess, Assist, Arrange) and the control arm comprising of routine advice by the physicians. Change in intention to quit in 30 days was the primary outcome measured at two time points (baseline (2015) and end line (2016)). Adjusted logistic regression model was applied using intention to treat principle. RESULTS: About half of the patients were willing to quit tobacco in 30 days. An increase of 37% was observed from baseline (40%) to end-line (77%) in intention to quit tobacco among patients in intervention units as compared to the 5% increase in control units. Respondents who were smokers and received tobacco cessation counseling were about two times more willing to quit tobacco use in intervention units as compared to those who have received routine care in control units (intention to treat analysis; OR=2.30; CI=0.30-3.8;  $p$  value=0.02). However, results were not significant for smokeless tobacco users. CONCLUSIONS: A primary care behavioral intervention ('5A' model) for tobacco cessation is effective in motivating smokers to quit tobacco. The intervention may act as a viable option to be included in the routine care practices in primary care settings of India. There is a need to develop targeted interventions for smokeless tobacco. More large scale studies on effectiveness and cost-effectiveness of tobacco cessation intervention should be taken up in future.

FUNDING: Nonprofit grant funding entity

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## POS3-119

### A QUALITATIVE LOOK AT PARTICIPANT REACTIONS TO A SMARTPHONE-BASED SMOKING CESSATION TREATMENT

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SIGNIFICANCE: Smartphone-based tobacco cessation applications are increasingly used as an alternative to traditional cessation treatments. Ecological momentary assessments (EMA) can provide real-time data about a participants' mood and environment and this information can inform just-in-time adaptive cessation interventions. However, the frequency of EMAs can be burdensome for participants. The inclusion of a qualitative component to studies that collect EMA data can further inform the design and implementation of smartphone based interven-

tions. METHODS: This ongoing pilot study is a 3-armed randomized clinical trial that compares a real-time automated smartphone intervention (Smart-T2), the free NCI QuitGuide smoking cessation application, and an in-person smoking cessation treatment. All participants are prompted to complete 5 EMAs of mood, cravings, activities, etc. each day. In an effort to assess participant attitudes and experiences with the EMA application, semi-structured qualitative interviews are completed when participants return study phones after 5 weeks. RESULTS: A total of 13 participants were interviewed and reported smoking an average of 27.4 ( $SD=9.9$ ) cigarettes per day. Participants were primarily male (61.5%) and white (76.9%) with the average age being 50.8 ( $SD=8.7$ ). Preliminary results show four emerging themes: 1) 11 participants expressed annoyance with the frequent alerts and repetitive EMAs, 2) participants assigned to the Smart-T2 group ( $n=5$ ) reported that the tailored cessation tips were useful in keeping them accountable and helping them to recognize lapse triggers, 3) 3 of the 5 participants assigned to the QuitGuide group reported that they did not access/use the QuitGuide app, 4) participants made suggestions to make the applications more personal, such as asking more open-ended questions and connecting them with others using the same app. CONCLUSIONS: Findings from qualitative data collection can inform future EMA study designs. Implementation of a mixed methods approach could also help researchers to better understand participant burden due to frequent and repetitive questions.

FUNDING: Academic Institution

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## POS3-120

### WOMEN VETERANS RESPONSE TO PROACTIVE, MULTI-FACETED RECRUITMENT TO A GENDER-SPECIFIC TREATMENT PROGRAM, VETERANS ADMINISTRATION LOMA LINDA HEALTHCARE SYSTEM, LOMA LINDA, CA

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SIGNIFICANCE: Tobacco prevalence is higher among Women Veterans (WV) than their civilian counterparts (20.8% versus 15.8%). Post-traumatic stress disorder (PTSD) and major depression are among the top 3 diagnoses for WV, and 20% report military sexual trauma. WV who use tobacco have a >70% prevalence of DSM-V diagnoses. METHODS: We identified all WV as smokers in the electronic health record (EHR),  $n=780/3,750$  total WV in the Loma Linda VA. In July 2015, we designed a "women-only" tobacco treatment program (4 sessions), named "Lady Butt Busters" (LBB). Staff attempted to recruit "unreachable" WVs to the LBB program via personalized, mailed letters (Wave#1) from recent EHR stop-smoking referrals ( $n=350$ ). Wave #2 in 2016; emails and invitation letters were sent to all 683 smoking WVs, reaching 87.5%. Wave #3 in 2017; we contacted all high-risk WVs referred in 1 year to treatment by direct phone calls to engage in LBB education groups. RESULTS: Response rates from proactive mailings in 2015 & 2016 were 2.3% and 1.6%, respectively and 5 women joined a LBB group. Since January 2017, 201/780 WV smokers (24.1%) received LBB direct marketing at women's health or Preventive Medicine clinics or by telephone calls, with 37/201 WVs (18.4%) "agreeing to participate". Only 9/37 WVs (24.3%) came. In June 2017, when all 7 agreed to join a 4-week group, only 5/7 attended at least 1 session. All 5 engaged WVs agreed to join a bi-weekly support group; however, none came on more than 1 session in subsequent weeks. CONCLUSIONS: A proactively-targeted, multi-faceted population approach did not create even a 5% participation in gender-specific treatment in 1 year compared to community standards of 10% expected treatment rates per year for the whole smoking population, which would have equaled 78/780 WV. An engagement rate in the LBB program of 4.5% (9/201 contacted in 2017) indicates the need for understanding barriers faced by WV and more engaging interventions and focus groups. Dual-diagnosis tobacco & mental illness interventions must address gender-specific needs of high-risk WV, who depend on tobacco to cope with life's challenges after military service.

FUNDING: None

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## POS3-121

### FEASIBILITY OF A SUPPORT PERSON INTERVENTION TO ENGAGE SMOKERS WITH MENTAL ILLNESS IN CESSATION TREATMENT

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**BACKGROUND:** An estimated 30-60% of adults with mental illnesses such as schizophrenia, bipolar disorder, and major depression regularly smoke cigarettes. Increasing the use of evidence-based smoking cessation treatment in this population is a significant public health challenge. Social support may be an effective strategy to increase engagement in cessation treatment for smokers with mental illness as it is in the general population. The purpose of this pilot study was to assess the feasibility of a support person intervention linking smokers with mental illness to an online smoking cessation decision aid. **METHODS:** We conducted a 12-week pilot study of a one-session telephone coaching intervention ("Care2Quit") to train non-smoking family members and friends (i.e., support persons) to promote the use of an online cessation decision aid by smokers with mental illness. The primary aim of the study was to assess the feasibility of the support person intervention tailored for supporters of people with mental illness by examining recruitment, retention, adherence, and participant satisfaction. A secondary aim was to explore changes in the hypothesized mechanism underlying the intervention effect (i.e., cessation support provided) and primary outcome (i.e., smoker use of online cessation decision aid). **RESULTS:** Seventeen support persons enrolled of which 94% (n=16) completed the telephone coaching intervention. Eighty-eight percent of support persons rated the intervention as highly acceptable. Self-reported cessation supportive behaviors by the support person increased significantly by 6 weeks post intervention ( $t(15) = -4.64, p < .001$ ). Forty-one percent of smokers (n=7) linked to support persons used the online cessation decision aid by 12 weeks following the support person's telephone coaching session. **CONCLUSIONS:** Preliminary results from this study demonstrate the feasibility of a support person intervention to promote the use of a smoking cessation decision aid among smokers with mental illness. Future research to evaluate strategies for harnessing support from family and friends to link smokers with mental illness to cessation treatment is warranted.

**FUNDING:** Academic Institution; Federal

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## POS3-122

### A LABORATORY STUDY OF TOBACCO USE TRAJECTORY AND ABUSE LIABILITY

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While many individuals use tobacco during their lifetime, only a subset of individuals will become regular users. Prevention efforts may be more effective at reducing regular tobacco use by targeting factors associated with increasing use following initiation, rather than an exclusive focus on abstinence. Fourteen light (fewer than 4 cigarettes per day for  $\geq 1$  year) and 8 regular (more than 7 cigarettes per day for  $\geq 1$  year) adult tobacco users were recruited into a laboratory study to examine the effects of tobacco cigarettes with three nicotine yields (.026, .28, and .68 mg nicotine). Participants completed three two-day blocks, with each block including a 'sample' and a 'self-administration' day, each following 8 hours of nicotine deprivation. On 'sample' days participants administered eight puffs from one of the three nicotine yields, while on the subsequent 'self-administration' days participants could earn up to eight puffs of the nicotine yield sampled on the previous day via a modified progressive ratio procedure. Measures included puffs earned on the modified progressive ratio procedure, ratings of subjective effects, heart rate, and blood pressure. Regular users earned more puffs at all nicotine yields compared to light users, but neither group exhibited changes in puffs as a function of nicotine yield, suggesting that nicotine did not function as a reinforcer under the conditions in this study. Regular users reported dose dependent increases in 'good effects' and 'smoke again,' while light users did not. Heart rate decreased comparably, in a dose-dependent manner, for both groups following smoking. Regular, but not light, users exhibited increased mean arterial blood pressure following the highest nicotine yield. These data suggest that under nicotine deprivation

conditions regular users are more sensitive to nicotine yield than light users on measures of subjective effects but not heart rate.

**FUNDING:** Federal

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## POS3-123

### THE EARLY STAGE OF A SMOKING CESSATION ATTEMPT USING A CIGALIKE VERSUS A TANK SYSTEM E-CIGARETTE: EFFECTS ON SUBJECTIVE SYMPTOMS

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**SIGNIFICANCE:** Compared with tank system, cigalike e-cigarettes have been associated with poorer nicotine delivery and reduced satisfaction. Given that nicotine is the primary reinforcer of smoking behaviour, models with poor nicotine delivery will likely decrease product acceptability and preclude smoking cessation. This study aimed to compare a cigalike and a tank model e-cigarette on smoking behaviours over a 2-week period. **METHODS:** E-cigarette-naïve smokers, willing to quit, (n = 70; 62.9% female) were randomly allocated to either a cigalike-high (18mg/mL nicotine), a tank-high (18mg/mL) or a tank-low (6mg/mL) e-cigarette, following administration of baseline measures of smoking history, dependence, craving, withdrawal and subjective effects. Participants were asked to use the e-cigarette over 2 weeks and report daily e-cigarette use, cigarettes smoked per day (CPD) and subjective symptoms. Carbon monoxide (CO) levels were also collected at baseline, after 1 and 2 weeks. **RESULTS:** CPD, CO and nicotine dependence reduced from baseline to week 1 and 2, there were no differences between conditions. The tank-high and cigalike-high were more efficient in reducing craving compared to the tank-low at baseline ( $p < 0.05$ ). Participants rated the tank-high and tank-low as more satisfying at baseline and week 1, and the cigalike as less satisfying. Higher satisfaction and other positive subjective effects were associated with an increase in puff number and a decrease in CPD and CO. **CONCLUSIONS:** E-cigarettes can help to reduce tobacco smoking in the initial weeks of a quit attempt. Whilst higher nicotine concentrations are more effective in reducing craving, tanks are preferable in achieving satisfaction.

**FUNDING:** Academic Institution

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## POS3-124

### SMOKING AS AN INDEPENDENT RISK FACTOR FOR POSTOPERATIVE DELIRIUM: SECONDARY ANALYSIS OF A RANDOMIZED CONTROLLED TRIAL ON MONITORING DEPTH OF ANESTHESIA

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**INTRODUCTION:** Postoperative delirium (POD) is an adverse complication after surgery affecting attention, awareness and at least one additional cognitive domain [1]. Several patients' predisposing factors as well as surgery-related precipitating factors explain its onset [2]. Among them, with inconclusive evidence, smoking was found to be an independent predisposing risk factor for POD [3-6]. **OBJECTIVE:** To evaluate the independent effect of smoking status on POD in patients undergoing major surgery. **METHODS:** Secondary analysis of the *Surgery -depth of anaesthesia and cognitive function* (SuDoCo)-Study, ISRCTN 36437985 [7]. Multivariate analysis was by logistic regression analysis. **RESULTS:** Overall 870 out of 1277 (68.1%) study participants had complete data on the outcome and all covariates. Of these, 396 (45.5%) were women, 359 (41.3%) had intracavitary surgery, and ~ 97% were classified as having mild to severe systemic disease [8]. The mean age was  $69.8 \pm 6.2$  years and the median surgical time was 150 (60 – 585) minutes. Overall 368 (42.3%) were never-smokers, 390 (44.8%) were former smokers and 112 (12.9%) were current smokers. During one week after surgery, 104 study participants (12.0%) developed POD, 10.1% of never-smokers, 14.4% of former smokers and 9.8% of current smokers (9.8%),  $p = 0.14$ . In multivariate analysis, former smoking compared with never smoking showed a tendency for an independent association with POD (Odds ratio 1.59 (95% confidence



interval 0.96-2.64),  $p = 0.075$ ), after adjustments for predisposing factors such as age ( $p < 0.001$ ), gender ( $p = 0.36$ ), pre-surgical cognitive status assessed with the Mini-Mental State Examination questionnaire ( $p < 0.001$ ), systemic disease status ( $p = 0.29$ ), smoking dependency in current smokers assessed with the Heaviness of Smoking Index ( $p = 0.98$ ) as well as precipitating factors such as site of surgery ( $p = 0.045$ ), length of surgery ( $p < 0.001$ ) and randomization status ( $p = 0.41$ ). Current smoking (Odds ratio 1.02 (95% confidence interval 0.25-4.07),  $p = 0.98$ ) showed no association with POD. CONCLUSIONS: There is weak evidence for an independent association of former smoking with the development of POD.

FUNDING: Academic Institution

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## POS3-125

### PATTERNS OF QUITTING SMOKING AND THE PARTICIPANT EXPERIENCE IN THE BREATHEASY TRIAL: A MIXED METHODS ANALYSIS

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OBJECTIVE: *Breatheasy* is a randomized clinical trial designed to examine the effects of yoga as a complementary therapy for quitting smoking. The goal of this mixed methods analysis is to understand patterns of quitting behavior in this smoking cessation trial. METHODS: Latent Class models (LCMs), identified 4 distinct patterns of change in quitting behavior over time. To further understand differences among the patterns, qualitative analysis of focus group data used pattern assignment to analyze participant comments about their smoking cessation process. RESULTS: The overall sample consisted of 227 participants randomized to Yoga ( $N=113$ ) or Wellness ( $N=114$ ) at baseline. Participants smoked an average of 17.3 (SD=7.6) cig/day at baseline. Mean nicotine dependence was 4.9 (SD=2.1) at baseline. At 8 weeks 28.1% of Yoga participants self-reported 7 day PPA vs. 23.5% of Wellness participants ( $p > .05$ ). Yoga participants reduced their smoking rate from 16.5 cig/day at baseline (SD=7.8) to 6.1 (SD=6.2) at 8 weeks and Wellness participants reported decreases from 17.1 cig/day (SD=7.8) to 6.3 (SD=6.9) at 8 weeks. LCMs supported 4 patterns of quit. Specifically, 16 % of participants quit by week 5 and had high probability of quitting through week 8. 71% of participants were non-quitters; 5% were slow and steady quitters (slope increased over time with high probability of quitting at week 8) and 8% had high probability of quitting at week 4 and a decline in quitting thereafter. Qualitative data examples illustrate each of the four pattern-specific experiences. CONCLUSIONS: There were significant between-group differences in pattern ( $p < .001$ ) with more yoga participants in patterns characterized by successful quitting behavior by week 8. These patterns were also significantly associated with self-reported quit and continuous abstinence at follow-ups. This mixed methods approach may help researchers develop highly-tailored treatments for specific subsets of smokers which could ultimately improve the delivery of smoking cessation intervention and increase cessation success rates.

FUNDING: Federal

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## POS3-126

### TOBACCO USE CHARACTERISTICS AMONG BLUNT AND NON-BLUNT MARIJUANA AND CIGARETTE SMOKERS

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SIGNIFICANCE: African Americans are more likely than other racial/ethnic groups to co-use marijuana and tobacco. Few studies focus on how co-use impacts African American young adults and if methods of marijuana consumption influence tobacco use characteristics. METHODS: An anonymous online survey recruited African American young adults ( $N = 111$ ) aged 18-29 who reported past-month marijuana and cigarette co-use. Participants completed the Fagerstrom Test for Nicotine Dependence and questions about tobacco withdrawal symptoms. Participants were categorized as blunt co-users (i.e., blunt and cigarette use) and non-blunt co-users (i.e., non-blunt marijuana and cigarette use). RESULTS: Blunt co-users reported a higher odds of past-year insomnia ( $OR = 1.21$ , 95% CI = 1.05-1.34), irritability ( $OR = 1.35$ , 95% CI = 1.05-1.58), and tobacco cravings ( $OR$

= 1.15, 95% CI = 1.10-2.31) than non-blunt co-users,  $p < .01$ . Blunt co-users also reported a higher odds of nicotine dependence relative to non-blunt co-users, ( $OR = 2.34$ , 95% CI = 1.45-3.26,  $p < .05$ ). CONCLUSIONS: These findings highlight the adverse impact of smoking blunts in conjunction with cigarettes and the need for targeted interventions that focus on treating both cigarette and blunt use among African American young adults.

FUNDING: Federal

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## POS3-127

### IMPROVING TOBACCO CESSATION SERVICES IN PRIMARY CARE: THE NURSE PRACTITIONER-PATIENT NAVIGATOR TEAM

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BACKGROUND: Tobacco use is the leading preventable cause of morbidity and mortality in the United States. 44% of smokers attempt to quit every year, but <10% are successful without assistance. Counseling and treatment by providers can increase the success rate, to quit rates of > 30%. As part of a quality improvement effort, we set out to proactively identify smokers in our hospital network, so that we could target them for smoking cessation interventions. METHODS: We generated a daily report from the Electronic Medical Record (EMR) of all patients with primary care appointments who were flagged as tobacco users. Referrals were similarly generated from specialty practices. We employed a patient navigator to reach out to these patients either the day of their appointment or subsequently by telephone. Brief counseling was provided by the patient navigator and documented in the EMR. Interested patients were then scheduled to see the nurse practitioner for one on one treatment and counseling and optional group counseling. Certified Tobacco Treatment Specialist (CTTS) training was held for providers, nurses, social workers and community health workers at our institution. RESULTS: During the intervention period, the number of scheduled visits to our practice for tobacco cessation counseling increased by more than 600%. Additionally, 30 people underwent CTTS training including providers, nurses, social workers, and community health workers. Limitations Our no show rate was 40% despite frequent reminders leading up to the appointments. CONCLUSIONS: Identification of tobacco users from the EMR, combined with the presence of a Nurse Practitioner-Patient Navigator team, increased visits for tobacco treatment and counseling. This effort also provided education to health care professionals and community health workers. Our hope is to increase the provision of tobacco cessation service in a variety of clinical settings. IMPLICATIONS: Identification of tobacco users from our EMR combined with reaching out to this population can substantially increase tobacco cessation visits. Future work includes the feasibility of utilizing tele-health and determining tobacco cessation outcomes.

FUNDING: State

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## POS3-128

### EVALUATING THE INFLUENCES OF SOCIAL PRESSURE AND SUPPORT ON DAILY SMOKING ABSTINENCE

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INTRODUCTION: High levels of perceived social support are related to higher smoking cessation success rates. However, few studies have examined the influences of social pressure and support for quitting on lapse during a quit attempt. METHODS: Socioeconomically disadvantaged smokers participating in a smoking cessation program at a safety net hospital completed smartphone-based ecological momentary assessments (EMAs) for two consecutive weeks (1 week pre-quit through 1 week post-quit). A mixed-effects logistic regression model used 1 week post-quit EMAs to evaluate whether perceived social support (i.e., pressure to quit, support to quit, being offered a cigarette) were related to the likelihood of smoking within a day. RESULTS: Participants ( $N=138$ ) were predominantly African American (63.8%) and most (68.7%) reported an annual household income of less than \$16,000. Participants completed 774 out of 966 post quit daily diary EMAs



(80.1%,  $M = 5.6$  EMAs per participant). Perceived social pressure and support to quit were not related to daily smoking status. However, participants were more likely to smoke on days when they were offered a cigarette by others compared to days when no such event occurred ( $OR = 3.34$ ,  $p = .018$ , 95% CI: 1.22 – 9.13). This effect was also significant after adjusting for perceived social pressure to quit and support to quit ( $OR = 3.43$ ,  $p = .017$ , 95% CI: 1.25 – 9.41). **CONCLUSION:** Results indicated that being offered a cigarette may negatively impact smoking cessation among socioeconomically disadvantaged adults in the early stages of a smoking cessation attempt. Future interventions focused on increasing cigarette refusal skills in high risk moments may reduce the likelihood of relapse.

**FUNDING:** Academic Institution; Nonprofit grant funding entity

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## POS3-129

### DUAL USE OF CIGARETTES AND SMOKELESS TOBACCO: PRODUCT USE AND NICOTINE EXPOSURE

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**SIGNIFICANCE:** Smokeless tobacco (SLT) products have been marketed to smokers as a means to reduce risk of tobacco-related diseases or to use in situations where smoking is prohibited. An (un)intended consequence of such marketing may be that smokers supplement rather than replace their cigarettes with SLT. The purpose of this study was to compare product use and nicotine exposure on days when only cigarettes are smoked (single use) versus when both cigarettes and SLT are used (dual use). **METHODS:** Forty-three dual users ( $M \pm SD = 19.3 \pm 8.9$  cigarettes/day;  $4.1 \pm 2.2$  SLT uses/day for  $5.7 \pm 1.6$  days/week) recorded their product use daily for two weeks via an electronic diary. They also collected butts from cigarettes smoked, and a saliva sample for measurement of cotinine, every day during this two-week period. On the final visit, users provided reasons for and beliefs about traditional SLT (e.g., snuff, dip) and/or snus products. **RESULTS:** The number of cigarettes smoked/day, as measured by diary records ( $M \pm SEM = 10.8 \pm 0.3$ ) and returned cigarette butts ( $11.1 \pm 0.3$ ), were correlated significantly ( $r = .62$ ;  $p < .01$ ). Cotinine levels were significantly higher on dual versus single use days ( $M \pm SEM = 375.1 \pm 10.6$  ng/ml versus  $306.1 \pm 18.0$  ng/ml, respectively;  $p < .01$ ), though the number of cigarettes recorded did not differ between these days ( $10.3 \pm 0.7$  versus  $10.8 \pm 0.3$  cigarettes, respectively;  $p > .05$ ). The most commonly reported reason for initiating (72.1%) and continuing (79.1%) use of preferred SLT/snus product was to circumvent indoor smoking restrictions. Most participants believed that traditional SLT (65.1%) and snus (48.8%) are equally as harmful as cigarettes, and that neither traditional SLT (51.2%) nor snus (51.2%) help with quitting cigarettes. A notable portion, however, do believe that these products (37.2% and 20.9%, respectively) could serve as cessation aids. **CONCLUSIONS:** Those smokers sampled here show a pattern suggestive of product supplementation rather than replacement, and consequently increased exposure to nicotine. This pattern of SLT use may be explained by the motivation to use SLT primarily for situations where smoking is forbidden.

**FUNDING:** Federal

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## POS3-130

### BASELINE FACTORS DISTINGUISHING EXCLUSIVE SWITCHING FROM DUAL USE AMONG SMOKERS SWITCHING TO ELECTRONIC CIGARETTES

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**SIGNIFICANCE:** Evidence is mounting that electronic cigarettes (EC) are a less harmful alternative to cigarettes. Given that the benefits of switching to ECs appear more substantial for those who switch exclusively, it is important to identify

factors distinguishing those who adopt ECs exclusively from dual use of cigarettes and ECs. **METHOD:** Cigarette smokers ( $N=40$ ) interested in switching to ECs were provided second generation ECs (e-Go C non-variable battery, refillable atomizers, and choice of 8 flavors in 12 or 24 mg nicotine dosage) to use for four weeks. All participants in the study adopted ECs and are included in the analyses; some made a complete switch from cigarettes to ECs (exclusive users; 43%, 16/37) and some made a partial switch, using both ECs and cigarettes (dual users; 57%, 21/37). Independent samples t-tests compared exclusive users of ECs versus dual users of cigarettes and ECs on demographic, behavioral, and social cognitive factors measured at baseline. **RESULTS:** Relative to dual users of cigarettes and ECs, exclusive users of ECs displayed lower smoking dependence motives,  $p < 0.05$ , more time to first cigarette,  $p < 0.05$ , higher self-efficacy to quit smoking,  $p < 0.01$ , lower perception of ECs as affordable,  $p < 0.05$ , lower risk perception of becoming addicted to ECs,  $p < 0.01$ , and less current use of marijuana,  $p < 0.05$ . Exclusive versus dual users did not differ on demographics; smoker identity, self-rated cigarette addiction, intention to quit, tobacco use norms, disease risk perception, perception of ECs as less harmful than cigarettes, popular, socially acceptable and safe; or carrying cigarettes, recommending ECs to others, exposure to EC advertisements, or alcohol use ( $p > .05$  on all). **CONCLUSION:** Study findings identify baseline factors distinguishing exclusive switching to ECs from dual use of cigarettes and ECs, which is important given the relatively greater harm reduction associated with exclusive switching compared to dual use. Further work, with a larger sample size, is needed to strengthen our understanding of factors associated with switching to exclusive use of ECs to assist smokers achieve greater harm reduction.

**FUNDING:** Academic Institution

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## POS3-131

### DEVELOPMENT OF A TELEPHONE-DELIVERED, GUIDED IMAGERY TOBACCO CESSATION INTERVENTION

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**SIGNIFICANCE:** Telephone quitlines are an effective and highly scalable way to help individuals quit smoking. However quitlines are an underutilized resource, and do not reach certain segments of the population, including males and racial/ethnic minorities. Guided imagery is a form of mind-body therapy that involves controlled visualization of specific mental images. Studies have shown that imagery training results in significantly increased smoking abstinence rates. Imagery is used by a significant number of racially diverse male and female athletes. We hypothesize that guided mental imagery delivered using the quitline "coaching model" could be an effective and disseminable intervention strategy. In addition, this model may be more readily accepted by underrepresented smokers, and may increase the reach and effectiveness of telephone quitlines. The objective of this study is to develop and test the feasibility of a telephone plus website imagery intervention for smoking cessation. **METHODS:** We have developed the telephone guided imagery intervention protocols, materials, and companion website with input from quitline personnel, a community advisory board, expert consultants, focus groups, and user groups of male and female, racially- and ethnically-diverse smokers in preparation for a randomized clinical trial. **RESULTS:** We will present findings on our development process, and how we created the program content and materials for use with a wide range of smokers. We will share lessons learned, and provide an overview of the guided imagery intervention protocol and program materials. **CONCLUSIONS:** The results of this study have the potential to improve public health through a novel tobacco cessation intervention, and increase the reach of telephone quitlines by offering an alternative approach to standard services.

**FUNDING:** Federal

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## POS3-132

### IMPACT OF E-CIGARETTES ON SMOKING AND RELATED OUTCOMES IN VETERAN SMOKERS WITH PSYCHIATRIC COMORBIDITY

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**SIGNIFICANCE:** Improved modalities for reducing tobacco-related harm in smokers with comorbid psychiatric illness are needed. Because electronic cigarettes (e-cigarettes) can deliver physiologically relevant levels of nicotine, they represent an additional nicotine delivery system that could be used in cessation interventions. While current data suggests that e-cigarettes can promote a reduction in combustible cigarette use, smoking quit rates appears to be low. The goal of this study was to examine impact of e-cigarette use on combustible tobacco use, as well as on the readiness to quit smoking and on changes in nicotine dependence, in a multi-morbid population. **METHODS:** We conducted a 4-week, open label study in 43 military veteran smokers who were receiving psychiatric care from the VA healthcare system and who had no immediate intention to quit smoking. Participants were provided with a study e-cigarette they could use ad libitum, along with other tobacco products, and were encouraged to attend weekly laboratory visits and a one-month follow-up visit. Main outcome measures were number of cigarettes smoked per day (CPD), the frequency of e-cigarette use, the amount of money spent on combustible cigarettes (U.S. dollars/week), alveolar carbon monoxide (CO) levels, and urine cotinine levels. **RESULTS:** Mean e-cigarette use was 5.7 days per week and only 9% of participants used the e-cigarette for less than 4 days per week. Significant reductions in breath CO and CPD were observed across study weeks, and no serious adverse events were reported. Three participants (10% of completers) reported smoking cessation that was corroborated biochemically. At one-month follow-up, motivation to quit smoking remained significantly higher, and nicotine dependence severity was significantly lower, than at baseline. **CONCLUSIONS:** E-cigarettes are acceptable to smokers with psychiatric comorbidities, as indicated by sustained and frequent e-cigarette use by 90% of participants. E-cigarette use can promote reduction and/or cessation of combustible cigarette use and represents a viable harm reduction modality for established smokers with psychiatric comorbidities.

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## POS3-133

### MOTIVATION FOR TOBACCO CESSATION AMONG POSTMENOPAUSAL FEMALES: A PILOT STUDY

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**SIGNIFICANCE:** Postmenopausal (PM) female smokers continue to smoke despite significantly increased health concerns (Michnovicz et al., 1986; Tanko & Christensen 2004). This population faces several unique barriers to cessation surrounding the menopausal transition, including concerns related to affect, weight, and menopausal symptoms (McVay & Copeland, 2011). Understanding how these barriers affect motivation to make a quit attempt is integral to improving cessation treatments for these female smokers. **METHODS:** In the present study, PM female smokers ( $n=22$ ) were randomized to receive a brief-motivational intervention or control treatment. At baseline, participants completed Positive and Negative Affect Schedule, Smoking-Related Weight and Eating Episodes Test, and Menopause Rating Scale. The Motivation to Stop Scale and University of Rhode Island Change Assessment were completed both pre- and post-treatment and one week following treatment. **RESULTS:** Participants provided information regarding smoking habits, including cigarettes per day ( $M=18.18$ ,  $SD=9.36$ ) and pack years ( $M=30.98$ ,  $SD=19.78$ ). Prior to treatment, increased menopausal symptom severity was related to increased motivation to stop smoking,  $r(20)=0.50$ ,  $p=0.02$ . Increased positive affect,  $r(20)=0.45$ ,  $p=0.04$  and smoking to prevent overeating,  $r(20)=0.43$ ,  $p=0.04$  were related to increased readiness to quit at baseline. Regardless of treatment group, participants' readiness to quit increased over time,  $F(2,20)=3.32$ ,  $p=0.04$ , with highest reports of readiness to quit at follow-up, ( $M=8.78$ ,  $SD=2.21$ ). Cigarettes per day (CPD) decreased to 11.97 ( $SD=5.68$ ) at follow-up, representing a decrease of approximately 6 CPD. There were no significant differences in motivation/readiness to quit or CPD between treatment groups. **CONCLUSIONS:** Results provide relevant insight into

the relationship between barriers to smoking cessation and motivation to quit smoking. Health care providers may increase readiness to make a quit attempt among PM females by asking patients about their smoking habits and querying about desire to make a quit attempt following the initial intervention.

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## POS3-134

### ACCEPTABILITY OF A TELEMEDICINE CARDIOVASCULAR DISEASE PREVENTION INTERVENTION FOR ALASKA NATIVE MEN AND WOMEN WHO SMOKE CIGARETTES

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Alaska Native (AN) people have high smoking prevalence and an increased risk for tobacco-related disease and death. In 2016<sup>2</sup>, the adult smoking prevalence overall in Alaska was 22% vs. 42% for AN adults. The Healing and Empowering Alaskan Lives Toward Healthy Hearts (HEALTHH) study is a telemedicine-delivered, two-group RCT in Alaska's rural Norton Sound Region. The HEALTHH study aims to identify acceptable and efficacious interventions for tobacco use and other risk behaviors for AN people in rural communities. With two active intervention arms, the groups are: 1) smoking + physical activity vs. 2) native diet + adherence to heart medications. Both groups, with different behavioral targets, receive video teleconference (VTC) based, stage-tailored counseling sessions, printed personalized reports, and stage-tailored manuals. The VTC sessions take 30 min to complete and are done at baseline and 3, 6, and 12-months. Here, we report on participants' satisfaction with the VTC sessions. A total of 197 participants have been randomized to a treatment group (50% women; age  $M=47$ ,  $SD=14$ ,  $R: 19$  to  $81$ ). At the end of each VTC session, participants rate the program on a 1-10 scale, where 1 = no desire and 10 = high desire to recommend the program to friends or colleagues. Satisfaction with the VTC counseling is high overall ( $M=8.6$ ,  $SD=2.2$ ) and by group (Smoking+PA  $M=8.4$ ,  $SD=2.1$ ; Diet+Med  $M=8.7$ ,  $SD=1.7$ ). Further, satisfaction scores have remained high overtime:  $M=8.4$  ( $SD=2.4$ ) at baseline, 8.9 ( $SD=2.1$ ) at 3 months, 8.6 ( $SD=2.3$ ) at 6 months, and 8.6 ( $SD=2.4$ ) at 12 months. Satisfaction is comparable for the hub community of Nome ( $M=8.5$ ,  $SD=1.7$ ) and the more remote communities ( $M=8.6$ ,  $SD=2.0$ ). Scores also are high for men ( $M=8.4$ ,  $SD=1.6$ ) and women ( $M=8.7$ ,  $SD=2.1$ ) and do not correlate with age ( $r=.15$ ,  $p=.03$ ). With novelty and reach to remote communities, a telemedicine-based intervention has demonstrated acceptability overall and with high sustained ratings among AN smokers of different gender and age groups. The approach appears appropriate for the population. Assessments of smoking and related behaviors are being collected out to 18-month to determine treatment efficacy.

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## POS3-135

### ENROLLMENT STRATEGIES OF THE HEALING AND EMPOWERING ALASKAN LIVES TOWARD HEALTHY HEARTS (HEALTHH) STUDY

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Alaska Native (AN) people have high smoking prevalence with increased risk for disease and death. The HEALTHH study is a telemedicine-delivered, two-group RCT in the Norton Sound Region (NSR) of Alaska; a region with 16 communities and populations ranging from 107 to 3,695. Here we summarize recruitment efforts, challenges, and identify best practices for research in this rural and geographically remote area. Eligibility criteria are: AN adults 19+ years old, in the NSR, smoking 5+ cigarettes per day, English speaking, with BMI < 50, not pregnant, not in a tobacco cessation program, and identified with high blood pressure (BP) and/or high cholesterol. Study staff travel to the communities to recruit and enroll participants, staying upwards of 1 to 2 weeks. Here, we summarize recruitment (counts, %) by day in each community and the association between community size and





enrollment. Since June 2015, the team has made 85 trips to the communities and screened 779 individuals. Of the 438 ineligible, 68% had normal BP or cholesterol. Most screenings occurred on Day 2 (n=201, 26%), Day 3 (n=200, 26%), and Day 4 (n=165, 21%), with Day 1 (n=59, 8%) focused on community outreach and coordination with the local clinic. To date, 210 participants have enrolled (50% women; age M=47, SD=14, R: 19 to 81; smoking M=12 cigarettes/day (SD=11); 65% smoke within 30 min of waking). Enrollment has been greatest on Days 4 (n=58, 28%) and 3 (n=57, 27%), with waning return on Days 8+ (0.1%). Community size is significantly correlated with enrollment ( $r=0.81$ ,  $p<.001$ ); a third of the sample comes from the two largest communities. Recruitment challenges include harsh weather, poor internet connectivity, missed appointments, and historical mistrust of research by the community. Recruiting AN men and women smokers in rural Alaskan communities, best practices include: tabling in busy areas, offering flexible times and locations to meet, attending community events, utilizing all forms of media, and collaborating with clinic staff. Study findings can inform future community-based tobacco treatment research trials in rural areas.

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## POS3-136

### THE TOBACCO TREATMENT RESEARCH PROGRAM (TTRP): INTEGRATING RESEARCH AND PRACTICE

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SIGNIFICANCE: Although smoking prevalence has declined to 15.1% among U.S. adults, 22.2% of Oklahomans continue to smoke. Intensive tobacco cessation interventions that include counseling in combination with pharmacotherapy offer the greatest likelihood of achieving abstinence. METHODS: The Tobacco Treatment Research Program (TTRP) provides free tobacco cessation counseling and pharmacotherapy, and also functions as an observational research study. Participants are encouraged to complete 6 weekly counseling sessions (in-person or by phone), and are offered 12 weeks of combination nicotine replacement therapy. Brief assessments are completed on tablet computers at each visit and focus on sociodemographic factors, tobacco history, medication adherence and side effects, withdrawal symptoms, stress, mental health, sleep disturbance, and self-efficacy. Smoking status is assessed by self-report and expired carbon monoxide. Participants are compensated with \$20 gift cards for completing key follow-up visits at 5, 13, and 27 weeks post-enrollment. RESULTS: A total of 152 participants were enrolled between Oct. 2016 and Aug. 2017. Participants were primarily female (63.2%); and of White (55.9%), Black (25%) or American Indian (6.6%) race. The average age of participants was 51.8 (SD=11.4) years, with 19.3% reporting less than a high school education and 49.1% reporting an annual household income of less than \$11,000. Participants smoked an average of 17.3 (SD = 9.9) cigarettes per day and had been smoking for 31.0 (SD=13.1) years. Of those enrolled, 63.8% tried electronic cigarettes at least once, while 20.4% had used these products in the past 30 days. To date, 132 participants have reached the 5-week follow-up visit (16.7% were biochemically-verified abstinent; an additional 4.5% self-reported abstinence via telephone [21.2% abstinent]) and 86 have reached the 13-week follow-up visit (16.3% were biochemically-verified abstinent; an additional 5.8% self-reported abstinence via telephone [22.1% abstinent]). CONCLUSIONS: The TTRP offers a valuable resource that benefits the community while facilitating tobacco-related research in Oklahoma.

FUNDING: State

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## POS3-137

### TAPPING NONSMOKERS TO HELP SMOKERS: RESULTS OF A LARGE RCT

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Nonsmokers play a key role in turning social norms against smoking. Anti-smoking social norms have been shown to increase the rate of cessation in the population. Given the large number of nonsmokers, it is likely that smokers have a number

of nonsmokers in their social network who could be activated to help them. The aim of this study was to demonstrate that targeting nonsmokers with a relatively low-intensity direct mail intervention can be an effective way to increase the cessation rate for smokers in the same household. Households with smoker-nonsmoker pairs (N=3,102) were recruited through 211 resource and information hubs in California and Oklahoma, stratified by recruitment site, and randomly assigned to one of three conditions. Conditions differed by who was identified as the target of a sequence of mailings. The control group (CG) received a single mailing thanking them for their participation in the study. The two intervention groups received a series of 10 mailings which differed in whether they targeted the nonsmoker (TN) or the smoker (TS). The program was branded as Project BEST: Bring an End to Smoking—Together. Mailings included booklets, fact sheets, videos, posters, etc. designed to be interesting and informative for the recipient. The key message for nonsmokers was "Quitting is hard. You can help." For smokers it was "Quitting takes practice. Keep trying." All participants were evaluated at 7-month post randomization. The results show that at 7-month, the percent of smokers quit for at least 30 days were 26.3% (95%CI 23.2-29.4), 29.2% (95%CI 28.0-32.5), and 17.4% (95%CI 14.7-20.0) for TN, TS, and CG, respectively. Targeting nonsmokers to help smokers quit is an effective intervention. Nonsmokers are a largely untapped resource in tobacco control, and there is great potential to mobilize them to help smokers quit.

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## POS3-138

### YOUNG ADULT SMOKERS PROMOTE MORE PRO-SMOKING BELIEFS THAN MIDDLE-AGED OR OLDER ADULTS AFTER A CANCER DIAGNOSIS

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SIGNIFICANCE: Continued smoking after a cancer diagnosis is surprisingly common. To understand this behavior, we explored differences in cancer patients' beliefs about the dangers of smoking, depending on their age. METHODS: The sample consisted of 908 oncology patients who smoked cigarettes in the past 30 days. In a self-report survey, participants rated a series of statements about the potential harms of smoking. Statements focused on beliefs about whether smoking causes cancer; whether smoking can lead to a second cancer; whether smoking interferes with the efficacy of cancer treatment; whether smoking exacerbates the side effects of treatment; and whether quitting smoking can improve health once advanced cancer is reached. Patients rated each statement as *Very True* (0), *Somewhat True* (1), *Somewhat Untrue* (2), or *Very Untrue* (3). Differences between young adults (18-39 years; n=113), middle-aged adults (40-64 years; n=545) and older adults (65-100 years; n=239) were examined. RESULTS: ANOVAs revealed that beliefs about smoking leading to *second* cancers, interfering with cancer treatment, and exacerbating side effects of treatment were all related to age, [ $F(2, 622)=3.517$ ,  $p=.03$ ;  $F(2, 556)=3.968$ ,  $p=.019$ ;  $F(2, 539)=4.24$ ,  $p=.015$ ], respectively. Similarly, age was related to the belief that quitting does not improve health after advanced cancer, [ $F(2, 511)=3.271$ ,  $p=.039$ ]. Post-hoc comparisons revealed that young adults were consistently less likely to acknowledge the risks of tobacco use than middle-aged or older adults. Young adults were less likely than middle-aged adults to believe smoking leads to a second cancer ( $M=2.6$ ,  $M=2.38$ ), respectively, and more likely than older adults to believe quitting won't improve health after advanced cancer ( $M=1.19$ ,  $M=1.64$ ), respectively. Young adults were less likely than middle-aged adults to believe that smoking decreases treatment efficacy ( $M=2.53$ ,  $M=2.28$ ) and exacerbates side effects ( $M=2.55$ ,  $M=2.24$ ). CONCLUSIONS: Young adults were more likely to promote pro-smoking beliefs after a cancer diagnosis. Perhaps young adults are an important age group to target when implementing cessation programs in oncology clinics.

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**POS3-139****VARENICLINE AND CHANGES IN COCAINE AND OPIOID USE AMONG METHADONE MAINTAINED SMOKERS IN THE BRONX, NEW YORK**

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**SIGNIFICANCE:** Up to 92% of methadone maintenance treatment (MMT) patients smoke cigarettes. MMT patients also have high prevalences of other opioid and cocaine use. Varenicline aids in smoking cessation and may reduce use of other drugs by acting on shared reward and withdrawal pathways. Research on varenicline and cocaine use in MMT patients has been limited by small samples and no research has examined varenicline's potential to decrease use of other opioids. This study examined changes in cocaine and opioid use in MMT patients in a clinical trial of varenicline for smoking cessation. **METHODS:** 109 MMT patients who smoke (47% male, 53% Hispanic), recruited from three MMT centers in the Bronx, NY, were enrolled in a 12-week double-blind randomized placebo-controlled trial of varenicline between 8/2009 and 9/2011. Drug use was assessed through urine toxicology tests collected six months prior to and during the intervention period. The relationship between treatment arm (varenicline, placebo) and drug use (cocaine, opioid, and poly-substance use, i.e., use of both opioids and cocaine) was examined using generalized linear mixed effect modeling. Factors in main models included treatment arm and time and adjusted for drug use prior to the study baseline. Outcome variables were opioid, cocaine, and poly-substance use during the intervention period. **RESULTS:** There were no significant associations between varenicline and cocaine, opioid, or poly-substance use during the intervention period. The main effect of past substance use was significant in all analyses. Subjects with higher past substance use had significantly higher substance use during the intervention period. **CONCLUSIONS:** Varenicline treatment was not associated with changes in cocaine or opioid use. Given the high rate of smoking and concurrent drug use by those in MMT, research on other treatment options to reduce concurrent drug use by MMT smokers is needed.

**FUNDING:** Federal

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**POS3-140****DIFFERENCE IN SMOKING-RELATED SYMPTOMATOLOGY BETWEEN PREGNANT AND NON-PREGNANT SMOKERS DURING AD LIBITUM SMOKING AND FOLLOWING OVERNIGHT ABSTINENCE**

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**INTRODUCTION:** Women who smoke have more difficulty quitting and maintaining long-term smoking abstinence compared to men. Evidence on addictive behavior suggests that sex hormones (i.e., progesterone) may play a role. This study's aim is to explore differences in smoking-related symptomatology (SRS; craving, urges, affect) between pregnant smokers (high progesterone) and non-pregnant smokers (low progesterone) during ad libitum smoking and following overnight abstinence. We expected that pregnant smokers would experience less severe SRS during ad lib smoking and following overnight abstinence. **METHODS:** Participants were pregnant (16-37 weeks gestation) or non-pregnant smokers (oral contraceptive users) who were enrolled in a laboratory-based study. SRS was measured by self-reported validated measures (MNWS, PANAS, and QSU) during ad libitum smoking and following overnight abstinence. Differences in SRS were assessed using linear regression with univariate and multivariate analyses. Nicotine dependency was calculated using Fagerstrom (FTND) at baseline. **RESULTS:** Participants (n=127) averaged 25.2 (±4.25) years of age, were mostly white (62.2%), and smoked 11.2 (±4.3) cigarettes per day. During ad libitum smoking, pregnant smokers had higher scores for craving (2.10 vs. 1.50, p=0.003) and withdrawal (4.71 vs. 2.83, p=0.04) compared to non-pregnant smokers. Following overnight abstinence, pregnant women had higher scores for craving (3.25 vs. 2.63, p=0.003), withdrawal (8.31 vs. 5.57, p=0.01), urges (51.30 vs. 41.80, p=0.002) and negative affect (17.18 vs. 14.59, p=0.02) compared to non-pregnant smokers. After adjusting for FTND scores at baseline, none of these associations remained significant. **DISCUSSION:** Contrary to our hypothesis, smoking-related symptomatology was more severe in pregnant women compared to non-pregnant women during ad libitum smoking and following overnight abstinence. However,

after adjusting for dependency, this association was no longer significant. Future studies should obtain absolute progesterone levels, include a larger sample size and collect several days of SRS to further investigate the relationship between progesterone and SRS.

**FUNDING:** Federal

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**POS3-141****MENSTRUAL PHASE DIFFERENCES IN THE RELATIONSHIP BETWEEN LEISURE TIME EXERCISE AND MOOD AMONG TOBACCO SMOKERS**

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**SIGNIFICANCE:** Exercise continues to be studied as treatment for sustainable smoking cessation. The effects of exercise on smoking relapse risk factors (i.e., mood) may differ by menstrual phase. Understanding the effect of exercise on women attempting to quit is important for the development of exercise as a cessation strategy. Our aim is to explore how exercise may impact mood in female smokers and how this differs by menstrual phase. **METHODS:** Participants were smokers aged 18-45 participating in a tobacco cessation trial. Participants completed two visits prior to randomization, screening (SC) and baseline (BL). Women completed the SC visit in the follicular phase (FP) and the BL visit in the luteal phase (LP) of their menstrual cycle. Self-reported data on leisure time exercise (LTEQ) and mood (POMS) were collected. The POMS is reported as 6 subscales of mood. Linear regression was used to test the relationship between exercise and mood among women in each phase. Interaction terms were added to look for menstrual phase differences. **RESULTS:** Participants (n=98) were 36±7 years of age. For women in the LP, there was a positive association between LTEQ and Vigor ( $\beta \pm SE$ ) (0.74±0.26, p<0.01). This was not true for women in the FP (0.26±0.21, p=0.21). Women who reported higher exercise levels in FP also reported higher Confusion and Anxiety, but in the LP, women who reported higher exercise levels reported lower Confusion and Anxiety, (Confusion F 0.05±0.03 v L -0.01±0.03, p=0.02) (Anxiety F 0.02±0.03 v L -0.03±0.03, p=0.049). Similar trends were observed in additional mood subscales: Fatigue (F 0.05±0.03 v L -0.01±0.04, p=0.09), Anger (F 0.03±0.04 v L -0.05±0.04, p=0.06) and Depression (F 0.02±0.04 v L -0.05±0.05, p=0.10). **CONCLUSION:** We found a positive relationship between exercise and negative mood in women during the FP, and the inverse relationship during LP. The LP has been associated with less smoking-related symptomatology (SRS) and better cessation outcomes. The relationship between exercise and mood during the LP may be further evidence of the positive effects experienced during the LP. Further work should include more precise measures of exercise and SRS.

**FUNDING:** Federal

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**POS3-142****VARENICLINE AND NABILONE IN TOBACCO+CANNABIS CO-USERS: VARENICLINE INCREASES OUTPATIENT TOBACCO ABSTINENCE, AND BEHAVIORAL MARKERS OF TOBACCO DEPENDENCE SEVERITY PREDICT INPATIENT CANNABIS RELAPSE**

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**SIGNIFICANCE:** Concurrent use of tobacco+cannabis is common, and predicts poor clinical outcomes. This human laboratory study examined the effects of varenicline on outpatient tobacco cessation, and the effects of varenicline alone and varenicline+nabilone (a cannabinoid agonist), on inpatient measures of withdrawal and relapse to cannabis self-administration. **METHODS:** Non-treatment-seeking tobacco+cannabis users were randomized to active vs. placebo varenicline, and then completed a 15-day outpatient phase. Varenicline was titrated to 1mg BID over days 1-8, and participants were instructed to abstain from tobacco/nicotine



on days 9-15. Next, participants completed a 16-day inpatient phase, consisting of two 8-day medication periods. Each 8-day period included controlled cannabis administration (days 1-2), and maintenance on either nabilone (4mg BID) or placebo-nabilone, in counterbalanced order (days 3-8). Participants remained tobacco-abstinent and on active or placebo varenicline while inpatient. Withdrawal was measured during controlled cannabis administration (days 1-2), and when no active cannabis was available (days 3-5). Relapse was measured on days 6-8, when participants could self-administer cannabis at financial cost. RESULTS: Rates of bio-chemically verified outpatient tobacco abstinence were higher with varenicline vs. placebo, and the varenicline group reported less mood disturbance and tobacco craving during controlled cannabis administration. Nabilone attenuated cannabis withdrawal in both varenicline groups, but did not alter relapse. Predictor analyses revealed that younger age of 1<sup>st</sup> tobacco use, self-reported tobacco use during outpatient days 9-15, and greater tobacco craving during inpatient days 3-5 all predicted cannabis relapse. CONCLUSIONS: Varenicline increased tobacco abstinence rates outpatient, improved mood and reduced tobacco craving inpatient, and did not alter nabilone's effects on cannabis withdrawal or relapse. Overall rates of cannabis relapse were ~30% lower than in prior studies, and tobacco-related variables were robust predictors of relapse. Tobacco cessation may reduce cannabis relapse in some tobacco+cannabis users.

FUNDING: Federal

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## POS3-143

### EXPOSURE TO TOBACCO IN VIDEO GAMES AND SMOKING IN ARGENTINA

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BACKGROUND: Our objective was to assess whether exposure to tobacco in videogames is associated with smoking in adolescents from Argentina. METHODS: We performed a cross-sectional study with 3,646 middle school students from public and private schools in Argentina. Tobacco content in video games was estimated using previously validated methods and adolescent's tobacco exposure was assessed by multiplying tobacco content by the hours per day played (range 0 to 5). Outcome measure was current smoking among video game players. Logistic regression models with random intercepts for school were used to regress current smoking on tobacco exposure and study variables multivariate models were adjusted for age, sex, parental education, rebelliousness, sensation seeking, parenting style of mother and father, technophilia and rules about the use of video games. RESULTS: 3113 students responded to the survey (response rate 85.4%), 1802 boys and 1312 girls; 1658 (92%) boys and 737 (56.2%) girls were gamers and were included in the analytic sample (n = 2442). Mean age was 14.3 years (SD = 1.1), and the prevalence of smoking was 13.8 among boys and 22.0% among girls; 74.5% of boys played more than 1 hour per day compared with 47.7% of girls. High exposure to tobacco as compared to no exposure to tobacco in video games was independently associated with current smoking among girls (OR = 1.78; 95%CI = 1.02 - 3.09) but not among boys (OR = 0.98; 95%CI = 0.64 - 1.51). CONCLUSIONS: Higher levels of exposure to tobacco in videogames were associated with higher likelihood of smoking in girls from Argentina.

FUNDING: Federal

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## POS3-144

### DUAL USERS OF E-CIGARETTES AND CIGARETTES HAVE GREATER POSITIVE SMOKING EXPECTANCIES THAN REGULAR SMOKERS

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SIGNIFICANCE: Recent data indicates that while rates of daily cigarette smoking among youth and young adults (including college students) are declining, elec-

tronic-cigarette (e-cig) use is growing in popularity among these populations. This population tends to view e-cigs as less harmful and less addictive than traditional cigarettes. The goal of the current study was to determine how e-cig users compared with cigarette smokers on smoking outcome expectancies. METHODS: Participants were college undergraduates (N = 1,370) who were 78.7% Caucasian, 13.3% African American, and predominantly female (79%). Participants were divided into smoking status groups depending on their cigarette smoking and e-cig use patterns: nonsmokers (n = 816), e-cig users (n = 319), cigarette smokers (n = 48), and dual users/cigarette and e-cig users (n = 187). Among those who endorsed smoking regular cigarettes (n = 235), 102 reported smoking daily, 70 reported smoking monthly, and 63 reported smoking on a yearly basis. Among the daily smokers, average daily smoking rate was 6.47 (SD = 5.0) cigarettes per day, mean number of years smoking was 3.15 (SD = 3.04), and Fagerström Test for Nicotine Dependence (FTND) average total score was 2.0 (SD = 2.16). All participants completed the Smoking Consequences Questionnaire (SCQ) to assess smoking outcome expectancies. RESULTS: One-way analyses of variance were conducted with smoking status group as the factor and the 4 SCQ scales as dependent variables. Main effects for Positive Reinforcement, Negative Reinforcement, and Appetite/Weight control were significant, whereby dual users consistently reported the highest scores, followed by regular smokers, followed by e-cig users, followed by nonsmokers. The main effect for Negative Consequences approached significance (p = .08), with dual users reporting the highest scores. CONCLUSION: These findings show that dual users of regular cigarettes and e-cigarettes have particularly strong beliefs for positive smoking outcomes, which may place them at high risk for continued smoking and related adverse health consequences.

FUNDING: Academic Institution

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## POS3-145

### SMOKING AND QUITTING DURING PREGNANCY: FORMATIVE DATA FOR THE DEVELOPMENT OF A COUPLE-BASED SMOKING CESSATION INTERVENTION IN ROMANIA

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SIGNIFICANCE: Tobacco smoking is especially harmful for women because, in addition to its effects on mortality and morbidity, it negatively affects pregnancy, reproductive, and offspring health. Smoking rates during pregnancy are high in Romania and other LMIC. This research informed the development and adaptation of a smoking cessation intervention for couples during and after pregnancy in Romania. METHODS: 155 pregnant smokers (74) and ex-smokers (81) women answered a questionnaire while waiting for a prenatal appointment in three obstetrics and gynecological clinics in Cluj-Napoca, Romania. Eligibility criteria included being married or living with a partner and adult age. Pregnancy history, social support, tobacco smoking, motivation, importance, and confidence related to quitting, emotional health, details about the relationship with the partner, partner smoking status, and partner and couple behaviors related to the pregnancy smoking were assessed. Pregnant smokers and ex-smokers were compared to assess correlates of smoking cessation in this sample of Romanian women. RESULTS: Women who quit smoking during pregnancy were more educated (64% graduated college vs 18% among smokers), more likely to be primigravida (65% vs 50%), had lower stress (score 4.45 vs 5.43), and higher self-esteem (score 24.9 vs 22.7). Ex-smokers were more motivated to quit smoking (score 4.9 vs 4.5), assigned a higher importance to (score 9.1 vs 7.2), were more confident in a successful quit decision (score 8.6 vs 6.3), reported higher dyadic coping dealing with the stress related to a quit decision (score 30.5 vs 28), and had more positive couple interactions regarding their smoking (score 10.2 vs 7.3) than women who continued to smoke during pregnancy. All group differences were statistically significant (p<0.05). DISCUSSION: The results of this study lend support to pregnancy smoking cessation behavioral interventions that focus on motivation enhancement and partners in a couple working together as a team to enhance the likelihood of long-term quitting.

FUNDING: Federal

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## POS3-146

### THE INFLUENCE OF MENTAL HEALTH ON SMOKING CESSATION AMONG SOCIOECONOMICALLY DISADVANTAGED SAFETY NET HOSPITAL PATIENTS

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**BACKGROUND:** Previous research has demonstrated associations between socioeconomic status, mental health, and smoking. **OBJECTIVE:** The purpose of the current study was to describe the mental health of adults seeking treatment at a safety net hospital smoking cessation clinic, and to characterize the influence of mental health on smoking cessation. **METHODS:** Participants were adults enrolled in a tobacco cessation program at a safety net hospital, who were also participating in a randomized trial to evaluate the effectiveness of offering small financial incentives for smoking abstinence. The Patient Health Questionnaire (PHQ), Loneliness Scale, Perceived Stress Scale (PSS), Urban Life Stress Scale (ULSS), and Center for Epidemiological Studies-Depression scale (CES-D) were administered 1 week prior to quitting, and smoking status was assessed 4 weeks after the scheduled quit attempt. Descriptive analyses were conducted to describe the mental health of study participants. Logistic regression models were evaluated to determine the associations between pre-quit mental health variables and smoking status 4 weeks after the quit attempt. **RESULTS:** Participants (N=146) were predominantly female (58.9%) and African American (62.3%), with an average age of 52.2 (SD=7.3) years. More than half of the sample (55.5%) had an annual household income of < \$12,000 per year. PHQ probable major depression was indicated for 14.4% of participants and 43.8% scored > 16 on the CES-D suggesting significant distress. After adjustment for covariates, analyses indicated that probable major depression, OR=4.40, 95% CI (1.22, 15.81), greater ULSS scores, OR=1.04, 95% CI (1.003, 1.07), and greater CES-D scores, OR=1.04, 95% CI (1.001, 1.07), were each associated with a greater likelihood of non-abstinence 4 weeks after the quit attempt. **CONCLUSIONS:** Depression is common among socioeconomically disadvantaged individuals seeking smoking cessation treatment, and poorer mental health had an adverse impact on smoking cessation. Integrated interventions that address mental health concerns during smoking cessation treatment may be beneficial for individuals of lower socioeconomic status.

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

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## POS3-147

### USING DIGITAL PHENOTYPING TO PREDICT SMOKING BEHAVIOR DURING A QUIT ATTEMPT

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**SIGNIFICANCE:** Although more than 50% of smokers make a quit attempt each year, most quit attempts are unsuccessful. Technological advances in wearable devices enable the collection of physical activity and sleep data throughout a smoker's quit attempt. Novel statistical methods applied to these digital phenotyping data provide the opportunity to identify critical antecedents of a smoking relapse with the goal of developing more targeted treatment strategies. To this end, we evaluated the role of physical activity and sleep quality as predictors of the ability to quit smoking during a short-term quit attempt. **METHODS:** Forty-five smokers (14 female) completed this study which consisted of two laboratory sessions (one following 24-hour biochemically-verified abstinence and one smoking-as-usual; order counterbalanced) followed by a well-validated model of short-term abstinence (quit week). For the duration of the study (~2-3 weeks), smoking rate was collected via standard timeline followback and subjects wore an armband (SenseWear Armband, BodyMedia, Inc.) which continuously measured physical activity (METs) and sleep quality (% of time spent sleeping while lying down). An autoregressive model and logistic regression were used to relate sleep quality to whether a subject smoked during the quit week. **RESULTS:** During the monitored abstinence period, subjects were abstinent 3.3 days (SD=2.1) and smoked a total of 12.9 cigarettes (SD=15.8). While METs were unrelated to smoking behavior, abstaining from smoking was associated with a decrease in sleep quality. On average, a 10% decrease in sleep quality corresponded with a 5.6% decrease in the probability of smoking (p=0.02). **CONCLUSIONS:** These data indicate that smoking abstinence smoking may reduce sleep quality, which may in turn increase the risk of relapse. These digital phenotyping data highlight the importance of mobile health research

coupled with novel statistical techniques to identify behavioral anomalies that can be used to predict health behavior change. This knowledge can be used to develop more personalized smoking cessation approaches to improve quit rates.

**FUNDING:** Federal

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## POS3-148

### PRENATAL AND POSTNATAL TOBACCO EXPOSURE: IMPACT ON RELATIONAL AND PHYSICAL AGGRESSION IN KINDERGARTEN

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Prenatal tobacco exposure (PTE) poses risk for higher physical aggression in children. Despite a large literature linking PTE to higher child physical aggression, none have examined other forms of aggression such as relational aggression (i.e., removal or the threat of the removal of relationships as the means of harm), the role of continued postnatal exposure (POE), or considered other maternal risks and parenting using a prospective, case-control design controlling for demographic risk factors such as poverty. We examined the association between tobacco exposure and aggression at early school age among a low-income, diverse sample (n=95) of children recruited prenatally with prospective, multi-method assessments beginning in the first trimester of pregnancy. PTE was assessed using self-report, salivary cotinine, and tobacco metabolites in meconium. POE was assessed via child salivary cotinine at 2, 9, 16, and 24 months (averaged). Other maternal risks and parenting constructs associated with prenatal exposure and child aggression were included as possible indirect risk factors: maternal hostility, depression, stress, and dysregulation in infancy as well as maternal aggression and parenting at school age. Child-reported aggression was assessed at Kindergarten. Within linear regression analyses predicting child relational and physical aggression, average number of cigarettes/day during pregnancy (betas = 0.19 - 0.23) and postnatal child cotinine (betas = 0.35 - 0.39) were associated with relational and physical aggression even when controlling for child gender and maternal characteristics [ $F(9,83) = 5.58 - 5.85, p < .001$ ; Rsquared = 0.38 - 0.39]. There was also a significant interaction effect between prenatal and postnatal exposure [ $F(1, 91) = 247.40 - 384.33, p < .001$ , Rsquared = .50 - .55], such that high levels of both prenatal and postnatal exposure was associated with increased aggression. **RESULTS:** replicated the direct effect of PTE and the later development of physical aggression, but also highlighted the cumulative risk of prenatal and postnatal exposure on both child relational and physical aggression.

**FUNDING:** Federal

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## POS3-149

### "IT'S ALL YOUR FAULT, THAT'S WHY YOU GOT IT": A THEMATIC ANALYSIS OF STIGMATIZING INTERACTIONS BETWEEN LUNG CANCER PATIENTS AND MEDICAL PROVIDERS

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**SIGNIFICANCE:** Nearly all (95%) patients diagnosed with lung cancer report perceiving stigma surrounding their diagnosis from family, friends, and their medical providers, with 48% reporting perceiving stigma specifically from medical providers. The negative effects of lung cancer stigma on patient outcomes are widespread and include misreporting of smoking behaviors and avoidance of help-seeking. Perceiving stigma within a medical encounter may be triggered by routine probes about patients' smoking history. In order to promote patient engagement in tobacco cessation services, it is critical to focus on identifying and reducing stigmatizing interactions between lung cancer patients and their medical providers. **METHODS:** We collected qualitative data from 14 lung cancer survivors (4 interviews and 2 lung cancer survivor focus groups), recruited through the Lung Cancer Alliance, a national lung cancer patient advocacy organization. **RESULTS:** Thematic analysis revealed that patient experience with stigmatizing interactions with medical providers can be categorized into the following themes: *repeated*





*probes about smoking* (different medical professionals questioning about smoking; eg, "...you're constantly asked the question, Did you smoke? by every medical professional that comes—you come in contact with"); *presumptions about the patient* (making pre-conceived notions about patient's smoking behavior; eg, "...as I'm laying on the table and we're sitting there watching the PA that was there from cardiology said, Well, you smoked, didn't you?"); *blaming statements* (statements that imply judgment or guilt; eg, "Well, you wouldn't get lung cancer if you didn't smoke."); and *disbelieving the patient* (not believing the patient is telling the truth; eg, "Well, you're still smoking, right? You're sneaking some cigarettes."). Participants also provided a list of do's and don'ts of communication strategies based on their experiences with medical providers. **CONCLUSION:** These findings will help guide the development of effective communication strategies for reducing lung cancer stigma, specifically, training medical providers on strategies to reduce lung cancer stigma.

FUNDING: Federal

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## POS3-150

### EVALUATING THE STRUCTURE OF WITHDRAWAL, CRAVING, AFFECT, AND SIDE EFFECTS DURING SMOKING CESSATION

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Withdrawal, craving, affect, and side effects may all play a role in smoking cessation and relapse. Clinical trials often include questionnaires to measure these ostensibly separable constructs; however, these measures have substantial item overlap. This redundancy may reflect psychometric limitations (e.g., identical items) or conceptual overlap (e.g., negative affect [NA] as both a side effect and withdrawal symptom). These issues pose interpretive challenges in evaluating the relative contributions of each construct in quitting and relapse. To better characterize the number and nature of the constructs assessed in these batteries, secondary analyses were conducted on data from a clinical trial that examined cessation among 1246 smokers randomly assigned to varenicline, nicotine patch, or placebo. The Minnesota Nicotine Withdrawal Scale (MNWS), Questionnaire of Smoking Urges-Brief (QSU-B), Positive and Negative Affect Schedule (PANAS), and a Side Effect Checklist (SEC) were administered one week pre-quit, on the quit date, and one week post-quit. The sample was split into two random subsamples, one for Exploratory Factor Analyses (EFAs) and one for Confirmatory Factor Analyses (CFAs). EFAs across time points indicated a 4 or 5 factor solution was most appropriate. In both solutions, MNWS, PANAS, and SEC items merged to form NA and somatic symptoms factors, though the nature of these factors varied across time. Robust craving and positive affect factors emerged, consisting primarily QSU and PANAS items, respectively. The 5-factor solution yielded a sleep problems factor, with some NA loadings at pre-quit. In the CFAs, both the 4- and 5-factor solution attained acceptable fit; however, the 5-factor solution was superior across time points (e.g., Mean CFI = .95 vs. .94). These results highlight the problematic overlap among withdrawal, NA, and side effects and suggest that measurement of these constructs may be complex over the course of cessation. Planned analyses will examine higher-order factors and directly test measurement invariance to better understand these co-occurring constructs, with the goal of improving assessment of putative treatment mechanisms.

FUNDING: Federal

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## POS3-151

### SMOKELESS TOBACCO USE AND LOW BIRTH WEIGHT CHILD AMONG WOMEN IN A RURAL SETTING OF INDIA

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**INTRODUCTION:** Low birth weight and preterm birth are powerful determinants of morbidity and mortality in newborn babies and infants. It has been known for more than 40 years that babies born to mothers who smoke weigh less than babies whose mothers don't smoke. Smoking during pregnancy also increases the risk

for preterm delivery. In South East Asia smoking among women may be rare, but use of smokeless tobacco is common. There are indications that using smokeless tobacco could be as detrimental to fetal health as cigarette smoking. **AIM:** To study the effect of using smokeless tobacco during pregnancy on babies' birth weight at birth. **Materials and Methods** A prospective cohort study was carried out in a teaching hospital in a rural setup among 54 pregnant women who had used smokeless tobacco product at least once a day for the past six months. The frequency of use was categorized as light (one to four times per day) or heavy (five or more times per day). Commonly used forms of tobacco was betel quid (paan) with tobacco, gutka, and paan masala are chewed and generally retained in the mouth for longer periods. They were followed for a period of seven months and birth weight of the newborn was measured. **RESULTS:** Smokeless tobacco use was associated with an average reduction of 105 g in birth weight (95% confidence interval 30 g to 181 g). The odds ratio for low birth weight was 1.6 (1.1 to 2.4), adjusted by logistic regression for maternal age, education, socioeconomic status, weight, anaemia, antenatal care, and gestational age. The adjusted odds ratio for preterm delivery (< 37 weeks) was 1.4 (1.0 to 2.1); for delivery before 32 weeks it was 4.9 (2.1 to 11.8) and before 28 weeks it was 8.0 (2.6 to 27.2).

FUNDING: None

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## POS3-152

### MENTHOL CIGARETTE USE AND PAIN REPORTING AMONG AFRICAN AMERICAN ADULTS SEEKING TREATMENT FOR SMOKING CESSATION

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**SIGNIFICANCE:** Pain can be a potent motivator of cigarette smoking; nicotine has been shown to inhibit pain; and there is reason to suspect that menthol cigarettes may enhance the acute analgesic effects of nicotine. Up to 90% of Black smokers report using menthol cigarettes, and Black smokers tend to report more severe pain and greater difficulty quitting. No previous research has examined pain reporting as a function of menthol (vs. non-menthol) cigarette use. We hypothesized that daily use of menthol cigarettes would be associated with lower current pain intensity, and less pain and functional impairment over the past three months, among a sample of Black adults seeking treatment for smoking cessation. **METHODS:** Participants ( $N = 116$ ; 70% male;  $M_{age} = 47.05$ ;  $M_{CPD} = 18.1$ ) were recruited to participate in a study testing a novel psychosocial cessation intervention. These data were collected at the baseline session, prior to randomization. **RESULTS:** A series of independent-samples  $t$ -tests indicated that daily mentholated (vs. non-mentholated) cigarette use was associated with lower current pain intensity ( $t = 3.67$ , 95% CI: 1.25-4.19), lower average pain ( $t = 2.96$ , 95% CI: 0.74-3.73), lower pain at its worst over the past three months ( $t = 2.92$ , 95% CI: 0.21-3.32), and less pain-related impairment over the past 3 months for both daily ( $t = 3.40$ , 95% CI: 0.85-3.32) and work activities ( $t = 2.34$ , 95% CI: 0.28-3.43). **CONCLUSIONS:** This is the first study to demonstrate that menthol (vs. non-menthol) cigarette use is associated with lower pain/functional impairment among Black daily smokers. Menthol cigarette use has been linked to the disproportionate burden of smoking-related disease among Black smokers, and enhanced pain-inhibition could contribute to the maintenance of menthol cigarette smoking. These analyses should be replicated among individuals with chronic pain, and those who are not currently planning to quit. Future research would benefit from evaluating the acute analgesic effects of menthol vs. non-menthol cigarette use (e.g., using quantitative sensory testing), and from examining temporal covariation between menthol cigarette use and pain reporting.

FUNDING: Federal

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**POS3-153****ALCOHOL AND OTHER DRUG TREATMENT STAFF AND CLIENT PERCEPTIONS OF ELECTRONIC CIGARETTES: AN AUSTRALIAN PERSPECTIVE**

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**SIGNIFICANCE:** Tobacco smoking rates are as high as 84% in alcohol and other drug treatment settings. Electronic cigarettes containing nicotine e-liquid may potentially assist cessation in a heavily dependent population with high relapse and tobacco-related burden. Given staff and client attitudes are important determinants of provision and uptake of care, it is important to understand perceptions regarding e-cigarettes. This study aimed to examine alcohol and other drug treatment staff and client perceptions regarding nicotine electronic cigarette safety, use and recommendation. **METHODS:** Two surveys were completed: A telephone-administered cross-sectional survey of 427 clients and an online cross-sectional survey of 120 staff from 31 alcohol and other drug treatment services was conducted in Australia, September to October 2016. **RESULTS:** Staff: The majority were non or ex-smokers (79%). Nearly half (48%) of all respondents reported agreeing with the statement that e-cigarettes could help smoker quit tobacco and that e-cigarettes were safer than tobacco smoking (55%). However, only 29% reported that they would recommend e-cigarettes to clients. Clients: Most (93%) reported awareness of electronic cigarettes, and 39% reported ever use. However, only 7% reported current use with 3% reporting it as daily use. Of those reporting ever use, 52% used e-cigarettes with nicotine and 16% were unsure whether it contained nicotine. The most common reasons for trying e-cigarettes were "wanted to just try them" (72%) and "help cut down smoking" (70%). E-cigarettes were commonly purchased at the tobacco shop (22%). **CONCLUSIONS:** Smokers receiving substance use treatment are trialling e-cigarettes to help quit smoking, but few continue with e-cigarette use. This may be due in part to the highly restricted context of e-cigarettes in Australia. This appears to be an opportunity for harm reduction that is being missed. Staff appear to perceive that e-cigarettes may assist cessation but are cautious in recommending their use, this may be due to high restrictions surrounding these products.

**FUNDING:** National Health and Medical Research Council Australia

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**POS3-154****FACTORS ASSOCIATED WITH THE PAIN AND SMOKING INVENTORY AMONG PEOPLE LIVING WITH HIV**

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**SIGNIFICANCE:** People living with HIV (PLWH) smoke at a much higher prevalence than the general US population. Further, the prevalence of pain is higher among both PLWH and smokers. Little is known about the relationship between pain and smoking among PLWH. This study examined variables associated with the interrelation of smoking and pain among a sample of PLWH who are current smokers. **METHODS:** PLWH who reported current cigarette smoking were recruited from the Center for Positive Living (Montefiore Medical Center; Bronx, New York). Participants completed assessments of demographics, smoking, anxiety, depression, and pain. Participants also completed the Pain Smoking Inventory (PSI), a 9-item questionnaire designed to assess the interrelations between perceived pain and tobacco smoking. The PSI has three subscales: pain as a motivator of smoking, smoking for pain coping, and pain as a barrier to quitting. Response options are on a 7-point Likert scale (0=not true at all, 6=extremely true) with total and subscale scores ranging from 0 to 6. A multivariate linear regression was used to analyze the association between the PSI total score and subscales and demographics, smoking level, psychiatric symptoms, and pain. **RESULTS:** One hundred and five participants completed the study (50.5% male; 54.4% Latino/a; Mean age=49.55±8.81). The average total PSI score was M=2.01 (SD=1.87). While controlling for other variables in the model, higher anxiety ( $\beta=0.388$ ,  $p<0.001$ ) and higher current pain ( $\beta=0.444$ ,  $p<0.001$ ) were associated with higher total PSI scores. Seventy-six participants met the criteria for lighter smoking ( $\leq 10$  cigarettes) and 25 participants met the criteria for heavier smoking ( $\geq 11$  cigarettes). Smoking level was not associated with the PSI total score but was

associated with the PSI subscale of pain as a motivator for smoking ( $\beta=0.193$ ,  $p=0.04$ ). **CONCLUSION:** Anxiety and current pain were associated with greater endorsement of smoking for pain-related reasons. Heavier smokers more strongly endorsed pain as motivator for smoking than lighter smokers. Targeting anxiety and pain may be helpful in smoking cessation programs for PLWH.

**FUNDING:** Federal

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**POS3-155****PREDICTING RISK OF IMMINENT SMOKING LAPSE IN REAL TIME USING MACHINE LEARNING**

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**SIGNIFICANCE:** Smoking lapse is influenced by momentary triggers such as mood and environmental context. Machine learning uses algorithms to automatically learn and make predictions from large datasets, making it suitable for predicting dynamic behaviors. The purpose of this study was to apply machine learning classification methods to the prediction of smoking lapse. **METHODS:** Participants were socioeconomically disadvantaged adults participating in a clinic-based smoking cessation program. Participants were loaned smartphones and prompted to complete 5 ecological momentary assessments (EMA) each day from 1 week pre-quit to 4 weeks post-quit, and to self-initiate an EMA whenever they lapsed. EMAs evaluated mood, smoking urge, environmental context, and smoking lapses (i.e., smoking after 24 hours of abstinence). Baseline demographics and all EMA variables reported within 4 hours preceding a lapse were included as potential predictors. Time since last cigarette and last quit attempt, number of prior lapses, and deviations from an individual's average mood (e.g. happiness, sadness, anxiety) over the past 2-days were included in the model. XGBoost, a machine learning library that uses boosted tree ensembles combined with a stratified k-fold cross-validation, was used to identify a lapse prediction model. Receiver operating characteristic (ROC) curve analysis was used to evaluate model performance. **RESULTS:** Participants (N=31) were on average 48 years old, female (77.4%), white (58.1%), and earned less than \$10,000 a year (57.7%). The variables found to be most predictive of imminent smoking lapse (i.e., lapse within the next 4 hours) were related to prior lapse (time since initiation of last quit attempt, time since last cigarette, and prior number of lapses). However, changes in anxiety, sadness, and confidence that smoking would improve mood were also strongly predictive of lapse. The algorithm had a sensitivity of 82.95%, a specificity of 89.04%, and an area under the ROC curve of 0.86. **CONCLUSIONS:** Accurate prediction of smoking lapse using machine learning methods and EMA data can significantly improve just-in-time interventions for smoking cessation.

**FUNDING:** Federal

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**POS3-156****HEALTHY YOUNG ADULT SMOKERS SHOW REDUCED CORTICAL THICKNESS, BUT NOT CORTICAL SURFACE AREA, RELATIVE TO NEVER SMOKERS**

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**SIGNIFICANCE:** Substantial literature suggests reductions in gray matter volume throughout the cerebral cortex in smokers, with some indicating focused abnormalities in the prefrontal cortex, cingulate cortex, and insula. This has been observed among older adults who have smoked for many years and younger smokers who have not. The volume of gray matter in the cerebral cortex is the product the thickness of the cortex and the surface area along its sulci and gyri. Cortical thickness and surface area are associated with different genetic profiles, demonstrate different developmental trajectories, and they are associated with different cognitive, behavioral, and psychopathological phenotypes. While some research has investigated smoking-related differences in cortical thickness, most have studied small samples or have been conducted in samples with comorbid psychopathology. Additionally, no research has been published on the effects of smoking on surface area or comparing the relative importance of cortical thickness and surface



area to differences in gray matter volume in smokers. **METHODS:** The current study used a large open-source dataset to investigate differences in both cortical thickness and surface area between current smokers and never smokers. Participants were 191 smokers and 589 non-smokers (mean age = 29) without significant medical, psychiatric, or substance abuse history. GLM analyses were conducted investigating differences in cortical thickness and surface area in all regions of the cortex, controlling for intracranial volume (i.e., head size), age, gender, income, education, and IQ. **RESULTS:** Correcting for multiple comparisons (false discovery rate  $q < .05$ ), smokers demonstrated greater cortical thinning throughout the frontal and parietal lobes, as well as in the medial temporal lobe and posterior cingulate cortex. No differences were found in cortical surface area. **CONCLUSIONS:** These findings contribute to the literature by providing information about the nature of the morphometric deficits in smokers, which may assist in understanding their origins.

**FUNDING:** Federal

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## POS3-157

### CHARACTERIZING RESPONSE TO CIGARETTES WITH VARYING LEVELS OF NICOTINE IN WOMEN VULNERABLE TO SMOKING DURING PREGNANCY

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**RATIONALE:** Approximately 11% of women are smokers when they become pregnant, but prevalence is higher among socioeconomically disadvantaged women. Smoking during pregnancy among women who are depressed or opioid-dependent is 3- and 8-fold higher, making them particularly vulnerable. Smoking during pregnancy causes catastrophic pregnancy complications and adverse effects on fetal development. Reducing the nicotine content in cigarettes has the potential to reduce the prevalence of cigarette smoking and smoking-related adverse health outcomes in these especially vulnerable populations. We investigated how women of child bearing age at risk for smoking during pregnancy respond to cigarettes with varying levels of nicotine. **METHOD:** Eighty-nine women (18-44 years) completed four sessions where they sampled cigarettes with varying levels of nicotine (0.4, 2.4, 5.2, 15.8 mg/g). All participants had  $\leq$  a high school degree; 47 had no additional psychosocial risk factors, 22 women had past year depression, and 20 women were opioid-maintained. Participants smoked cigarettes through a smoking topography device, completed the modified Cigarette Evaluation Questionnaire (mCEQ) and completed measures of withdrawal before and every fifteen minutes in the hour after smoking. **RESULTS:** All women had significantly smaller total puff volume, mean maximum flow and puff number when smoking 0.4 mg/g v. 15.8 mg/g cigarette. All mCEQ subscale scores (e.g., Satisfaction, Psychological Reward) decreased across doses ( $p$ 's  $< .05$ ). The highest dose produced the greatest decreases immediately and one hour after smoking (dose X time,  $p < .01$ ). Depression and opioid dependence did not change responses to cigarettes with varying levels of nicotine. Collapsed across dose, depressed women showed significantly longer inter-puff intervals and higher nicotine withdrawal. **DISCUSSION:** The present analyses suggest very low nicotine content cigarettes have reduced abuse potential but alleviate withdrawal and do not produce acute compensatory smoking among women highly vulnerable to smoking during pregnancy, suggesting they could benefit from a national policy to reduce nicotine content in cigarettes.

**FUNDING:** Federal

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## POS3-158

### READINESS TO INTEGRATE MOOD MANAGEMENT AND SMOKING CESSATION IN PRIMARY CARE

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**SIGNIFICANCE:** Individuals with depression are almost twice as likely to be smokers, have lower long-term smoking abstinence, and experience greater addiction severity and negative mood when quitting smoking. In family health teams (FHT) operating the Smoking Treatment for Ontario Patients (STOP) program, an Ontario based smoking cessation program, 38% of smokers have current or past depression; their 6-month quit rates are significantly lower than patients without depression (33% vs. 40%,  $p < 0.001$ ). Data are lacking on health care providers' perceived readiness to integrate a brief mood management intervention into a family health team setting, especially as part of smoking cessation programming. **METHODS:** A survey was administered to primary care providers based at FHTs to assess their organization's readiness to adopt a mood management intervention as part of the STOP program. The survey was categorized into three components of organizational readiness: motivation, general capacity, and innovation-specific capacity. Each component was scored on a scale of 0 to 7; with 0 indicating least ready and 7 indicating most ready. **RESULTS:** Health care providers from 104 family health teams (68% response rate) completed the readiness survey. Results showed that 68% of providers are motivated to implement a mood management intervention as part of smoking cessation programming in their clinic (score of 5 or higher; Mean 5.38, SD 1.81); 63% reported their organization had the general capacity to implement a mood management intervention (M 5.28, SD 1.67); but only 31% believed that their organization had the specific capacity to do so (M 3.85; SD 1.96). **CONCLUSIONS:** Although most providers recognize the importance of addressing depression concurrently with smoking, and are motivated to do so, there seems to be a need to increase their specific capacities (e.g., feeling prepared to counsel patients on mood management) before starting the intervention. The results of this survey identify specific gaps experienced by FHTs, allowing STOP program planners to provide tailored, data-informed guidance to health care providers about how to strategically allocate limited resources most effectively.

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## POS3-159

### CHARACTERISTICS OF CANCER PATIENTS ENROLLED IN A SMOKING CESSATION CLINICAL TRIAL AND CORRELATES OF SMOKING RATE AND NICOTINE DEPENDENCE

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**SIGNIFICANCE:** Despite the clear link between adverse health outcomes and continued smoking after a cancer diagnosis, there has been little advancement in the development of novel behavioral smoking cessation interventions, particularly those that consider the unique characteristics of the cancer patient population. **METHODS:** This study sought to identify key demographic, disease, affective, and cognitive variables associated with smoking behavior in a representative sample of cancer patients. This study also included a novel concurrent choice task to examine the influence of varenicline on background and cue-elicited cravings. 569 smokers were recruited for a clinical trial among cancer patients examining standard (12-week) vs. extended (24-week) varenicline treatment + smoking cessation therapy. 207 participants (68.6% Caucasian, 51% female, 15±8.2 cigarettes/day) completed an initial cessation counseling session and were used in our analyses. **RESULTS:** Of the sample, 20% identified being in cancer stages 0-2, 21% identified being in cancer stage 3-4, and 58% were in remission or unaware of their cancer staging. The most prevalent cancer site reported was for head, neck, and lung cancer (18.8%), and 44% of all participants reported undergoing treatment within the past month. Multivariate linear regressions were conducted to examine factors that predicted severity of nicotine dependence (FTND) and baseline smoking behavior (cigarettes/day). Greater nicotine dependence was predicted by employment status, reasons for smoking, and levels of craving on the choice task; while increased smoking behavior was predicted by race, cancer site, and reasons for smoking. **CONCLUSION:** By understanding the unique factors under-





lying smoking behavior among cancer patients, future studies can target potential key characteristics in tailoring smoking cessation interventions to overcome the specific barriers to treatment faced by these individuals.

FUNDING: Federal

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## POS3-160

### SMOKING AS A CONTRIBUTING CAUSE OF SUICIDE: CALIFORNIA PROPOSITION 99 AS A NATURAL EXPERIMENT

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**SIGNIFICANCE:** Smokers are at high risk for suicide, but little work has addressed the hypothesis that smoking is a causal risk factor for suicide. One approach to addressing causality is to leverage changes in state-level tobacco control policy as an exogenous exposure that leads to reduced population rates of smoking and compare outcomes to a suitable control population. One particularly attractive method for this type of comparison involves the use of "synthetic controls" – a combination of states selected to match the "treated" state in terms of relevant confounders and pre-intervention trends in suicide rates. **METHODS:** California Proposition 99, which was implemented in 1989, reduced per-capita cigarette consumption by as much as 40% over the course of ten years through a combination of cigarette tax increases, restrictions on indoor smoking, and funding for anti-tobacco campaigns. We compared suicide rates in California over the years 1980-2000 with those from a synthetic control state ("synthetic California") matched as closely as possible to California on demographics, alcohol and tobacco control policies, and pre-intervention suicide rates. **RESULTS:** In the 9-years preceding Proposition 99 implementation, average suicide rates in California and the synthetic control unit were perfectly matched at 14.6 per 100,000. California's suicide rate was reduced relative to the synthetic control in all years following the intervention, with the gap steadily growing from -1.3 in 1989 to -3.5 in 2000. Placebo permutation tests confirmed that differences were statistically significant at  $p < 0.01$ . No significant differences were seen in the population 65 and over who were examined as "likely non-smoker" negative controls. **CONCLUSION:** The drop in per-capita cigarette consumption in California following Proposition 99 closely tracked with a drop in suicide rates relative to synthetic California. These results support the hypothesis that smoking contributes directly to suicide risk and corroborate prior work that focused on cigarette excise taxes and smoke-free policies in all 50 states.

FUNDING: Federal

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## POS3-161

### THE EFFECT OF PRICE ON THE SELECTION AND SMOKING OF REDUCED NICOTINE CIGARETTES

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**SIGNIFICANCE:** Despite ongoing research, a number of questions remain regarding the potential effects, outcomes and methods of a FDA policy of gradually reducing nicotine content in cigarettes over time. Questions include how a policy may be received and how alternative products and market forces may impact the use of reduced nicotine cigarettes (RNCs). One of the most effective approaches to reducing tobacco use is taxation; increased cost results in decreased use. This has led behavioral economists to suggest that an effective policy for reducing tobacco use may be to base the price of products on their nicotine content: higher nicotine costing more and low nicotine costing less. Such a price-based policy would exploit competitive market forces and may exert an influence on behavior and product choice. If smokers voluntarily select RNCs because of lower price, the goals of a nicotine reduction policy may be achieved without enacting a forced reduction approach. **METHODS:** The present study conducted a laboratory-based evaluation of the effect of price on the selection of low (0.07mg), moderate (0.3mg) or high (0.7mg) nicotine content cigarettes. The study also examined how smoking behaviors (e.g., puff frequency and volume) were affected by price. Nicotine dependent smokers ( $n=20$ ) participated in a 4-hour lab session where they were

provided with a set allowance to spend on puffs of RNC or regular cigarettes, with the price of each puff being dependent on the nicotine content (high nicotine = high cost; low nicotine = low cost). **RESULTS:** The majority (80%) initially selected either low ( $n=6$ ) or moderate ( $n=10$ ) nicotine cigarettes. Those selecting the RNC products took more puffs ( $M = 6.9$  puffs) with lower puff volume ( $M = 67.2$ ml volume) than those selecting regular nicotine ( $M = 4.5$  puffs; 75.5ml volume). Those selecting RNC products were more dependent (FTND  $M = 4.3$ ) and smoked more cigarettes per day ( $M = 14.8$ ) than those selecting regular nicotine (FTND  $M = 2.8$ ; CPD  $M = 10$ ). **CONCLUSIONS:** Despite rating them as inferior in quality, smokers voluntarily selected RNC products based on lower price. Policy and research implications will be discussed.

FUNDING: Federal

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## POS3-162

### REDUCTION IN BEHAVIORAL AND SOCIAL COGNITIVE RISK FACTORS AMONG SMOKERS SWITCHING TO ELECTRONIC CIGARETTES

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**SIGNIFICANCE:** The harm reducing potential of electronic cigarettes (ECs) is being increasingly recognized. Most studies have focused on biomarkers of toxicant exposure or cardiopulmonary symptoms when switching from cigarettes to ECs. Less research has investigated switching-related changes in behavioral (e.g., substance use) and social cognitive factors (e.g., beliefs about self or perceptions of products) that may maintain persistent tobacco use. Changes in behavioral and social cognitive risk factors among smokers switching to ECs may provide additional evidence of risk reduction. **METHODS:** Cigarette smokers ( $N = 40$ ;  $M_{age} = 30.08$ ; 73% male; 50% Caucasian) interested in switching to ECs were provided second generation ECs (e-Go C non-variable battery, refillable atomizers, and choice of 8 flavors in 12 or 24 mg nicotine dosage) to use for four weeks. All participants adopted ECs and are included in the analyses; some made a complete switch from cigarettes to ECs (exclusive switchers; 43%, 16/37) and some made a partial switch, using both ECs and cigarettes (dual users; 57%, 21/37). Changes in behavioral and social cognitive factors associated with tobacco use were examined from baseline to week 4 using paired samples t-tests. **RESULTS:** Significant changes in several factors were found, including a decrease in smoker identity ( $p < .01$ ), an increase in perceived social acceptability of ECs ( $p < .05$ ), and an increase in ever recommending ECs to someone ( $p < .05$ ). Marijuana usage in the past month decreased ( $p < .05$ ), while past month alcohol use remained unchanged. Perceptions of the popularity, affordability, and safety of ECs also remained unchanged. Intention to quit smoking showed a non-significant increase ( $p = .07$ ). **CONCLUSION:** Study findings add to the evidence base for the harm reducing potential of ECs. Further study with a larger sample size, longer product trial, and a randomized controlled design are needed to bolster the results and improve our understanding of the harm reducing potential of cigarette smokers switching to ECs.

FUNDING: Academic Institution

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## POS3-163

### HORMONAL CONTRACEPTIVE USE IS ASSOCIATED WITH SMOKING MOTIVES

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**INTRODUCTION:** Endogenous sex hormones influence smoking-related outcomes. While hormonal contraceptives (HCs) alter endogenous sex hormones, the effect of HCs on smoking-related outcomes is less known. Therefore, we



sought to explore the association between HCs and smoking motives (SMs). **METHODS:** An online cross-sectional survey was completed by female smokers between the ages of 18 and 35. Survey questions included smoking behavior, SMs (including Wisconsin Inventory of Smoking Dependence Motives and Modified Smoking Evaluation Questionnaire), use of HCs and menstrual cycle regularity. Participants were classified into one of four groups: Cyclical HC users (HC-C; e.g., oral contraceptives, transdermal patch), long-acting HC users (HC-L; e.g., hormonal intrauterine device, injection), naturally cycling in the follicular phase (NC-F; e.g., menstrual cycle days 1 to 8) and naturally cycling in the luteal phase (NC-L; e.g., menstrual cycle days 20 to 30). **RESULTS:** Participants ( $n=734$ ) were, on average ( $\pm$ standard deviation),  $20.7 \pm 2.7$  years old and smoked  $7.3 \pm 6.7$  cigarettes/day. Overall, SMs of HC users were intermediate to those of NC-F and NC-L. Specifically, compared to NC-L, HC-C scored significantly higher on 15 subscales ranging from 13% higher on craving reduction ( $p=0.041$ ) to 35% higher on automaticity ( $p<0.001$ ). In contrast, compared to NC-F, HC-C scored significantly lower on 3 subscales ranging from 13% lower on smoking satisfaction ( $p=0.013$ ) to 15% lower on enjoyment of respiratory tract sensations ( $p=0.018$ ). Similarly, HC-L scored significantly higher on 8 subscales compared to NC-L and significantly lower on 4 subscales compared to NC-F. SMs were greater among NC-F compared to NC-L for 15 of the 18 subscales investigated whereas only two SMs varied by HC-C and HC-L. **DISCUSSION:** These observations suggest that SMs may vary by menstrual phase and that HC may blunt this variation. Additional prospective research is needed to confirm these observations and explore the potential implications for smoking cessation.

**FUNDING:** Federal

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## POS3-164

### DEVELOPMENT OF A TREATMENT WORKBOOK TO FACILITATE EXTINCTION USING VERY LOW NICOTINE CONTENT CIGARETTES

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The availability of very low nicotine content (VLNC) cigarettes presents a unique opportunity to examine their efficacy as a smoking cessation tool. From a classical conditioning perspective, smoking cigarettes with substantially lower nicotine than conventional cigarettes should reduce the expectation of drug reward from smoking, thereby creating optimal conditions for smoking cessation. Accordingly, we developed a workbook entitled "Countdown: Preparing to Quit Smoking with Low-Nicotine Cigarettes." The Countdown workbook, written at a 6<sup>th</sup> grade reading level, was adapted from a prior workbook developed to enhance extinction during a pre-quit period while using Varenicline (Brandon et al., in press). The current booklet was designed as a self-guided intervention to be implemented during a 5-week pre-quit period, using an amalgam of exercises to maximize opportunities for extinction learning while smoking VLNC cigarettes. For instance, participants are instructed to maintain their daily smoking amount and to smoke VLNC cigarettes in various trigger situations that are closely associated with their prior smoking (e.g., being around other smokers, while driving, while bored/stressed/angry, while drinking alcohol). Another technique incorporates use of an extinction retrieval cue, intended to remind smokers of their extinction learning following their quit day. Development of the workbook included several qualitative stages of review involving the project Co-Investigators and off-site expert consultants, with feedback used to enhance the visual appeal of the workbook and its conceptual clarity regarding the theme of facilitating extinction. The qualitative review process also led to a greater emphasis on generating positive expectancies related to VLNC cigarette use; that is, their role in decreasing nicotine dependence, cravings, and withdrawal. Moreover, a catchphrase "Retrain Your Brain!" was incorporated to highlight the underlying theme of facilitated extinction. The workbook is currently being pilot tested among treatment-seeking smokers ( $n=20$ ), and after further refinement will be utilized in a subsequent randomized controlled trial.

**FUNDING:** State

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## POS3-165

### CIGARETTE USE AND DRINKING MOTIVATIONS AMONG COLLEGE-AGED PROBLEMATIC DRINKERS

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**SIGNIFICANCE:** Research has found that college students are at a particularly high risk for binge drinking and roughly 14.7% of college students report using cigarettes during their lifetime. The current study proposed to assess drinking motivations among college students who binge drink and concurrently smoke cigarettes in order to better understand the relationship between alcohol use and cigarette consumption in this at-risk population. **METHODS:** Current college undergraduate students ( $N=254$ ) completed the Alcohol Use Disorders Identification Test (AUDIT), Motivations Questionnaire Revised (DMQ-R), and Smoking Status Questionnaire measures to assess problematic alcohol use, drinking motivations, and smoking use. In the present sample, 27.73% of participants were problematic drinkers (AUDIT score  $>8$ ), of which 53.5% were part of the Greek life system and 60.6% reported ever trying a cigarette. **RESULTS:** Amongst problematic drinkers, those who have tried a cigarette reported greater endorsement of social drinking motives ( $F(1,69) = 12.94, p = .01$ ) and enhancement drinking motives ( $F(1,69) = 15.98, p = .01$ ) compared to non-smoking counterparts. Those who had tried a cigarette also reported greater endorsement of coping drinking motives ( $F(1,69) = 5.67, p = .02$ ). No differences were observed regarding the endorsement of conformity drinking motives. **CONCLUSIONS:** The development of specific, tailored interventions addressing the needs of at risk college students, specifically those who endorse social and enhancement drinking motives is integral. Future research should explore the underlying factors relating to positive reinforcement effects involved in drinking motivations and comorbid cigarette use.

**FUNDING:** Academic Institution

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## POS3-166

### STAKEHOLDER ENGAGEMENT IN THE DEVELOPMENT OF A TOBACCO PREVENTION CLINICAL SUPPORT TOOL FOR PEDIATRIC PRIMARY CARE

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**SIGNIFICANCE:** Following guideline recommendations for interventions to promote tobacco prevention in pediatric primary care, we are developing a patient-facing clinical support tool to screen pediatric patients for tobacco use. The electronic tool will screen for use and susceptibility to conventional and alternative tobacco products, and promote patient-provider communication about tobacco prevention. The development of the tool has followed an iterative process, engaging multiple stakeholders prior to implementation. **METHODS:** During the pre-testing phase, our research team consulted with 7 Citizen Scientists via CTSA-sponsored Implementation Science Studios. Throughout the development phase, we engaged 24 participants from 3 pediatric clinics in provider focus groups. Usability testing of the tool was conducted via in-depth, cognitive interviewing of adolescent patients recruited from the same pediatric clinics. **RESULTS:** Citizen Scientists played a critical role in shaping the design of the tool, contributing to the final selection of educational content and participating in role-play during mock-up patient interviews. Cognitive interviews with patients ensured that all systems were in place for the feasibility trial and assessed ease of navigation. Focus group participants offered substantive recommendations for integrating the tool into clinical workflow and provided input on the intervention's expected acceptability, adoption, appropriateness and feasibility. A key recommendation was to build the electronic tool into the existing patient portal, which furthers its integration with increasingly common clinic processes, streamlines patient accessibility, and reduces clinical burden. **CONCLUSIONS:** The inclusion of multiple stakeholders ensures that the end-user is represented in the development of new interventions. Citizen Scientists can be valuable partners in implementation research. Engaging key stakeholders to discuss implementation outcomes throughout the implementation process can improve the quality, applicability, and relevance of the research, and enhance implementation success.

**FUNDING:** State; Federal

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**POS3-167****SELF-CONTROL AND CIGARETTE USE IN A SAMPLE OF RACIAL MINORITY ADULT SMOKERS**

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**BACKGROUND:** Racial and ethnic minority smokers face a great health burden among smokers and are underrepresented in smoking literature. As such, limited research has been conducted on their smoking-related behaviors. Of specific interest is self-control, as inhibiting the desire or urge to smoke is a key factor in smoking cessation efforts. Given the potential of self-control in smoking cessation efforts, it is important to understand the relationship of smoking and self-control. Little is known about the relationship of smoking and self-control for racial/ethnic minority persons as past research has focused on primarily White samples. The aim of the current study was to examine the relationship between self-control and smoking behaviors in a racial/ethnic minority sample. **METHOD:** Participants (N=43) were self-identified African-American, Latino/a, and Biracial adult cigarette smokers recruited in the Bronx, New York. The relationship between self-report self-control measures (i.e., overall self-control, smoking specific self-control) and smoking behaviors (i.e., cigarettes per day (CPD), nicotine dependence) were examined using hierarchical multiple regressions. Based on preliminary Pearson correlations, age, gender, and marital status were entered as covariates and self-control was entered as the independent variable. It was hypothesized that lower self-control would be associated with greater CPD and greater nicotine dependence. **RESULTS:** Lower self-reported self-control related to smoking was significantly associated with higher levels of nicotine dependence ( $p=0.02$ ). The relationships between smoking-related self-control and CPD, overall self-control and CPD, or overall self-control and nicotine dependence were not significant ( $ps>0.05$ ). **CONCLUSIONS:** In a racial and ethnic minority sample of current adult smokers from the Bronx, greater nicotine dependence was associated with lower self-reported self-control related to smoking but was not associated with general self-control. Targeting self-control for racial/ethnic minorities might benefit from focusing on smoking self-control rather than more general self-control as past research has examined.

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**POS3-168****SMOKERS' EXPECTATIONS OF THE BENEFITS OF LUNG CANCER SCREENING AND THEIR ASSOCIATIONS WITH MOTIVATION TO QUIT, TREATMENT UTILIZATION, AND SHORT-TERM ABSTINENCE**

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**SIGNIFICANCE:** Lung cancer screening using low dose computed tomography (LDCT) presents a novel opportunity for current smokers to be counseled regarding the risks of continued smoking and benefits of quitting, yet its implementation has raised concern about potential negative effects on quitting. Our prior qualitative work demonstrated that smokers receiving LDCT held a number of problematic beliefs about screening that could interfere with quitting. The aim of this analysis was to evaluate smokers' expectations of the benefits of screening and to explore their association with cessation motivation, behaviors, and outcomes. **METHODS:** This is a post hoc analysis of a pilot study testing a novel, telephone-delivered treatment for Veteran smokers undergoing LDCT (n=83; 93% male; 57% with low medical literacy) in the Veterans Health Administration (VHA). A 6-item measure assessing knowledge of the benefits of lung cancer screening was administered within a month after the LDCT test, as were measures of post-screening motivation to quit, utilization of cessation treatment, and smoking abstinence. **RESULTS:** Only 2/83 (2%) were able to answer all items correctly and on average the sample answered 2.8 items (out of 6) correctly. The expectation that a negative screening

result meant that the smoker was safe from lung cancer for 12 months was associated with both lower motivation to quit ( $p=.03$ ), with a trend toward a lower likelihood of quitting ( $p=.07$ ). The expectation that screening decreases lung cancer risk was associated with a lower likelihood of utilizing behavioral support for quitting ( $p=.03$ ). **CONCLUSIONS:** Distorted perceptions of screening benefits were highly prevalent among Veterans receiving LDCT through the VHA, and some of these distorted perceptions may interfere with motivation to quit, engagement in cessation treatment, and abstinence from smoking. Improved communication around risks and benefits of LDCT are needed to address these perceptions and decrease the likelihood that lung cancer screening will have a negative impact on quitting among current smokers.

**FUNDING:** Federal

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**POS3-169****IMPACT AND INFLUENCE OF WATERPIPE TOBACCO SMOKING ON BACTERIAL ORAL FLORA**

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**SIGNIFICANCE:** Waterpipe tobacco smoking (WTS) has significantly increased worldwide. It has become a global public health problem (threat) and a serious global concern. This type of smoking is not a safe alternative to cigarette smoking which is a potential risk factor. The effects of waterpipe tobacco smoking on health outcomes remain unknown. However, few studies investigated and reported the relationship between waterpipe tobacco smoking and adverse health effects (deleterious health effects associated with waterpipe tobacco smoking). Little is known about effects of waterpipe tobacco smoking on oral health (if it can cause oral health problems). The objective of the current investigation is to determine the effect of waterpipe tobacco smoking on the changes in oral microbial flora which is still under investigation. Samples were taken aseptically from the oral cavity and subgingival regions of healthy participants (waterpipe smokers and waterpipe non-smokers). **METHODS:** To identify types, frequency and mean number of microorganisms in cultures from the oral cavity and subgingival regions, standard bacterial culture methods were used. **RESULTS AND CONCLUSIONS:** The present study provides a preliminary proof (evidence) indicating that oral microbial flora is significantly changed (altered) by waterpipe tobacco smoking (linking between waterpipe tobacco smoking and alteration in oral microflora).

**FUNDING:** Jordan University of Science and Technology

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**POS3-170****PREDICTORS OF CIGARETTE AND MARIJUANA CO-USE AMONG YOUNG ADULTS**

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Studies have found those who smoke cigarettes are more likely to progress to using marijuana. Additionally, the combined use of cigarettes and marijuana is highly prevalent in young adults. However, less is known regarding predictors of cigarette and marijuana co-use among young adults. The current study aimed to further investigate possible predictors of cigarette and marijuana co-use among young non-daily smokers. A sample of 740 young adults between the ages of 18 and 24 who reported non-daily smoking enrolled in a longitudinal study and completed an online baseline assessment followed by quarterly assessments. Indicators of negative mood including negative affectivity, stressful life events, and self-efficacy were related to frequency of cigarette and marijuana co-use. These findings suggest young non-daily cigarette smokers may be combining cigarette and marijuana use to cope with stress. A greater understanding of how mood contributes to cigarette and marijuana co-use can aid in the development of early interventions.

**FUNDING:** Federal

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## POS3-171

### ABUSE POTENTIAL OF ELECTRONIC CIGARETTES IN TOBACCO CIGARETTE SMOKERS

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**BACKGROUND:** Electronic cigarettes (ECIGs) aerosolize a liquid that often contains nicotine. ECIGs use is increasing, and few studies have assessed their abuse potential, or the likelihood that ECIG use will become persistent and lead to dependence. This study's purpose was to compare the abuse potential of an ECIG with and without nicotine to combustible cigarettes and a nicotine inhaler. **METHODS:** Cigarette smokers (N=24; 18 male, mean cigs/day=16.3) participated in 4 sessions that differed by product: own brand cigarettes (OB); a 4 mg nicotine inhaler (IN); a 3.3V eGo ECIG with 1.5 Ohm dual-coil cartomizer loaded with 0 mg/ml nicotine liquid (ECIG\_0) that was flavor-matched to participants own brand of cigarettes (i.e. tobacco or menthol); or that same ECIG loaded with 36 mg/ml nicotine liquid (ECIG\_36). During each session participants completed 2, 10-puff bouts, followed by the multiple-choice procedure (MCP), where they chose between 10 puffs of the product and increasing amounts of money. The MCP yields a monetary crossover value: higher values indicate greater reinforcing efficacy. Plasma nicotine concentration was measured before and after product use. **RESULTS:** For OB, the mean (SD) MCP crossover value was \$1.33 (1.2), significantly higher [ $t(23) > 2.3$ ,  $p < 0.05$ ] than IN mean of \$0.41 (0.7) and ECIG\_0 mean of \$0.89 (0.9). No significant differences between OB and the ECIG\_36 mean crossover value of \$1.22 (2.1) were observed. Mean plasma nicotine boost (SD) for OB after bout 1 was 10.1 (10.7) ng/ml, significantly higher [ $t(23) > 4.2$ ,  $p < .001$ ] than IN at 0.7 (2.0) ng/ml and ECIG\_0 at 0.00 (1.4) ng/ml. No significant differences between OB and ECIG\_36 mean of 5.4 (5.4) ng/ml were observed. **CONCLUSIONS:** Participants valued OB significantly higher than ECIG\_0, but not ECIG\_36, suggesting that ECIGs' reinforcing effects at least partially are due to their ability to deliver nicotine, but the reinforcing effects of ECIGs may extend beyond nicotine delivery. Assessing the abuse potential of ECIGs will help inform policies regarding ECIG warning labeling regulations.

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## POS3-172

### LINGERING OVER SMOKING CUES CAN BE PLEASANT: CAN BEHAVIORAL TASKS INFORM FMRI DATA DURING POSITIVE ANTICIPATORY CRAVINGS?

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Understanding the cognitive and motivational dimensions of craving has been a focus of both behavioral and brain imaging studies. While most work has centered on the negative affect linked to unrequited craving, positive affect also has been related to craving (e.g., when smokers anticipate smoking soon). That is, in some cases craving (and exposure to smoking cues) itself may be satisfying—and perhaps even more satisfying than smoking per se. Brain imaging data suggest that opportunity to smoke is related to increased cue-related connectivity among regions implicated in cognitive control and motivation in active smokers, which may reflect cognitive processing linked to savoring the moment of anticipation. We recently reported that under certain conditions, Ps find viewing smoking cues in themselves to be pleasant. Male and female abstinent smokers (N=227) with or without a current interest in quitting (Status) were told they would or would not be able to smoke soon (Allow). Ps rated a series of advertising images pertaining to either smoking or drinking (interspersed) purportedly to be used in a future study. Ps viewed each image (piloted to be similarly pleasant) as long as they wished (TIME) and rated the pleasantness (PLEASANT) of each image using a 1-9 scale. Here we probe further by determining whether being allowed to smoke would lead to a link between TIME and PLEASANTNESS, which we expected would be significantly positive only for Ps who might savor viewing the smoking images. Controlling for status, we computed a pair of partial correlations between TIME and PLEASANTNESS, finding a correlation between the two variables only when Ps were allowed to smoke during the study: ALLOW condition [ $r(113) = .24$ ,  $p < .01$ ; NOT ALLOW  $r(114) = .02$ ,  $p = .81$ . A conservative (2-tailed) Fisher Z contrast revealed a marginally significant difference between these two partial correlations ( $p < .10$ ). Findings reinforce the idea that cognitive (attentional) processes and the

enjoyment of drug cues are linked during positive anticipatory craving, a connection that can be further illuminated by using behavioral data to test predictions derived from neurobiological models.

FUNDING: Federal

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## POS3-173

### THE IMPACT OF NICOTINE DOSE ON THE REINFORCING VALUE OF CIGARETTES IN ADOLESCENTS

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**SIGNIFICANCE:** The FDA has the authority to implement a nicotine reduction policy nationwide, and such a policy may reduce the reinforcing efficacy of cigarettes. However, it is not yet known how different levels of nicotine may affect the reinforcing efficacy of cigarettes for adolescents. As the majority of smokers began during adolescence, studying this population is crucial for understanding the potential effects of such a policy. The aim of the current project was to determine how reduced nicotine content may affect adolescents' potential demand for cigarettes using the cigarette purchase task (CPT). **METHODS:** The CPT asks participants to estimate how many cigarettes they would smoke in a day across a series of increasing costs. Adolescent daily smokers (ages 15-19,  $n = 50$ ) completed a CPT for their usual brand cigarette at baseline, and again after smoking each dose of research cigarette (15.8, 5.2, 1.3, and 0.4 mg nicotine/g tobacco) during four counterbalanced laboratory sessions. We conducted repeated measures ANOVAs to evaluate the effect of nicotine dose on four indices derived from the CPT, including: intensity (cigarette consumption at 0 price), Omax (the maximum expenditure on cigarettes), Pmax (the price that produces Omax), and breakpoint (the price at which consumption is reduced to 0). We also tested whether alpha, which is a measure of the essential value of a product, differed across doses using F tests. **RESULTS:** Tests revealed a significant main effect of dose on all indices (all  $ps < .01$ ), with significantly higher demand for usual brand at baseline than each dose of the research cigarettes as measured by intensity, Omax, & breakpoint; dose did not significantly affect any of the cigarette demand indices when usual brand was excluded. Similarly, alpha was significantly greater for usual brand cigarettes than research cigarettes, and there were no significant differences between doses of research cigarettes. **CONCLUSIONS:** These results indicate a significantly reduced reinforcing efficacy of all research cigarettes relative to usual brand; but no dose-dependent differences in reinforcing efficacy across nicotine content under acute conditions.

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## POS3-174

### IMAGING THE DOPAMINE SYSTEM WITH [<sup>11</sup>C]PHNO AND PET IN RECENTLY ABSTINENT TOBACCO SMOKERS COMPARED TO NONSMOKERS

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**SIGNIFICANCE:** Smoking continues to be a leading cause of death in the U.S., yet the majority of smokers who attempt to quit are unsuccessful and relapse within the first two weeks. Nicotinic activation of beta2 subunit-containing nicotinic acetylcholine receptors on mesolimbic dopaminergic neurons triggers dopamine (DA) release and underlies the reinforcing properties of tobacco smoking. The goal of this work was to interrogate the DA system in recently abstinent smokers compared to nonsmokers using positron emission tomography (PET) brain imaging with [<sup>11</sup>C]PHNO, a radiotracer that binds to D2/D3 receptors in the striatum. **METHODS:** Tobacco smokers ( $n=9$ ) and never smokers ( $n=6$ ) participated in 2 [<sup>11</sup>C]PHNO scans on the same day. A baseline scan was first acquired following bolus injection of [<sup>11</sup>C]PHNO ( $570.5 \pm 179.0$  MBq;  $2.6 \pm 1.5$  micrograms). Amphetamine (0.5 mg/kg, PO) was then administered three hours before a second [<sup>11</sup>C]PHNO scan ( $555.4 \pm 192.0$  MBq;  $2.9 \pm 1.6$  micrograms). PET data were analyzed with SRTM2 using cerebellum as a reference region to measure [<sup>11</sup>C]PHNO





binding potential ( $BP_{ND}$ ) at baseline and post-amphetamine.  $BP_{ND}$  is the steady state ratio of specifically bound tracer to free tracer, and is proportional to D2/D3 receptor availability. The percent fractional change in  $BP_{ND}$  ( $\% \Delta BP_{ND}$ ) before and after amphetamine, an indirect measure of dopamine release, was compared between groups. RESULTS: Preliminary analysis indicates lower D2/D3 receptor availability in abstinent smokers (S) compared to nonsmokers (NS) in caudate (S:  $1.7 \pm 0.1$ , NS:  $2.2 \pm 0.1$ ;  $p < 0.05$ ) and ventral striatum (S:  $3.7 \pm 0.1$ , NS:  $4.2 \pm 0.2$ ;  $p < 0.05$ ), and a trend towards a smaller magnitude amphetamine-induced DA release in smokers compared to nonsmokers in ventral striatum (S:  $22.7 \pm 3.5\%$ , NS:  $30.7 \pm 2.0\%$ ). CONCLUSIONS: These findings are consistent with evidence showing lower levels of D2/D3 receptors and "blunted" amphetamine-induced DA release in individuals with other addictive disorders compared to healthy controls. Our findings suggest there may be a DA transmission deficit that persists during withdrawal from tobacco smoking, which may impair quit attempts.

FUNDING: Federal

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## POS3-175

### OUTCOMES FROM A RANDOMIZED CONTROLLED TRIAL OF SMARTPHONE-BASED MINDFULNESS TRAINING FOR SMOKING CESSATION

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BACKGROUND: Mindfulness may help smokers pay attention to cravings as they arise, accept and work mindfully with them, learning to decouple cravings from smoking (i.e. ride them out). Our clinical trial found that in-person mindfulness training reduced smoking and decoupled craving from smoking. The current trial tested mindfulness training via smartphone app: Craving to Quit. Experience sampling (ES) measured momentary craving, smoking and mindfulness. A control app delivered only ES, to disentangle the effects of mindfulness from effective self-monitoring. Design: 2-group parallel-randomized experimenter-blind trial. METHODS: Subjects were 18-65yr,  $\geq 5$  cig/day, and motivated to quit. The trial was conducted via smartphone. The intervention group received Craving to Quit with ES (C2Q-ES) for 22d. The comparator received a control app with only ES for 22d. All were asked to complete 6 paid check-ins/day. The primary hypothesis was that C2Q-ES vs ES would lead to higher smoking cessation rates, measured as 1wk point-prevalence abstinence, carbon-monoxide verified at 6mo in an intent-to-treat sample. The secondary hypothesis was that C2Q-ES vs ES would decouple craving and smoking, measured as change in the prediction of smoking by craving from baseline to 6mo. RESULTS: 505 subjects (C2Q-ES  $n=245$ , ES  $n=260$ ) were randomized ( $42 \pm 12$ yr, 70% F, 81% white). We found no group difference in abstinence ( $\chi^2=0.4$ ,  $p=.53$ ). Treatment starters (C2Q-ES  $n=143$ , ES  $n=182$ ;  $\chi^2=7.4$ ,  $p=.007$ ) showed a reduction in smoking (cig/day, baseline= $16.8 \pm 8.2$ , 6mo=  $9.1 \pm 8.5$ ;  $p < .0001$ ) and craving ( $p < .0001$ ), and an increase in mindfulness ( $p < .0003$ ), with no group differences. Higher mindfulness was associated with lower smoking ( $p=.004$ ) and craving ( $p < .0001$ ). Importantly, craving and smoking were decoupled in C2Q-ES vs ES for pre/post-surveys ( $p=.03$ ) and measured by ES ( $p=.05$ ). Further, with more C2Q-ES modules completed, the more this decoupling was evident ( $p=.03$ ). CONCLUSION: These results provide mechanistic evidence that mindfulness training via smartphone app may help to break the link between craving and smoking, which may be meaningful to support quitting and prevent relapse in the longer-term.

FUNDING: Federal; Nonprofit grant funding entity

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## POS3-176

### INTENSIVE SELF-HELP FOR SMOKING CESSATION: SMOKING STATUS ONE YEAR POST-TREATMENT

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Brandon et al. (2016) developed low-cost, self-help interventions for current smokers wanting to quit based on the Forever Free<sup>®</sup> self-help intervention targeting relapse prevention for those who had quit smoking. The standard intervention

was delivered via 8 booklets mailed over 12 months. An intensive version added 2 booklets and 9 pamphlets that broadened and extended the self-help to 18 months. Participants ( $N=1874$ ) completed assessments at baseline and every 6 months through 24 months. Intensive self-help produced higher 7-day point prevalence abstinence rates at the end of treatment and 6 months post-treatment compared to traditional self-help (i.e., single National Cancer Institute booklet); and produced greater abstinence rates at the end of treatment than standard self-help, with a marginally significant difference at 6 months post-treatment. The current study focused on long-term efficacy of the intensive intervention by examining abstinence rates 12 months post-treatment (30 months since baseline). Missing data across all six assessments were managed using multiple imputation with the Markov Chain Monte Carlo method under the Missing at Random assumption. For point prevalence, a post hoc adjustment was made to include a small-to-medium effect of missing implies smoking. Relative to Brandon et al., including data from the final assessment required creating new imputed data sets for this study. Abstinence rates at the final assessment for the intensive, standard, and traditional interventions were 33.4%, 28.8%, and 23.3%, respectively. There was an overall linear dose response effect ( $OR=1.28$ ,  $p=.002$ ) with a significant difference between the intensive and traditional interventions ( $OR=1.66$ ,  $p=.002$ ) and a marginally significant difference between the standard and traditional interventions ( $OR=1.34$ ,  $p=.056$ ). The intensive versus standard difference was not significant ( $OR=1.24$ ,  $p=.115$ ). These results further support intensive self-help as a robust, low-cost intervention for smoking cessation. Ongoing studies are evaluating adaptations of intensive self-help for a Spanish-speaking population and for a population of tobacco and e-cigarette dual users.

FUNDING: Federal

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## POS3-177

### CRAVINGS MEDIATE BETTER SMOKING CESSATION OUTCOMES FOR BLACKS BUT NOT WHITES

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SIGNIFICANCE: Withdrawal symptoms, including cravings, have been shown to maintain smoking behavior. Previous research has shown that Whites report higher withdrawal symptoms which impact quit success relative to Blacks. Further, while medication adherence is critical for smoking cessation, craving but not withdrawal was associated with good medication adherence. This study was a secondary analysis designed to examine craving and withdrawal symptoms on smoking behavior and medication adherence between White and Black smokers. METHODS: 500 smokers under criminal justice supervision in the community received 12 weeks of bupropion and were followed up to 3 months post-baseline. The Questionnaire of Smoking Urges (QSU-SF) and Minnesota Withdrawal Scale (MNWS) were administered at baseline. PROCESS macro for SPSS was used to examine the parallel mediation of smoking urges and withdrawal simultaneously mediating the relationship between race and number of cigarettes smoked at 3-months post-baseline. A separate parallel mediation was run for medication adherence. For both models, the overall indirect effects were estimated using bootstrapping with 10,000 samples. RESULTS: Smoking urges significantly mediated the relationship between race and number of cigarettes smoked, such that being Black compared to White led to an decrease in number of cigarettes smoked ( $B = -.29$ ) due to their decrease in smoking urges (95% CI:  $-.66$  to  $-.03$ ). Similarly, results revealed that smoking urges significantly mediated the relationship between race and medication adherence, such that being Black led to an increase in medication adherence ( $B = .05$ ) due to decreases in smoking urges (95% CI:  $.002$  to  $.136$ ). Although, Blacks had significantly less withdrawal compared to Whites, nicotine withdrawal did not significantly mediate the relationship between race and overall CPD or medication adherence. CONCLUSIONS: Cravings, rather than other withdrawal symptoms, were associated with important smoking outcomes such as medication adherence and reduction in smoking for Blacks but not Whites and may be an important target for improving smoking cessation outcomes.

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## POS3-178

### ASSOCIATION OF NICOTINE METABOLISM RATIO WITH [<sup>11</sup>C]-(+)-PHNO BINDING IN TOBACCO SMOKERS

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**SIGNIFICANCE:** Nicotine is responsible for the dependence-producing properties of cigarettes and the rate at which nicotine is metabolized may be an important determinant of smoking characteristics. Nicotine is metabolically inactivated by the hepatic enzyme CYP2A6 and the nicotine metabolite ratio (NMR) provides a biomarker of the rate of nicotine metabolism. People who are fast metabolizers of nicotine (FM) tend to smoke more and have a harder time quitting than those who are slow metabolizers of nicotine (SM). Dopamine (DA) is critical addiction and we have previously shown that smoking a cigarette can produce increases in DA in the ventral striatum (VS) and ventral pallidum (VP), as measured indirectly with PET scanning with [<sup>11</sup>C]-(+)-PHNO. Further, it is well-established that DA D2 receptors are down-regulated in people with substance use disorders. The effect of NMR on smoking-induced elevations in DA and basal DA receptor levels is, however, unknown. The purpose of the present study was to determine whether SM and FM would have different levels of D2 and/or D3 receptor levels and different smoking-induced increases in DA in the VS and VP. **METHODS:** Participants underwent two PET scans with [<sup>11</sup>C]-(+)-PHNO: one after 48 hours of abstinence from smoking, and the other after smoking a cigarette. Participants were 13 SM and 15 FM who smoked on average about 12 cigarettes a day and did not differ in baseline cotinine levels, Fagerstrom Test for Nicotine Dependence (FTND) scores, pack-years or age (about 35 years old on average). **RESULTS:** It was found that SM had lower D2 receptor levels (in the associative striatum ( $p=0.028$ , planned comparison) and sensorimotor striatum ( $p=0.024$ , planned comparison)) during abstinence from smoking as compared to FM; there were no differences in D3 receptor levels (in the substantia nigra). After smoking a cigarette, DA (as measured indirectly with [<sup>11</sup>C]-(+)-PHNO) was elevated in the VS and VP of both groups of smokers, with no differences between FM and SM. **CONCLUSIONS:** Future studies will need to determine whether these changes are pre-existing or differ as a function of smoking history.

**FUNDING:** Federal

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## POS3-187

### PHYSIOLOGICALLY BASED PHARMACOKINETIC MODEL TO CHARACTERIZE NICOTINE KINETICS FOLLOWING THE USE OF ORAL OR INHALED PRODUCTS

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Physiologically based pharmacokinetic modeling (PBPK) can be a useful tool for characterizing nicotine pharmacokinetics from use of tobacco products. We expand a previously published PBPK model (Teeguarden et al 2013) to simulate nicotine PK, following single or multiple use of various tobacco products (cigarette, smokeless tobacco and electronic cigarette) and nicotine inhaler (Nicotrol®). The airway section of the model was redesigned to describe three uptake compartments: buccal cavity (BC), upper respiratory tract (conducting airways, URT) and lower respiratory tract (transitional airways and alveolar region, LRT). Within each region, the model includes product specific descriptions of the flux of nicotine into plasma, as well as the flux of nicotine from the BC and URT to the GI tract. These descriptions are based on regional deposition and permeation models of nicotine into plasma. Regional deposition flux combined with regional differences in physiological parameters (e.g., blood perfusion ratio), play a key role in the product specific PK profile of nicotine. The current model describes the slower flux of nicotine into plasma across the BC and URT, as well as the rapid flux known to occur in the alveolar region. Overall, the addition of the BC and respiratory tract compartments to the nicotine model provided simulation results which are comparable to the nicotine time-course plasma concentrations reported from clinical studies. The model predictions of mean nicotine plasma levels at specific time points (using the average amount of product used in the clinical study, as model inputs), showed good fits with mean nicotine levels measured from clinical studies (average of individual PK curves). The R<sup>2</sup> values between the model prediction and actual

clinical plasma levels for cigarette, electronic cigarette and smokeless tobacco were 0.998, 0.959 and 0.997 respectively. This PBPK model may be utilized to understand the likely mechanisms for the differences observed within and across different product types. Such models may also be useful to simulate nicotine PK profiles under different product use behavior scenarios.

**FUNDING:** Tobacco Industry

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## POS3-188

### CHARACTERIZATION OF NICOTINE EXPOSURE PROFILES AND SUBJECTIVE MEASURES OF E-VAPOR PRODUCTS IN ADULT SMOKERS RELATIVE TO CONVENTIONAL CIGARETTES

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**INTRODUCTION:** NuMark LLC markets e-Vapor products (EVPs) under the MarkTen® brand. Devices consist of a battery and cartridges containing propylene glycol, glycerol, flavors and tobacco derived nicotine. The purpose of these studies was to characterize nicotine pharmacokinetics (PK) and subjective measures with use of MarkTen® EVPs by adult cigarette smokers, relative to cigarette smoking. **METHOD:** Two studies were conducted (n=30 in each) to test 8 differently flavored EVPs (2.4-2.5 % nicotine by weight, 4 per study) versus subject's own brand cigarettes (OBC). Generally healthy cigarette smokers (21 – 65 years of age, smoking 5 – 20 cigarettes per day, no use of EVP in past 30 days) were enrolled. Each subject used one of four EVPs or OBC over a ten-minute period, under controlled use conditions (10 puffs, 30 seconds between puffs) in the morning and ad libitum in the evening. **RESULTS:** Overall, the mean C<sub>max</sub> values ranged from 3.15 – 3.75 ng/mL and 5.13 – 6.82 ng/mL during controlled and ad libitum use condition of the 8 EVPs, respectively. These values were statistically significantly lower ( $p<0.0001$ ) than observed with their OBC (13.72 and 14.25 ng/mL during controlled use, 12.92 and 13.25 ng/mL during ad libitum use, in the two studies, respectively). The mean maximum reduction in "urge to smoke" for the EVPs during controlled use (32.24 – 38.40, on a scale of 0 - 100) was statistically significantly lower than for OBC (51.00 and 47.28 in the two studies, respectively). The mean maximum rating of "pleasant" (42.83 – 60.38, on a scale of 0 - 100) was statistically significantly lower for each of the 8 EVPs versus OBC (80.87 and 74.34 in the two studies, respectively). **CONCLUSIONS:** On average, the nicotine PK profiles for the EVPs are lower than the subject's OBC. Subjective measures were comparable across the 8 EVPs and lower than those of the subject's OBC, however, it remains to be seen whether these outcomes change after prolonged use. Although it was not the objective of the study, the data suggest different flavor variants of the MarkTen® EVPs, used under the study conditions, do not influence nicotine PK or subjective responses.

**FUNDING:** Tobacco Industry

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## POS3-189

### SMOKING CESSATION AND OPIOID DEPENDENCE TREATMENT INTEGRATION: DOES TIMING MATTER?

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**SIGNIFICANCE:** While cigarette smoking rates for the general population are historically low at 15%, those for opioid-dependent individuals are upwards of 90%. Pharmacotherapies have proven largely unsuccessful for this disadvantaged group of smokers, thus warranting the identification of factors that hinder treatment efforts. One factor may be the timing of the smoking intervention: immediately (present a consistent treatment message) or after a delay (after stabilization on opioid pharmacotherapy). The purpose of this pilot study was to evaluate smoking intervention outcomes as a function of the phase of patients' buprenorphine-naloxone maintenance treatment in which it was delivered: Phase 1 (0-90 days of drug abstinence and weekly counseling), Phase 2 (90-365 days of drug abstinence and biweekly counseling), and Phase 3 (>365 days of drug abstinence and monthly counseling). **METHODS:** Patients in all phases received varenicline for 12



weeks per recommended guidelines. They also responded daily to questions via text messaging (e.g., number of cigarettes smoked, withdrawal symptoms), and provided monthly expired air carbon monoxide (CO) samples. **RESULTS:** Seventy-four patients were enrolled: Phase I (n=32), Phase II (n=28) and Phase III (n=14). Mean cigarettes per day (averaged by week) decreased significantly as a function of time ( $p<.05$ ), though this effect was independent of phase. A similar pattern was observed for CO levels and craving ratings ( $p<.05$ ). Biochemically-verified abstinence at Week 12 was observed for 6.7% of participants. Retention rates were significantly greater among participants from Phases II (52%) and III (50%), relative to those from Phase I (28%). Participants in Phase I had the highest rates of relapse for opioids, other illicit drugs, or alcohol. Side effects did not differ as a function of phase. **CONCLUSIONS:** The timing of smoking treatment integration may not affect cessation outcomes among opioid-dependent smokers. Additional research using more sensitive biochemical monitoring (e.g., urinary cotinine, more frequent visits) may elucidate the extent of smoking reductions with pharmacotherapy in this disadvantaged clinical population.

FUNDING: Pharmaceutical Industry; Federal; Academic Institution

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## POS3-190

### CHARACTERIZATION OF NICOTINE PHARMACOKINETICS AND SUBJECTIVE EFFECTS FROM A NOVEL ORAL TOBACCO PRODUCT IN ADULT SMOKERS

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VERVE® Chews (VC) is a chewable, non-dissolvable tobacco-derived nicotine (~1.5 mg/piece) novel oral tobacco product available in blue mint (VBM) and green mint (VGM) flavors. A randomized four-way crossover study with n=28 adult smokers (AS) was used to characterize the nicotine pharmacokinetics and subjective effects of VBM and VGM relative to cigarettes (CIG) and nicotine polacrilex fresh mint chewing gum (NG). Prior to the visit to the clinic, AS (n=30) were supplied 24 pieces of VBM and VGM for 5-day ad libitum product trial. Subjects recorded number of VBM, VGM or CIG used per day. During the clinic visit, n=28 AS were randomly assigned to one of 4 sequences (one piece of VGM or VGM for 30 minutes, smoked one CIG of their own brand, or chewed a 2-mg NG for 30 minutes) on separate days. Responses to Tobacco/Nicotine Withdrawal, Direct Effect of Product, Use the Product Again questionnaires were recorded on a visual analogue scale. During the product trial period, subjects used on an average ~2 pieces/day of VC and reduced their cigarette consumption by ~3 CIG relative to self-reported smoking history. Plasma nicotine  $C_{max}$  (Geometric Least Square Mean [LSM], ng/mL) for VBM (2.73) and VGM (2.90) were statistically significantly lower than CIG (12.11) and higher than NG (2.04). The maximum reduction in "Urges to Smoke" Visual Analog Scale (VAS) scores (LSMean) for VBM (20.67) and VGM (24.90) were statistically significantly lower than CIG (40.41) and similar to NG (26.44). Similar results were observed for the maximum VAS scores of "Is the Product Pleasant Right Now". We conclude that under the study conditions nicotine  $C_{max}$  and subjective responses from VBM and VGM are lower than CIG and are similar ( $C_{max}$ ) or slightly higher (subjective responses) as compared to NG. No apparent pharmacokinetic and subjective differences between the flavor variants were observed between VBM and VGM.

FUNDING: Tobacco Industry

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## POS3-191

### METHODOLOGY FOR MONITORING ADVERSE EVENT REPORTS FOR POTENTIAL MODIFIED RISK TOBACCO PRODUCTS: EXPERIENCE AT PHILIP MORRIS INTERNATIONAL

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**BACKGROUND:** Philip Morris International (PMI) is working to develop potential modified risk tobacco products (MRTP) such as the Tobacco Heating System (THS). Consistent with the Draft Guidance on MRTP Applications, PMI implemented systems for monitoring adverse events (AEs) to detect safety signals for poten-

tially new or different health risks associated with the use of MRTPs. **METHODS:** PMI conducts safety assessments of MRTPs using a variety of techniques. In randomized clinical studies, AEs are actively monitored as per international Good Clinical Practices. Passive safety surveillance methods, derived from pharmacovigilance, are applied in consumers / behavioral studies. In such studies, MRTP users spontaneously report health problems which they consider to be associated with the MRTP use. A similar postmarket passive safety surveillance method is used in markets where PMI already commercializes THS. **RESULTS:** In 4 controlled studies assessing THS for 5 days to 3 months, smokers were randomized to smoking abstinence (SA), to continued use of cigarettes (CC) or to switch to THS. In these studies, a total of 278 (42%) of the randomized subjects experienced 526 AEs (all non-serious). The proportion of AEs was not higher in THS users than in those assigned to SA or to CC. A total of 152 AEs (14% assessed as THS-related) were reported in 27% of subjects randomized to THS. Incidence for most frequent THS-related AEs was ≤4% for cough and ≤3% for abnormal spirometry. Headache was the most frequent AE (10% of all AEs, reporting rate 1%) spontaneously reported by participants enrolled in studies with passive surveillance. The most frequent reported AE from postmarket safety surveillance was accidental ingestion of THS tobacco sticks by child (reporting rate similar to published data for cigarettes/e-cigarettes), with 12% of cases reporting also symptoms compatible with mild to moderate nicotine intoxication (with vomiting the most frequent symptom). Eight cases were assessed as serious (required hospitalization). **CONCLUSION:** The assessment of MRTP-emergent AEs has been successfully implemented using established standards and methods for safety monitoring and surveillance.

FUNDING: Tobacco Industry

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## POS3-192

### CHARACTERIZATION OF EXPOSURE TO METHYL SALICYLATE IN ADULT MOIST SMOKELESS TOBACCO USERS

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Wintergreen oil (WG) is used in some moist smokeless tobacco (MST) as flavor ingredient. Exposure to methyl salicylate (MS), the main constituent of WG, has not been fully characterized in MST users. In this randomized, four-way crossover study we estimated MS exposure by measuring MS and its metabolite salicylic acid (SA) and salicyluric acid (SU) in blood and urine of n=73 adult MST users following use of three commercial (A,B and C) and one prototype (D) MST products. Study participants used a 2-g quid for 40 minutes on Day1 and ad libitum on Day2 and Day3 with a two day washout period between product uses. MS and SA plasma pharmacokinetic profiles were determined for each product on Day1, and 24-hour urine samples were collected on Day2 and 3 for analysis of total MS equivalents (MSE = SA + SU). Following single use, the geometric LS mean  $C_{max}$  (ng/mL) for the four products ranged from 3.94 – 4.76 for MS and 254 – 298 for SA for the four products. Plasma methyl salicylate levels were below the limit of quantitation (1.75 ng/mL) at all timepoints in n=18 subjects for at least one product and elimination half-life ( $t_{1/2}$ ) for MS could not be estimated for majority of the study participants. The average  $t_{1/2}$  for SA ranged from 2.587 – 2.776 hours. During ad lib use period the average consumption was 7 – 8 quids (23.6 – 27.5 g) each day across the 4 products. The creatinine adjusted geometric LS mean MSE (µg/mg creatinine) ranged from 19.4 – 20.8 for Day 2 and 18.0 – 21.5 for Day 3 for the four products. This is the first report characterizing MS exposure in MST users. The SA levels observed in this study were several-folds lower than typically observed with oral aspirin. We conclude that due to the rapid elimination, MS exposure is difficult to measure directly but can be best determined from SA plasma measurements.

FUNDING: Tobacco Industry

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## POS3-193

### CLINICAL MODEL FOR ESTIMATION OF THE AMOUNT OF NICOTINE AND NNK ABSORBED FROM THE USE OF MOIST SMOKELESS TOBACCO PRODUCTS

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Assessment of exposure to nicotine and NNK between different moist smokeless tobacco (MST) products can be best conducted using a randomized crossover clinical trial design. However, the relatively long elimination half-life (e.g. ~52 days for NNK metabolites) would require an impractically long washout period making it impossible to conduct crossover studies. We present here a unique clinical model to estimate the amount of nicotine and NNK absorbed ( $Amt_{abs}$ ) from three MST products by first measuring the amount of nicotine and NNK in a fresh 2-g quid ( $Amt_{original}$ ) followed by use of another 2-g quid of the same MST product and measuring the amount of nicotine and NNK in the post-use quid ( $Amt_{post}$ ) and expectorate ( $Amt_{exp}$ ). The amount absorbed was estimated by  $Amt_{abs} = Amt_{original} - (Amt_{post} + Amt_{exp})$ . In this randomized crossover design study, adult male MST users ( $n=23$ ) used the three MST products. Subjects used a 2-g MST quid for 40 minutes every 2 hours for a total of 6 uses (2 uses for each of the three products per randomization). All expectorates along with the used quid were collected for nicotine and NNK measurement. Overall, the LS Mean of estimated  $Amt_{abs}$  of the three products ranged from 2728.19 to 3454.74  $\mu$ g for nicotine and from 215.94 and 263.74 ng for NNK. The results demonstrate a less invasive method to estimate the levels of nicotine and NNK absorbed by adult MST users.

FUNDING: Tobacco Industry

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## POS3-194

### A MULTI-CENTER, MULTI-REGIONAL STUDY ON BIOLOGICAL AND FUNCTIONAL CHANGES IN HEALTHY ADULT SMOKERS DURING ONE YEAR OF CONTINUOUS SMOKING ABSTINENCE

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The harm of smoking results mainly from long-term exposure to harmful and potentially harmful constituents (HPHC) contained in cigarette smoke generated by the combustion of tobacco. Smoking cessation (SC) is the most effective way to reduce the harm and risk of smoking-related diseases to a relative risk level approximating over time that of never-smokers. In most SC studies the main focus is on the successful quitting rate of the SC treatment being tested. However, only limited information on short- to long-term functional/biological changes following SC is available in the literature. To fill the gap on clinical benefits of SC, we conducted a multi-center (42 sites), multi-regional (USA, Europe, Japan) SC study in healthy smokers willing to quit. The overall study aim was to assess the reversibility of the harm related to smoking over a one year period of continuous smoking abstinence by assessing biomarkers of exposure (BoExp) to HPHCs and clinical risk endpoints (CRE) linked to the pathophysiological pathways of smoking-related diseases, and examine their change upon SC. The study included a 52-week smoking abstinence period in an ambulatory setting and a 28-day safety follow-up period. Nicotine replacement therapy was provided for up to 3 months, SC counseling and behavioral support were continuously provided. BoExp to HPHCs and CRE in urine and blood were assessed at Baseline, 3-, 6- and 12-month visits. The genotoxicity CRE total 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanol, and respiratory CRE from spirometry, lung volume and cough symptoms were assessed. Cardiovascular CRE included parameters reflecting inflammation (white blood cell), lipid metabolism (high density lipoprotein-cholesterol), endothelial function (soluble intercellular adhesion molecule-1), platelet function (11-dehydro-thromboxane B2), oxidative stress (8-epi-prostaglandin-alpha) and carbon monoxide exposure (carboxyhemoglobin). 1185 subjects (50.2% male) were enrolled, and approximately 35% successfully quit smoking for one year. The study results will be instrumental in assessing novel alternative products to cigarettes, considered for tobacco harm reduction strategies.

FUNDING: Tobacco Industry

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## POS3-195

### PROACTIVE POPULATION HEALTH STRATEGY TO OFFER TOBACCO DEPENDENCE TREATMENT TO SMOKERS IN A PRIMARY CARE PRACTICE NETWORK

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SIGNIFICANCE: Health care systems are key channels for delivering tobacco cessation treatment. Health systems that have smoking status recorded in the electronic health record (EHR) could use this information to reach out to smokers directly and provide treatment, complementing office-based care and offloading busy clinicians. We tested the feasibility of such population-based outreach through automated phone calls with interactive voice response (IVR), and explored the effectiveness of two strategies for delivering smoking cessation treatment in a pragmatic RCT. METHODS: Participants were smokers from 5 community health center primary care clinics affiliated with a large Boston hospital who were identified through the EHR and contacted for enrollment in the 3-arm RCT through IVR. The internal tobacco coach (ITC) group received 1 telephone call from a health system-based tobacco coach, who provided counseling, medication assistance, and referral for additional counseling. The external tobacco coach (ETC) group received a direct transfer to the state quitline. The usual care (UC) group was advised to consult their doctor about quitting. Outcomes were (1) program reach (% of smokers who enrolled in the study) and (2) effectiveness (defined as any use of cessation pharmacotherapy), collected 6 months after initial outreach. RESULTS: We contacted 5225 smokers by IVR call between 3/2016-1/2017. 640 (12%) smokers answered the IVR call, and 234 (4.5%) were eligible, consented, and randomly assigned to ITC ( $n=79$ ), ETC ( $n=79$ ), or UC ( $n=76$ ) groups. At 6-month follow-up, use of pharmacotherapy was 44% for the ITC group, 27% for the ETC group, and 36% for the UC group. In exploratory analyses, 30-day point prevalence abstinence at 6 months was 16% for the ITC group, 13% for the ETC group, and 8% for the UC group. CONCLUSIONS: Proactive outreach to smokers identified through a health system EHR is feasible through the use of IVR calls and can increase smokers' use of smoking cessation medications. Such population-based efforts may help clinicians adhere to clinical practice guidelines efficiently and improve patients' access to evidence-based smoking cessation treatments.

FUNDING: Pharmaceutical Industry

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## POS3-196

### AN ADAPTATION OF THE MCEQ FOR THE ASSESSMENT OF SELF-REPORTED REINFORCING EFFECTS OF NICOTINE AND TOBACCO CONTAINING PRODUCTS

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BACKGROUND: Understanding perception and behavior with respect to the whole spectrum of tobacco and nicotine containing products is key for the assessment of their potential impact at the individual and population health levels. In light of the unmet need for appropriate measurement instruments, Philip Morris International has undertaken scale development, adaptation and validation projects, such as the Perceived Risk Instrument (PRI). To measure product satisfaction, the modified Cigarette Evaluation Questionnaire (mCEQ) is one of the most established instruments to assess the self-reported reinforcing effects of smoking cigarettes, and more recently of oral tobacco products use (Hatsukami et al., 2013). The objective of this research was to further adapt the mCEQ for the assessment of other nicotine and tobacco containing products. METHODS: A psychometric evaluation of the mCEQ applied to cigarettes and a heat-not-burn tobacco product, the candidate Modified Risk Tobacco Product (MRT) Tobacco Heating System (THS), was conducted based on Classical Test Theory (CTT) and Rasch Measurement Theory (RMT). An expert consensus meeting was held to review the results of this evaluation and to consider the potential need for modification or adaptation. RESULTS: The psychometric evaluation confirmed the applicability of the mCEQ to cigarettes and THS. The two multi-item domains (Smoking Satisfaction and Psychological Reward) can be interpreted at the scale level, whereas the remaining items should be interpreted as single-item measures. Discussion with the experts confirmed the relevance of the initial 12 items for the conceptual framework of product reinforcement and further suggested to apply the item on Craving Re-





duction to any nicotine and tobacco containing products instead of restraining to cigarettes. **CONCLUSIONS:** The adaptation of the mCEQ enables the measure of reinforcing effects of nicotine and tobacco containing products and supports the assessment of candidate MRTPs. Additional psychometric testing is planned with a wider variety of products (e-cigarette, cigars/cigarillos, smokeless products) to confirm that broad applicability of the measurement instrument.

FUNDING: Tobacco Industry

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## POS3-197

### BIOMARKERS OF EXPOSURE SPECIFIC TO E-VAPOR PRODUCTS BASED ON STABLE-ISOTOPE LABELLED INGREDIENTS

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E-vapor products (EVPs) consumption has steadily increased worldwide over the past decade. Despite the increasing popularity of EVPs, little information exists on the fate of the main ingredients glycerol (G), propylene glycol (PG) and nicotine (Nic) during EVP use. Currently there are no biomarkers available to differentiate exposure from EVPs relative to other confounders (e.g. other tobacco products, food, etc.). The objective of this study was to assess the absorption, metabolism and further fate of stable isotope labelled PG, G, and Nic as well as compounds generated from these precursors during vaping or formed endogenously. A randomized controlled clinical study was conducted with 25 healthy male subjects, divided into 3 groups: Group I (N = 10): experienced EVP users, vaping under low wattage conditions; Group II (N = 10): experienced EVP users, vaping under high wattage conditions; Group III (N = 5): smokers, smoking conventional non-filter cigarettes spiked with stable isotope-labelled Nic, G and PG (positive control). Periodic samples of various biofluids (plasma, urine, saliva) were collected. Several bioanalytical methods were developed and modified for quantification of Nic, PG and G, as well as their metabolites and potential PG and G pyrolysis by-products. Labelled PG, G and Nic were only detected during use of study products, indicating no interferences from other sources of exposure. Stable isotope labelled mercapturic acids (MA) formed from acrolein (3-HPMA) and propylene oxide (2-HPMA) were not quantifiable in urine of EVP users in either Group I or II. In contrast, labelled 3-HPMA and 2-HPMA were observed in the smokers of Group III, verifying that the smoker group served as a positive control. In conclusion, our data demonstrate the applicability of the stable isotope labelling concept to unequivocally assess EVP-specific internal dose of the major ingredients PG, G, and Nic as well as the presence of potential pyrolysis products in the vapor and their further metabolism in the human body.

FUNDING: Tobacco Industry

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## POS3-198

### ESTIMATION AND COMPARISON OF MOUTH LEVEL EXPOSURE TO CERTAIN CONSTITUENTS FROM TWO MENTHOL CIGARETTE PRODUCTS

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Cigarette smoke exposure can be assessed by analyzing the spent filters (cigarette butts) collected during real use conditions and estimating the yield of smoke constituents that pass through the filter into the smoker's mouth (mouth level exposure [MLE]). Per-cigarette MLE parameters (MLE "tar" and MLE nicotine) are also estimates of mainstream smoke yields from cigarettes smoked by smokers rather than machines. In a clinical study of adult, menthol cigarette smokers, we estimated MLE "tar" (mg/cigarette) and MLE nicotine (mg/cigarette) for two menthol cigarettes (Cigarette A and Cigarette B). Using machine-smoking, selected harmful and potentially harmful constituents (HPHCs) in mainstream smoke for each product were evaluated. Linear regression models of HPHC yield and "tar" or nicotine yield from the machine-smoked cigarettes were developed. The models were applied to the clinical MLE data to estimate MLE to HPHCs for each product. Two-sample t-tests were used to compare estimated average MLE to each HPHC from smoking each product. Estimated MLE to acetaldehyde, acrolein, acryloni-

trile, benzene, benzo[a]pyrene, carbon monoxide, crotonaldehyde, formaldehyde, isoprene, menthol, toluene, 4-aminobiphenyl, and 1,3-butadiene from Cigarettes A and B was similar. Estimated MLE to ammonia, N-nitrosomnicotine (NNN), and 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK) was significantly lower from Cigarette A compared to Cigarette B (p<0.05). Our findings demonstrate an approach to estimate HPHC exposure in smokers using MLE "tar" and nicotine data obtained from cigarettes smoked by smokers and machine-generated HPHC yields. This approach was used to generate estimates to compare smoker exposure to HPHCs from those products.

FUNDING: Tobacco Industry

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## POS3-199

### A COMPARISON OF THE CRAVING PROFILE OF A NOVEL NICOTINE REPLACEMENT THERAPY VS NICOTINE PATCH DURING THE FIRST TWO WEEKS OF A QUIT ATTEMPT

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**SIGNIFICANCE:** Most quit attempts end in relapse. Smokers clearly need advances in the treatments that are available to assist them with quitting. Smokers consistently report that one of the key barriers to successful cessation is cigarette craving. As such, one evaluation of novel smoking cessation treatments is whether they can successfully attenuate the craving patients experience during a quit attempt. The Chrono Quit Smoking Solution (CQSS2) is a pre-programmed, wearable drug delivery product that transdermally delivers metered pulses of nicotine (approximately 21 mg daily) to achieve repeated peaks and troughs throughout the day. Here we report the results from a Phase 2, two-arm, open-label non-inferiority study designed to assess the craving profile of the CQSS2 vs the NiQuitin® patch (21mg) during the first two weeks of a quit attempt. **METHODS:** Interested quitters (n=85) were recruited using social and traditional media. Using hand-held diaries, participants were required to monitor their craving and withdrawal symptoms in real-time during the four days leading up to, and 14 days after, an assigned quit day. The first 40 participants received nicotine patch while the remaining 45 received the CQSS2. Craving (assessed on a 101-point visual analogue scale) and withdrawal (affect, concentration, and anhedonia) were assessed during ~4-5 randomly-timed assessments each day; symptoms were also assessed during scheduled daily morning and evening reports. Based on a non-inferiority limit of 12.4 points, we aimed to recruit 40 participants per arm; this would afford >80% power for our primary hypothesis. **RESULTS:** Daily craving in both groups followed the expected pattern, peaking soon after quit day and then gradually declining. Participants in the CQSS2 group reported lower daily craving severity than participants in the nicotine patch group. **RESULTS:** for morning craving, and withdrawal, showed a similar pattern. **CONCLUSIONS:** The CQSS2 was not inferior to standard 21mg nicotine patch for the control of craving experienced during the first two weeks of a quit attempt. These results suggest that the CQSS may be an effective treatment for smokers wishing to quit.

FUNDING: Pharmaceutical Industry

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## POS3-200

### COMPARISON OF STATISTICAL METHODS (UNIVARIATE VS MULTIVARIATE) USED TO EVALUATE BIOMARKER CHANGES FOLLOWING REDUCTION IN EXPOSURE TO CIGARETTE SMOKE

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A single primary clinical outcome measure is generally used to evaluate the effectiveness of pharmaceutical products. In contrast, several clinical outcome measures (biomarkers) are needed to assess cigarette smoking exposure reduction. In most cases however, each biomarker difference is independently determined with a univariate statistical model. Since changes in biomarkers are generally correlated, it may be more appropriate to use a multivariate model under certain circumstances. This may also increase the power to detect group difference. We developed a multivariate linear mixed model to examine multiple biomarkers.





We analyzed data from a clinical study designed to assess exposure reduction in adult cigarette smokers who switched to an electronically heated cigarette smoking system (EHCSS). The smokers were randomized into five study groups and several biomarkers of exposure including nicotine equivalents (NE), carboxyhemoglobin (COHb), total 1-hydroxypyrene (1-OHP), 3-hydroxypropylmercapturic acid (3-HPMA) and S-phenylmercapturic acid (SPMA) were measured daily for 8 days. We began our assessment with a model designed for two biomarkers (NE and COHb) with and without covariates. In the model without covariates, the dependent variables were NE and COHb, with the fixed effect of study group, the random effect of time and subject, and the interaction between study group and time. In the model with covariates, age, gender, daily cigarette consumption and BMI were considered. We then expanded the model to assess five biomarkers (NE, COHb, 1-OHP, 3-HPMA and SPMA). The results of the single univariate model were compared to the results of the multivariate model. The multivariate linear mixed model provides additional insight on biomarker relationships and factors. Unlike the single univariate model, the multivariate model estimates study effect on multiple biomarkers simultaneously and therefore do not need p value adjustment for multiplicity. This model can also estimate either the study effect for each biomarker or an overall effect on all biomarkers.

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

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## POS3-201

### ABUSE LIABILITY ASSESSMENT OF THREE MENTHOL VUSE SOLO ELECTRONIC CIGARETTES

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Abuse liability (AL) assessments of electronic cigarettes (ECs) provide the FDA with data that indicate possible impact to public health. Previous findings suggest these products likely will demonstrate lower abuse potential than combustible cigarettes (CC), but must have sufficient AL to provide an acceptable alternative for current smokers. We previously reported on the AL of three tobacco-flavored Vuse Solo ECs, and demonstrated they had a somewhat higher AL compared to nicotine gum, while AL was significantly lower than CC. The current study broadens this research by evaluating AL for three commercial, menthol-flavored Vuse Solo ECs. A single-site, randomized, crossover study was conducted in the US. Generally healthy, male and female adult smokers (n=55), naïve to EC use, completed the study. Subjects used a different test product each week for five consecutive weeks: three menthol Vuse Solo ECs (14 mg, 29 mg, and 36 mg nicotine), usual brand (UB) CC (high AL), and 4 mg nicotine gum (low AL). Use of UB was allowed throughout the study. At the end of each trial use week, subjects abstained from all tobacco/nicotine use overnight for 12 hours prior to participating in each 6-hour test visit. Endpoints included subjective measures (Product Liking [PL], Intent to Use Product Again [IUA], and Product Effects [PE]). Samples (n=18) for measurement of nicotine pharmacokinetics (PK) were collected, along with physiological measurements (i.e., pulse rate and blood pressure). Use of all menthol Vuse Solo ECs resulted in statistically significant differences in PL and IUA compared to UB CC (EC lower) and nicotine gum (EC higher). A few significant differences in PE-related subjective effects were observed. Subjective measure results were consistent with early nicotine uptake ( $AUC_{0-15}$ ), for which Vuse Solo fell between cigarettes and nicotine gum, while  $C_{max}$  and overall uptake ( $AUC_{0-360}$ ) were lower relative to both comparators. Maximum physiological changes showed few, small differences. The menthol results are aligned with our previous findings and collectively suggest that AL for Vuse Solo ECs is lower than combustibles and somewhat higher than nicotine gum.

FUNDING: Tobacco Industry

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## POS3-202

### CHARACTERIZATION OF A CONTINUUM OF RISK ASSOCIATED WITH VARIOUS BEHAVIORS IN USERS AND NONUSERS OF TOBACCO PRODUCTS

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SIGNIFICANCE: Adult tobacco consumers reportedly have misperceptions regarding the risks of non-combustible tobacco products (TP) relative to combustible TP, despite evidence to the contrary. For example, our analysis of two nationally representative surveys linked to the National Death Index has shown that U.S. smokeless TP (STP) actually carry no significant increase in all-cause mortality compared to never tobacco use. METHODS: We conducted an online survey in a non-probability sample of users and nonusers of TP in 2015. We investigated, among other end-points, the risk perceptions of cigarettes (CIG), moist smokeless TP (MST), snus (SN), cessation products (CP), complete quitting (QT) and never using (NU) TP across subgroups consisting of current adult smokers not planning to quit smoking (ASNPQ), current adult smokers planning to quit smoking (ASPQ), current adult dual users of cigarettes and MST (DU), current adult MST exclusive users (EXCL), former adult users of cigarettes and/or MST (FRM), adult past triers of tobacco (NONPT), and adult never users of tobacco (NT). RESULTS: The median risk perceptions, on a scale of 1 (No risk) to 10 (Great risk) for CIG, MST, SN, CP, QT, NU respectively were: ASNPQ= 8, 9, 8, 8, 9, 10, 10 MST= 7, 8, 6, 6, 8, 9, 9 SN= 7, 8, 6, 6, 8, 8, 9 CP= 5, 5, 4, 4, 4, 5 QT= 2, 2, 2, 1, 1, 2, 2 NU= 1, 1, 1, 1, 1, 1, 1 We report the first systematic assessment of the risk continuum in a large sample of users and nonusers of TP. The absolute values should be interpreted with caution, however the relative ranking does provide meaningful insights. We observe that the respondents accurately perceive that NU or QT carry minimal risks and CIG carry the most risk. All respondents perceive that CP carry significant risk relative to QT and NU. AS perceive STP (MST and SN) carry similar risks as CIG and a large proportion (~65%) perceive that STP carries the same risk as CIG. Although users of MST perceive that STP carries slightly lower risk, many (36%-EXCL and 51%-DU) still perceive STP have the same risks as CIG. CONCLUSIONS: Overall, these results demonstrate that risk perceptions vary by product use behaviors.

FUNDING: Tobacco Industry

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## POS3-203

### EVALUATION OF BIOLOGICAL AND FUNCTIONAL CHANGES IN HEALTHY SMOKERS AFTER SWITCHING FROM CIGARETTES TO TOBACCO HEATING SYSTEM (THS) 2.2 FOR 6 MONTHS

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The most effective way to reduce the risk of smoking-related diseases which results from long-term exposure to toxicants in cigarette smoke, is to quit smoking. Tobacco harm reduction, by substituting less harmful tobacco products for cigarettes, is a complementary approach to the current quit smoking strategies for smokers not willing to quit. THS is a novel tobacco product with the potential to reduce the risk of harm to smokers. It electrically heats tobacco at temperatures lower than cigarettes producing substantially lower levels of toxicants while providing nicotine, taste, ritual and sensory experience that closely parallels cigarettes. Previous clinical studies have demonstrated reduced exposure to the toxicants in cigarette smoke (approaching the levels observed after quitting) for smokers who switched to THS for up to 3 months (NCT01989156). This study was designed to further substantiate the harm reduction potential of THS by demonstrating that changes in clinical risk endpoints (CRE) are comparable in magnitude and direction to those observed when smokers stop smoking. The CREs are linked to smoking-related diseases, representative of multiple pathophysiological pathways (e.g., cardiovascular and respiratory function, carcinogenicity) which are sensitive to smoking and reversible upon smoking cessation. This was a randomized, controlled, 2-arm parallel group, multicenter US study in adult smokers who switched from cigarettes (CC) to THS compared to continuing to smoke CC over 6 months. The primary objective was to demonstrate significant changes in THS users (close to smoking cessation) for at least 5 out of the 8 CREs. 984 subjects were randomized to CC (n=496) or THS (n=488). Additional biomarkers of exposure and CREs of inflammation, lipid metabolism, endothelial function, platelet function, oxidative stress, and lung function were evaluated in the study. The changes observed in



this study will be compared to the changes following smoking cessation measured in a smoking cessation study (NCT02432729). The results further substantiate the reduced harm potential of THS, while providing information on product use and acceptance of THS by smokers.

FUNDING: Tobacco Industry

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## POS3-204

### ASKING THE RIGHT QUESTIONS: TRAINING PEDIATRICIANS TO ADDRESS TOBACCO CESSATION IN THE CLINICAL ENCOUNTER

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**SIGNIFICANCE:** Tobacco use/exposure is a pediatric disease with well-known impact on morbidity and mortality. Many pediatric clinicians do not address family tobacco use, creating missed opportunities to intervene with smokers/families. **OBJECTIVE:** Describe impact of a clinical training on pediatric providers' tobacco control knowledge and care delivery. **METHODS:** 190 pediatric providers attended a 2-day training entitled "Asking the Right Questions: Clinicians and Tobacco Cessation in the Clinical Encounter," which was offered 6 times from 2014-17. Pediatrician participants attended in pairs with a colleague from their practice (eg, nurse, social worker, administrator) to help support implementation of tobacco-control practice changes. Training topics included screening/counseling patients and parents, prescribing nicotine replacement therapy (NRT), addressing use of e-cigarettes and other tobacco products, and implementing health systems change to improve delivery of cessation support. Training methods included didactic presentations, small-group activities and an online quality-improvement module to guide practice change. Participants completed pre- and post-tests to evaluate knowledge gained; chi-square tests were used to analyze responses. Participants also completed qualitative surveys/interviews at 6 weeks and 6 months post-training to capture changes in practice. **RESULTS:** Participants showed increased knowledge of tobacco screening and cessation support services (pre-training 46%, post-training 95%); and increased comfort in counseling pediatric patients (pre-training 43%, post-training 95%) and parents (pre-training 47%, post-training 95%) about tobacco prevention and cessation (all  $p < .001$ ). At 6 weeks and 6 months post-training, participants reported the following changes implemented within their health systems: practice-wide screening systems for tobacco use/exposure, EHR workflows for tobacco screening, increased referrals to quitlines and NRT, and the addition of tobacco screening/counseling content into training programs. **CONCLUSION:** In-person training is an effective method of increasing tobacco control knowledge/care delivery among pediatric providers.

FUNDING: Nonprofit grant funding entity; Pharmaceutical Industry

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## POSTER SESSION 4

### POS4-1

#### SCHOOL-BASED RETAIL ENVIRONMENT EXPOSURES AND ADOLESCENT YOUTH CIGAR, CIGARILLO, AND LITTLE CIGAR USE

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Rates of cigar, cigarillo and little cigar (CCLC) use among youth have been increasing and increased use among African American youth are particularly alarming. Studies examining associations between retail tobacco availability (i.e., density and proximity) and tobacco use have been mixed. This study examined the associations between school-based retail environment exposures and CCLC use among middle school youth in Cleveland, OH. Retail outlets (n=1,834) were identified using the Cleveland Food Retail database, which were ground-truthed and audited from June, 2016 through August, 2016. Youth data was drawn from the 2016 Cleveland Youth Risk Behavior Survey. The survey was administered to all 7<sup>th</sup> and 8<sup>th</sup> grade students across Cleveland Metropolitan School District K-8 schools. A total of 3,778 students completed the survey (Response Rate=83.0%). Current CCLC use was assessed by asking if students had smoked cigars, cigarillos, or little cigars in the last 30 days. Retail environment exposures (i.e., proportion of students who walk to school, average number of food retail trips per week, retail outlet density, and proximity to the nearest retail outlet) were assessed for each school. Multiple regression analysis assessed the associations between school-based retail environment exposures and youth CCLC use. Across all middle schools (n=65), 10.8% (SD=6.4) of students indicated CCLC use in the past 30 days. Schools had an average retail outlet density of 25.14 outlets per square miles (SD=13.96) and a mean proximity to the nearest retail outlet of 0.18 miles (SD=0.10). After controlling for all other variables, the average number of food retail outlet trips per week significantly predicted CCLC use (beta=7.84, t(63)=2.36, p<.05) as did retail density (beta=0.13, t(63)=2.09, p<.05). This model explained 20.7% of the variance of CCLC use. Findings indicate that even after controlling for youth visits to corner stores, retail density is still significantly associated with CCLC use among 7<sup>th</sup> and 8<sup>th</sup> grade youth. This has potential policy implications for retailer licensing, zoning for tobacco retailers, and restrictions on exterior retail advertising.

FUNDING: Federal

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### POS4-2

#### REAL-TIME VAPING RECORDED BY A "SMART" E-CIGARETTE DURING SMOKING CESSATION ATTEMPTS: A FEASIBILITY STUDY

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BACKGROUND: A more comprehensive, fine-grained understanding of whether, how, and when smokers transition from smoking to vaping will allow us to assess whether dual use (continuing to smoke while vaping) is a transitional phase supporting smoking cessation, or a sustained pattern fostering continued smoking. Recent advances in smartphone and sensor technology have revolutionized our ability to passively and actively record behaviors in real-time. We describe a feasibility study that used this new technology to record patterns of e-cigarette (EC) uptake and subsequent use, and effects on smoking, with non-vaping adult daily smokers who were willing to attempt to quit smoking using a "smart" EC (SEC). METHODS: This eight-week study used a mixed-method design comprising a Bluetooth-enabled SEC that passively recorded real-time device use, daily surveys answered by participants using smartphones, and longitudinal interviews. Measures included passively recorded vaping intensity (puffs/day, sessions/day (≤60 seconds between puffs)) and self-reported cigarettes/day. Participants were eligible if they were not weekly EC users in the three months before entry. We purposively recruited 15 participants through community networks and social media to obtain a diverse sample (age, gender, baseline smoking, previous vaping experience). RESULTS: Participants' median SEC puffs/day ranged from 3–151;

median sessions/day ranged from 2–32 (though SEC technical problems meant not all participants were issued or used the SEC for the entire study period). We present case studies of three provisional vaping and smoking patterns: vaping experimentation with no change/reversion to baseline smoking; entrenched daily dual use with substantial smoking reduction; intensive vaping uptake with smoking cessation. CONCLUSION: Simply making ECs available to smokers may not be sufficient to catalyze successful quitting. Identifying specific vaping and smoking patterns that may be associated with cessation could allow us to provide advice to potential EC users, possibly enhancing the therapeutic potential of ECs by promoting full transition from smoking to vaping.

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### POS4-3

#### IDENTIFYING STRESS-RELATED VARIABLES LINKING SOCIOECONOMIC STATUS AND SMOKING STATUS

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OBJECTIVE: Across the socioeconomic status gradient smoking prevalence differs greatly, with those of lower socioeconomic status smoking at much higher rates. The goal of the current study was to identify stress-related variables linking socioeconomic status and smoking in order to identify variables that may be important to address in cessation programs for individuals across the socioeconomic status gradient. METHODS: Participants (N = 238) were primarily female (67.6%) and African American (51.7%) adults from the Dallas metropolitan area. A majority of the sample reported being nonsmokers (n = 164). On average participants who identified as smokers (n = 74) reported smoking 9.96 (SD = 10.79) cigarettes per a day. Stress variables examined as potential mediators between socioeconomic status (education) and smoking status (smoker vs. non-smoker) included financial strain, discrimination, urban life stress, perceived stress, depression, and neighborhood perceptions. Analyses were conducted with Hayes' PROCESS macro, which uses an ordinary least squares path analytic framework to estimate direct and indirect effects in mediation models. RESULTS: Analyses revealed a significant indirect effect of socioeconomic status on smoking status through financial strain. Specifically, lower socioeconomic status predicted greater financial strain, which in turn predicted a greater probability of being a smoker. Furthermore, when covariates (age, race, and gender) were included into the model financial strain was still a significant mediator of this relationship. No other stress-related variables were determined to mediate the relationship between socioeconomic status and smoking status. CONCLUSION: Findings suggest that financial strain is an underlying mechanism through which socioeconomic status exerts an influence on smoking status, especially for those of lower socioeconomic status. Future research should look to determine if addressing financial strain in cessation programs will increase positive outcomes for socioeconomically disadvantaged individuals.

FUNDING: Nonprofit grant funding entity; Federal

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### POS4-4

#### CHANGING TOBACCO USE PATTERNS AMONG NEW JERSEY HIGH SCHOOL STUDENTS

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SIGNIFICANCE: Tobacco use patterns among New Jersey youth have evolved with the emergence of new products. From 2012 to 2014, hookah and electronic cigarette (e-cigarette) prevalence increased substantially and surpassed cigarette and cigar use. We analyzed data from the 2016-17 New Jersey Youth Tobacco Surveys (NJYTS) to assess whether these trends have continued. METHODS: The NJYTS is a biennial survey of NJ high school students designed to yield representative estimates of tobacco use prevalence. Since 1999, the NJYTS has assessed ever and current (past 30 days) use of cigarettes, cigars, and smoke-



less tobacco; hookah and e-cigarette questions were added in 2008 and 2012, respectively. Questions about students' initial tobacco experience were asked for the first time in 2016: e.g., which product was tried first and whether that product was flavored. RESULTS: In the 2016-17 school year, e-cigarettes were the most prevalent tobacco product used by NJ high school students (9.6%), followed by hookah (7%), and cigars (6.8%). Prevalence of each product declined from 2014 to 2016, with the most dramatic decline observed for current cigarette smoking, which decreased significantly from 8.2% (95% CI: 6.3, 10.1) to 4.7% (95% CI: 3.7, 5.6). Consistent with 2014 trends, e-cigarette use was more common among males (11.5%) than females (7.5%) and among non-Hispanic whites (10.7%) than non-Hispanic blacks (7.3%), while hookah use did not differ by gender and was more common among Hispanics (11.6%) than non-Hispanic blacks (9.1%) and whites (4.6%). Among current users of at least 1 product, 26% reportedly tried e-cigarettes first, while 18%, 14%, and 13.5% began with regular cigarettes, hookah, or cigars, respectively. The first product used by the majority of tobacco users (54%) was flavored. CONCLUSIONS: A marked decline in current cigarette smoking was observed, and prevalence of hookah and e-cigarette use decreased for the first time since 2012. These findings are promising; however racial/ethnic disparities persist, and the role of emerging and flavored products in tobacco initiation warrants concern. Continued surveillance is critical for monitoring these trends.

FUNDING: State

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## POS4-5 POPULATION SMOKING AND CESSATION CHARACTERISTICS AMONG HISPANIC VETERANS AND NON-VETERANS

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SIGNIFICANCE: Research on smoking cessation among Hispanics has primarily focused on the fact that Hispanics are light, non-daily smokers who are less addicted to smoking. However, Veterans are known to be heavier smokers. We sought to determine whether smoking status, smoking characteristics, and cessation characteristics differ by Veteran status among Hispanics. METHODS: Hispanics who responded to the 2014-2015 Tobacco Use Supplement of the Current Population Survey (CPS) and smoked 100 cigarettes in their lifetime comprised the study sample (N=4,951). The CPS is administered by the U.S. Census Bureau using a probability selected sample of approximately 60,000 occupied households each month. Regression models were used to examine differences in demographics, smoking status, smoking characteristics, and cessation characteristics by Veteran status. Post-estimation commands were used to calculate predicted means and probabilities for each variable by Veteran status. Survey weights were used to produce nationally representative findings. RESULTS: Of the CPS Hispanic respondents, 40.7% of Veterans and 19% of Non-Veterans smoked 100 cigarettes in their lifetime and were included in this study ( $\chi^2=101.6$ ,  $p<.001$ ). Veterans had higher prevalences of daily (8.7% vs. 5.7%,  $p=.015$ ) and former (26.9% vs. 10%,  $p<.001$ ) smokers. Veterans were older, more educated, more likely to be male, married, and a native, U.S. citizen, and were less likely to be currently employed. Veterans smoked more cigarettes per day, had longer histories of daily smoking, and greater addiction (smoked within 30 minutes of waking). Veterans were less likely to try to quit in the past year and more likely to receive advice from a doctor to quit in the past year. CONCLUSIONS: We found several key differences between Hispanic Veterans and Non-Veterans regarding heaviness of smoking, addiction, and quit attempts. Hispanic Veterans predominantly had characteristics that were less favorable for cessation even though they were more likely to receive advice from a doctor to quit. These smoking and quitting patterns may need to be addressed as part of Hispanic Veteran and Non-Veteran targeted cessation efforts.

FUNDING: Federal

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## POS4-6 MATERNAL SMOKELESS TOBACCO USE PREDICTED BY MARIJUANA USE HISTORY

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SIGNIFICANCE: Maternal smokeless tobacco use has been concerning since electronic cigarettes became available in the market. Adverse birth outcomes from combustible cigarette smoking have been clearly documented, and it is not recommended for pregnant mothers to be exposed to nicotine products during pregnancy. Pregnant women who smoke cigarettes during pregnancy often co-use cannabis. It is important to understand what can predict maternal smokeless tobacco use and its relation to other substance use such as cannabis. METHOD: Anonymous survey was conducted to examine history of maternal smokeless tobacco use and other substances at an outpatient prenatal care setting. One hundred and seven pregnant women were approached and filled out the survey. RESULTS: Survey participant (N = 107) were on average 28 years old and 27 gestational weeks with 18.2% Hispanic, 37% Caucasian, 37% African American, 56% having  $\geq 12$  years of education, and 6% having previous involvement with child protection services (CPS). Only 3% (3/107) reported smokeless tobacco use during pregnancy. After adjusting for socioeconomic variables, use of cannabis ever lifetime, 6 months prior to the current pregnancy, and during pregnancy did not predict the lifetime history of smokeless tobacco use (AOR: 4.01; 95%CI: 0.41-34.09;  $p = 0.20$ ; AOR: 0.45; 95%CI: 0.02-6.74;  $p = 0.20$ ; AOR: 3.26; 95%CI: 0.35-74.55;  $p = 0.20$ ); however predicted smokeless tobacco use 6 months prior to the current pregnancy (AOR: 19.19; 95%CI: 1.25-600.52;  $p = 0.04$ ; AOR: 0.58; 95%CI: 0.02-10.28;  $p = 0.72$ ; AOR: 1.36; 95%CI: 0.09-35.93;  $p = 0.83$ ). CONCLUSIONS: Smokeless tobacco use 6 months prior to the current pregnancy was significantly associated with cannabis use at different time intervals. Given the increasing availability of electronic cigarettes and medicinal and recreational cannabis, screening pregnant patients for cannabis and smokeless tobacco use becomes critical.

FUNDING: None

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## POS4-7 BETEL QUID AS THE PRIMARY FORM OF TOBACCO USED AMONG CAMBODIAN WOMEN: TRENDS FROM A DECADE OF NATIONAL TOBACCO SURVEYS INDICATING A PERSISTENT AND HIDDEN DISEASE BURDEN

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SIGNIFICANCE: During the past decade, NIH-funded researchers from the Ministry of Health of Cambodia, WHO, and Loma Linda University reported findings from the first national prevalence survey of tobacco use indicating that among the 2 million tobacco users in Cambodia, 500,000 were women who chewed tobacco in the form of a betel quid. During 2005 to 2014, landmark public health measures were taken to reduce tobacco use in Cambodia, including placing health warnings on cigarette packs, banning all forms of tobacco advertising, increasing excise tax on tobacco, and the recent adoption of a comprehensive tobacco control law that included pictorial health warnings on tobacco packaging and stronger enforcement for smoke-free environments. METHODS: Cross-sectional analysis of national tobacco surveys from representative samples of Cambodian adults that were conducted in 2006, 2010, and 2014. RESULTS: Despite the efficacy of tobacco control measures for cigarette use, findings from our analysis of a decade of nationally representative surveys indicate a persistent burden of betel quid use that remains unchanged among half a million Cambodian females. This burden includes the well-known link between habitual betel quid use and oral cancer. In Cambodia, this association was confirmed by our analysis of a national sample indicating that avoidance of betel quid use in women could have prevented 90% of the estimated national burden of 75,072 self-reported cases of oral cancer. Our work in national samples of female betel quid users has further identified a less well known burden of betel quid use by linking it to infectious disease outcomes (i.e. tuberculosis, HIV/AIDS). Also, in the case of maternal betel quid use, the immediate and long term impact on adverse infant outcomes is considered. CONCLUSION: Our presentation provides population-based measures and a novel causal framework for estimating the national burden of non-communicable and communicable disease





from betel quid use. Our findings have immediate implications for policy measures needed to control this harmful form of smokeless tobacco use.

FUNDING: Federal; Nonprofit grant funding entity

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## POS4-8

### USING COMMUNITY-ACADEMIC PARTNERSHIPS AND SOCIAL DESIGN TO DEVELOP AND IMPLEMENT A SMOKE FREE HOME INTERVENTION

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**SIGNIFICANCE:** Home smoking bans (HSB) lead to lower SHSe, but African Americans are much less likely to implement a HSB. Motivational interviewing has been shown to be effective in reducing SHSe but has not been effectively implemented. **METHODS:** To develop a culturally appropriate, evidence-based intervention to reduce SHSe, we launched an innovative partnership between Baltimore City Health Department, Maryland Institute College of Art, and Johns Hopkins University. Using the social design process, design students worked with community members, investigators, and the health department to develop HealthiAir based on Motivational Interviewing. The goal was to engage residents to discuss their experiences with HSBs, discuss pros/cons of HSB, pledge to a smoke free home, and link smokers who want to quit with smoking cessation resources. Community qualitative feedback was collected after each event as a measure of feasibility and acceptability. **RESULTS:** Six HealthiAir community events have been conducted with 76 community residents (smokers and non-smokers). Thirteen residents requested follow up referrals with 8 residents engaging in a smoking cessation treatment. Qualitative feedback demonstrate high satisfaction ("I feel equipped with knowledge to share") and interest ("I would recommend the program to my husband to get him to quit smoking"). Many reported that the program was different than other health programs because it involved "group sharing" or "made them feel different" and "got them thinking about steps to quit". **CONCLUSIONS:** Given the significant negative impact of tobacco use on public health it is critical to identify programs that motivate residents to make changes to tobacco use. Preliminary results indicate an adapted community designed program that involved an interactive facilitated discussion to promote home smoking bans is well received and may be effective in engaging residents to commit to implementing a home smoking ban and engage with follow up referral services for smoking cessation. This innovative community academic partnership may be a useful model to continue to adapt evidence based interventions for broad community implementation.

FUNDING: State

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## POS4-9

### PROVIDER REFERRAL ENHANCEMENT PROJECT-PREP: INNOVATIVE SURVEY RESEARCH MAKING AN IMPACT ON PROVIDER ENGAGEMENT STRATEGIES FOR INCREASING REFERRALS TO THE MAINE TOBACCO HELPLINE

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**SIGNIFICANCE:** The Center for Tobacco Independence-CTI works with providers to make referrals to the Maine Tobacco Helpline-MTHL more accessible. The Provider Referral Enhancement Project-PREP an innovative survey research effort was designed to evaluate CTI internal provider engagement processes and gain feedback from provider stakeholders. One survey was developed for healthcare executives who receive monthly reports of total referrals sent from clinical sites in their network about the value and use of these reports. The main PREP survey was a provider needs assessment of their awareness and knowledge of the MTHL services and referral process. **METHODS:** A 5 question Monthly Referral Reports survey was sent with May 2017 reports via email. Contacts were given the option to respond directly or respond through Survey Monkey, to increase response rates. The PREP 15-question survey was sent in July 2017 to over 250 sites. The PREP survey was sent as a Survey Monkey link via email or in a newsletter. Data were

analyzed with SPSS v19. Opened ended responses were coded. **RESULTS:** The Monthly Referral Report survey response rate was about 40%. The key finding was 80 % believed the MTHL monthly referral reports were a valuable resource. Most indicated they distribute the reports out to administrators, but less so to clinicians. Comments showed the need for greater context with the reports: adding the MTHL's effectiveness, other practices referral rates, and time trends. The PREP survey had 163 responses, and showed providers identified patients lack of interest in quitting as the major barrier to both treating the patient and referring to the MTHL ( $p < 0.05$ ). Providers indicated lack of time as a significant barrier ( $p < 0.05$ ) and that the referral form itself is not a barrier. **CONCLUSIONS:** The PREP evaluation revealed providers often have misconceptions about patients desire to quit, lack of experience with the MTHL, and barriers to referring the patients. These results validate ongoing CTI outreach efforts and offered strategies for designing optimal provider engagement training sessions focused on referrals to the MTHL.

FUNDING: State

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## POS4-10

### SUCCESSFUL APPROACHES TO REDUCE TOBACCO USE IN MALE HIV PATIENTS ON ART ATTENDING INDIAN ART TREATMENT CENTERS

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**SIGNIFICANCE:** Tobacco use has significant health consequences for people living with HIV (PLHIV); evidence shows strong associations between tobacco use, comorbidities, oral cancers, HIV disease progression and ART adherence. In India, there are currently 1.2 million PLHIV receive free antiretroviral treatment (ART) at over 700 government centers. Up to 70% of male and 25% of female patients consume tobacco, mainly smokeless (SLT). Governmental ART Centers provide excellent opportunities for interventions to reduce tobacco use. However counselors and medical staff do not address tobacco reduction and cessation. We present the results of interventions to reduce alcohol consumption and ART non-adherence among PLHIV attending ART centers that had unanticipated positive effects on reductions in tobacco use. **METHODS:** A U.S./India team conducted individual counseling, group and community advocacy interventions with men in three ART centers (188 men per center, 65% tobacco users) addressing key issues associated with ART nonadherence. Data were collected on tobacco use but tobacco was not a direct focus of the study. GLM, adjusted for baseline alcohol use, age, education, marital status, migration and time since ART treatment, was used to assess the impact of the three interventions against two control sites on smoked, chewed and dual use tobacco. **RESULTS:** From baseline to post-intervention tobacco consumption showed an upward secular trend in control sites for both smoked and chewed tobacco and very significant short term reductions in chewed tobacco use in the individual ( $p < .001$ ), group ( $p < .01$ ) and community advocacy ( $p < .01$ ) interventions against the control sites. Reductions were significant but less strong for smoked tobacco. **CONCLUSIONS/IMPLICATIONS:** These results are used to show that interactive CBT interventions without NRT at the individual, group and community levels conducted in India's ART centers addressing alcohol, lifestyle change and tension reduction can also have a positive effect on tobacco use in PLHIV. Similar approaches specifically targeting tobacco use in ART centers should show significantly improved effects.

FUNDING: Federal

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## POS4-11

### COMPARISON OF NICOTINE AND FLAVORING GAS-PARTICLE PARTITIONING IN ELECTRONIC AND CONVENTIONAL CIGARETTES

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**SIGNIFICANCE:** An understanding of nicotine and flavoring distribution across gas and particle phases of electronic cigarette (EC) vapors and conventional cig-

arette (CC) smoke will provide insight into factors that potentially influence pulmonary toxicity and addiction. **METHODS:** We obtained the gas-particle partitioning data by using our previously reported method to produce and condition the aerosol and gas to the physiologically relevant temperature (98.6°F) and relative humidity (99%) to mimic the condition of the human respiratory tract. Adjustable system parameters include puff volume, duration, interval, profile (bell or square), and residence time (i.e., hold time) in the conditioning chamber. Our puffing regime followed CRM No.81 and ISO for EC and CC, respectively. Our sample collection approach followed the validated annular denuder-filter pad combination (AD-FP), and considered the potential artifacts in gas collection and particle transmission efficiencies. A laser spectrometer measured the aerosol size distribution. **RESULTS:** We found differences in nicotine gas-particle partitioning and size distribution that suggest the physicochemical properties can impact in vitro and in vivo pulmonary toxicity. The menthol and tobacco e-liquids with 1.8% nicotine had an average of 98.2% of the nicotine and 93.7% of the flavoring mass in the particulate phase. A recently published study similarly found 92% of the nicotine and as 90% of the flavorings in the particle phase. The Kentucky 3R4F cigarette had more than 99% of the nicotine in the particle phase, and agreed with published values of 98% or higher. Aerosol count median diameters between the three aerosols were different ( $p < 0.0001$ ), with 3R4F at 222 nm, tobacco at 307 nm, and menthol at 438 nm. The nicotine yields of 0.23 (menthol), 0.18 (tobacco), and 0.08 (3R4F) mg/puff agreed with published values. **CONCLUSIONS:** Electronic cigarettes vapors have more nicotine and flavoring in the gas phase than conventional cigarettes. How the gas-particle partitioning influences pulmonary toxicity and addiction warrants further investigation.

FUNDING: Academic Institution

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## POS4-12

### EVIDENCE TO DATE FOR EVALUATING POPULATION-LEVEL EFFECTS OF ELECTRONIC NICOTINE DELIVERY SYSTEMS (ENDS): A SYSTEMATIC LITERATURE REVIEW

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The framework in which electronic nicotine delivery systems (ENDS) are evaluated for their public health impact varies widely and has become a contentious topic. Some in the public health and research community view ENDS as an important tool to help people quit smoking, while others believe ENDS may have negative public health impact if smokers become dual-users of ENDS and cigarettes, and if there are negative effects on non-smokers, such as increased youth uptake of e-cigarettes and other tobacco products. As the empirical evidence to inform the potential impact of ENDS on population health expands, these perspectives can increasingly be informed by data. The major objective of the current systematic review is to describe the existing empirical literature that can best inform these differing perspectives, with special attention to three areas: a) ENDS as a cessation tool, b) concurrent use of ENDS and other tobacco products, and c) ENDS use among youth and other special populations. We searched PubMed and Web of Science with terms including: e-cigarettes, ENDS, cessation, tobacco, poly-use, and relapse. Studies on ENDS toxicology were not included in this review. The search was limited to the U.K. and U.S. where much of the research in these areas is conducted and the debate over public health effects is prominent. The search yielded 214 empirical articles, most published between 2014 and 2017. Studies mainly fell into two categories: psychosocial determinants of ENDS use and epidemiological/surveillance. About 25 studies focused on ENDS marketing, advertising, and promotion, and 20 studies were smoking cessation-focused. Regarding dual-use and smoking initiation, most of the studies were cross-sectional, with a heavy reliance on large, publicly available datasets. The literature largely ignored variation in devices (e.g., tank, pen, disposable), with most work studying "e-cigarettes" in general. The current review underscores the need for better measurement of ENDS types, randomized controlled trials of ENDS use, prevention intervention studies, as well as longitudinal studies of ENDS use and their potential effects on population health.

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## POS4-13

### FACTORS TO CONSIDER WHEN ANALYZING ELECTRONIC CIGARETTES: CHALLENGES AND SOLUTIONS

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Most electronic cigarette reports focused on harmful and potentially harmful chemicals (HPHCs) levels in the e-liquid or e-vapor; however little information is available on the reproducibility and stability of these devices, which impacts measurement uncertainties associated within and between brand, manufacturer, or device design. This report highlights some of the measurement variations we have observed on electronic cigarette products and approaches developed for overcoming such issues. The chemical composition of the liquid and aerosol from twenty electronic cigarette products (6 disposable, 13 rechargeable, and 1 tank style) was investigated using previously validated methods. Products were purchased from retail outlets in the Atlanta, Georgia area in 2014. Liquid analysis included nicotine, alkaloids, PAHs, and metals. Aerosol analysis included total particulate matter (TPM), carbonyls, and metals. After initial analysis, the products were stored for two years at room temperature. The same products were purchased again from the Atlanta area two years later. Analysis was then done on both sets of products in order to investigate the effects of long term storage on product performance (via TPM measurements) and nicotine concentration. A number of factors including product age, product performance, method validation protocols, and method detection limit may have a significant effect on the reported concentrations of HPHCs. For some older products, TPM generation varied by as much as 27% within the same products. Lot-to-lot differences in the measured pH of some e-liquids was noted. Glass and quartz fiber filter pads were found to be unsuitable for metals analysis for Cr, Ni, Cu, Zn, Sn, and Pb due to high background levels found in the pads. We recommend freshly obtained products should be tested and additional replicates measured when products performed poorly. Electronic cigarette data from all analytical laboratories should be carefully considered to ensure that methodology suitability is appropriate, has been well characterized, and deemed "fit for purpose" when assessing reproducibility as related to accuracy and precision.

FUNDING: Federal

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## POS4-14

### EFFECT OF IMPLEMENTING A TOBACCO-FREE GROUNDS POLICY ON CIGARETTE SMOKING AMONG INDIVIDUALS IN TREATMENT FOR SUBSTANCE USE DISORDERS

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**SIGNIFICANCE:** Individuals in treatment for substance use disorders (SUD) have a high prevalence of tobacco use and poor smoking cessation outcomes. The goal of this research was to assess the impact of a tobacco-free grounds (TFG) policy on client cigarette smoking at residential SUD treatment programs. **METHODS:** We surveyed clients from three residential SUD treatment programs in San Francisco, CA before and after implementation of a TFG policy. Surveys were conducted in 2015 (pre-policy, N= 190) and 2016 (post-policy, N= 218). There were no significant differences in age, race, sex, education, or primary drug of clients surveyed pre vs post implementation of the TFG policy. Demographic and tobacco-use characteristics were compared between the pre vs post policy surveys using bivariate comparison and multivariate models controlling for demographic characteristics and nesting of participants within clinics. **RESULTS:** After implementation of the TFG policy there were fewer clients reporting current cigarette smoking compared to the pre-policy survey (62.3% vs. 81.6%, AOR=0.39,  $p < 0.001$ ). More clients identified as former smokers in the post policy vs pre-policy surveys (30.3% vs. 16.3%). Interestingly, there was also an increase in those reporting as never smokers in the post-policy vs pre-policy surveys (6.9% vs. 2.1%). Clients reported smoking fewer cigarettes due to program requirements compared in the post-policy vs. pre-policy survey (AOR=2.47,  $p < 0.001$ ). Among current smokers there was a significant reduction in cigarettes per day (AOR=0.69,  $p < 0.001$ ) and an increase in time-to-first cigarette after waking (AOR=0.39,  $p < 0.001$ ). **CONCLUSIONS:** We



found a significant impact of a TFG policy on client cigarette smoking among individuals in treatment for SUDs, a populations with a high prevalence of tobacco use and poor smoking cessation outcomes. Federal and state agencies that fund drug abuse treatment, and state authorities that license and regulate treatment programs, should require tobacco-free grounds policies.

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## POS4-15

### FACTORS ASSOCIATED WITH BECOMING SUSCEPTIBLE TO E-CIGARETTES AMONG TEXAS ADOLESCENTS

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Susceptibility to tobacco use not only predicts experimentation with traditional and electronic cigarettes, it is amenable to intervention. While comprehensive preventive interventions have effectively reduced susceptibility to cigarette use, currently few programs address susceptibility to e-cigarettes. Here we seek to contribute to the body of knowledge available to develop such interventions by identifying risk factors associated with the transition to becoming susceptible to e-cigarettes. Self-report data were gathered in 2014-15 from 3,907 youth in the Texas Adolescent Tobacco and Marketing Surveillance System, representing students (N=461,069) in grades 6, 8, and 10 in five counties surrounding the four largest cities in Texas. Students completed a follow-up survey one year later. Data included susceptibility to e-cigarette use as well as potential cognitive and affective risk factors associated with susceptibility. We used logistic regression to identify Wave 1 risk factors associated with becoming susceptible to e-cigarette use one year later. At Wave 1, 1,372 (70%) of adolescents with complete data reported as non-susceptible, never e-cigarette users. Overall, 22% transitioned to being susceptible one year later. Roughly an equal number of girls and boys (23% and 21% respectively), and youth of Hispanic and other ethnicities (24% and 20%, respectively), transitioned to being susceptible. After controlling for gender, grade, ethnicity, family SES, school performance, other substance use, and friend and family influence, our results indicated that poor school performance (OR: 2.45; 95% CI: 1.10-4.57), lower positive affect (OR: 0.76; CI 95%: 0.61-0.93), and higher sensation seeking (OR=1.40; 95% CI: 1.19-1.64) were all associated with the transition to becoming susceptible to e-cigarette use one year later. Our results emphasize the importance of affective states in the transition to susceptibility. Identifying sensation seekers as well as boosting positive affect and tailoring materials to address key aspects of susceptibility (i.e., curiosity, ameliorating peer influence and behavioral intentions) might be useful targets for intervention.

FUNDING: Federal

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## POS4-16

### IMPACT OF FLAVORS AND SWEETENERS ON WATERPIPE TOBACCO SMOKING

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INTRODUCTION: Waterpipe tobacco (WT) smoking, a practice likely as dangerous as cigarette smoking, is proliferating in the US. One possible reason for the increase in WT smoking is the inclusion of flavors and sweeteners in the tobacco. No study has examined what effect the removal of flavors and sweeteners from WT would have on users' smoking patterns, abuse liability, behavioral intentions for continued use, and toxicant exposure. METHODS: In a randomized crossover design, WP smokers (N=30, 57% male,  $M_{age}$  =26.4 years) completed four, 1-hour WT smoking sessions with different flavoring preparations [flavored + sweetened (FS); flavored + unsweetened (FU); unflavored + sweetened (US); unflavored + unsweetened (UU)] in a counterbalanced fashion; all session were separated by a 48-hr washout period. Study visits were completed in dyads. Participants com-

pleted post-session measures assessing WT abuse liability, behavioral intentions for continued use, exhaled carbon monoxide (eCO), and waterpipe puff topography was measured continuously throughout the session. RESULTS: 94% of participants reported that the first time they smoked waterpipe the tobacco was flavored. For all measures of drug liking/satisfaction, the FS tobacco was rated significantly higher than all other flavoring preparations, with the UU tobacco preferred the least (all  $p < .0001$ ). Participants' intentions for continued use was lowest for the UU preparation, with 61%, 79%, and 86% of participants reporting that they were 'unlikely' or 'extremely unlikely' to "try this product again", "pay to smoke this product at a waterpipe lounge", or "use this product regularly", respectively. No significant differences were observed for topography measures or eCO boost between preparations. CONCLUSIONS: The current study suggests that flavors and sweeteners from waterpipe tobacco significantly influence the product's abuse liability and users' reported willingness and interest for continued use. This study is the first to indicate that flavors and sweeteners likely contribute significantly to the maintenance of waterpipe tobacco smoking.

FUNDING: Federal

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## POS4-17

### DAILY SMOKING PATTERNS AND POSITIVE SUBJECTIVE RESPONSE TO SMOKING MENTHOL AND NON-MENTHOL CIGARETTES IN YOUNG ADULT SMOKERS: RESULTS FROM AN EMA STUDY

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Menthol flavoring has been hypothesized to enhance the subjective rewarding properties of smoking by masking the harshness of inhaled smoke. All studies of subjective response to menthol smoking have been done with established adult smokers and using either population-based surveys, which provide a one-time snap-shot of behavior, or tightly controlled laboratory paradigms that may not translate to real-life settings. No information exists on whether menthol cigarettes are endorsed as more satisfying and rewarding than non-menthol cigarettes, measured in the natural environment. This is important information to help determine menthol's abuse liability. This study examined differences in subjective response to smoking (reward, satisfaction) menthol and non-menthol cigarettes via 14 days of ecological momentary assessment (EMA) in a sample of 23 young adult smokers (aged 18-24). EMA measured in-the-moment craving, cigarettes per day, and subjective reward and satisfaction to smoking the most recent cigarette (menthol or non-menthol) twice a day. Subjective reports were averaged within days. Over the study period, 22% of respondents exclusively smoked non-menthol cigarettes, 17% exclusively smoked menthol cigarettes, and 61% smoked both types. Among those who smoked both types, only 18% of days were spent smoking both menthol and non-menthol cigarettes, and cigarette craving was highest on those days. CPD was highest on menthol-only days. Reward and satisfaction were lowest menthol-only days, but highest on menthol and non-menthol days. Counter to expectations, CPD was higher, but reward and satisfaction were lower, on days in which only menthol cigarettes were smoked. Young adult menthol smokers may feel a need to smoke more cigarettes to achieve satisfaction. Given the high proportion of users who switched between menthol and non-menthol cigarettes, benefits of a ban may be mitigated if smokers are using both menthol and non-menthol cigarettes.

FUNDING: DC Metro Tobacco Research and Instruction Consortium (MeTRIC)

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## POS4-18

### PERCEIVED IMPACT OF MENTHOL IN CIGARETTES ON SMOKING PATTERNS AND DISPARITIES AMONG US ADULTS (2016)

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Despite declines in overall cigarette use in the US nationally, menthol cigarette prevalence has increased among young adults and remained constant among older adults. Disparities in menthol cigarette use exist with higher prevalence among younger age smokers and among racial/ethnic minority populations. However, little research focuses on perceptions of these disparities among a diverse sample of US adults. This study is intended to explore the beliefs of US adults regarding how menthol cigarettes are used and their potential impact on vulnerable groups of consumers. Data from this study come from a nationally representative panel of US adults ( $n=1,303$ ) surveyed in 2016. Participants were asked to what extent they agree with various statements regarding menthol use disparities (dichotomized to Strongly Agree/Agree and Strongly Disagree/Disagree, referred to here as agree or disagree). In adjusted analyses, young adults (YAs; 18-24 years) were >5 times more likely than adults 25-64 years ( $p<0.01$ ) to report they agree that menthol cigarettes make it easier to quit smoking. YAs (vs. 25-65 year-olds) also had significantly lower odds ( $aOR=0.49$ ; 95%CI: 0.26, 0.92) of reporting they disagree that menthol in cigarettes is linked to becoming a regular smoker. Current and former smokers were both about three times more likely than never smokers ( $p<0.001$ ) to report they disagree that youth smoking menthol cigarettes are more likely to become addicted and that menthol in cigarettes is linked to becoming a regular smoker. Black, non-Hispanic and Hispanic (vs. White, non-Hispanic) respondents had significantly higher odds ( $aOR=4.61$ ; 95%CI: 2.55, 8.33 and  $aOR=3.28$ ; 95%CI: 1.38, 7.78) of reporting they agree that menthol cigarettes are effective at helping people quit smoking. These data show disparities in perceptions of menthol use, with YAs, smokers, Hispanic, and Black participants misperceiving the negative impact of menthol use on vulnerable populations. Understanding awareness of tobacco use disparities can inform health messaging strategies and communication about potential policy approaches.

FUNDING: This study was funded by Truth Initiative

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## POS4-19

### BELIEFS CORRELATED WITH SUPPORT OF A MENTHOL BAN AMONG ADULTS IN THE US

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The 2009 Family Smoking Prevention and Tobacco Control Act (Tobacco Control Act) gave the U.S. Food and Drug Administration (FDA) the authority to regulate tobacco products. The law prohibits the use of characterizing flavorings in cigarettes, except for menthol. However, the 2013 Tobacco Products Scientific Advisory Committee report stated that "the removal of menthol cigarette from the marketplace would benefit public health in the United States. In addition, previous research indicates overall support for a menthol ban is high. Therefore, this study sought to determine the most important beliefs associated with a menthol ban. Data were collected through online/telephone surveys among 1,303 AmeriSpeak panel adults aged 18 and older. Support for a menthol ban was determined by the following question "Do you think the FDA should ban menthol flavoring in cigarettes?" Logistic regression was utilized to determine the effect of 15 individual belief items on the support for a menthol ban. Odds of supporting a menthol policy ban were higher among participants who had accurate knowledge of addiction, marketing and health effects of menthol. Specifically, if participants thought 1) menthol in cigarettes is linked to becoming a regular smoker ( $OR = 1.84$ ;  $p < 0.05$ ), 2) youth smoking menthol cigarettes are more likely to become addicted to smoking ( $OR=2.10$ ;  $p < 0.001$ ), 3) marketing of menthol cigarettes targets youth and African Americans ( $OR=2.05$ ;  $p < .001$ ), 4) among smokers, more adolescents are more likely to use menthol cigarettes than any other age group ( $OR = 1.75$ ;  $p < .05$ ), 5) menthol cigarettes are healthier than non-menthol cigarettes ( $OR = 3.37$ ;  $p < .001$ ) and 6) menthol cigarettes are more natural than non-menthol cigarettes ( $OR = 2.22$ ;  $p < .001$ ), then they had greater odds of supporting a ban vs. those who differed in their beliefs on these items. To gain support of communities in favor of banning menthol, mes-

sages should focus on changing knowledge and beliefs surrounding addiction, marketing and health effects of menthol flavoring.

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## POS4-20

### THE FLAVOR TRAIN: THE EMERGENCE OF FLAVOR CAPSULES AND UNCONVENTIONAL FLAVOR DESCRIPTORS

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One way tobacco companies market and promote cigarettes is by using flavors – by flavoring their products and also through the words, images and colors used on packaging. Data on flavor usage is, however, limited; Euromonitor data are not available at the brand variant level nor are there details on types of flavors, lexical references or capsule delivery. There are no other multi-country initiatives that we are aware of that use a systematic and consistent protocol to document the full range of brand variants – including flavored cigarettes – available in a country. We undertook a multi-country study to fill this gap; here we describe the range of flavors available for purchase in 14 low- and middle-income countries (LMICs). Between 2013 and 2017 we set out to systematically purchase all unique cigarette packs available in Bangladesh, Brazil, China, Egypt, India, Indonesia, Mexico, Pakistan, the Philippines, Russia, Thailand, Turkey, Ukraine and Vietnam. We have data from one time point in six countries and two time points in eight countries. Over 4,000 packs were purchased and double coded for flavor descriptors and imagery. Approximately one in five packs advertised a flavor. We identified four key grouping of flavors: menthol or mint; fruit or citrus; alcohol and other beverages; and, unconventional or non-characterizing flavors. More tobacco companies and more brands had flavor capsules in our later data collection (since 2015 as compared to 2013). While many flavor capsule packs communicated a fresh or cool (menthol-like) sensation (e.g., "ice xpress", "polar pearls"; "fresh", "Cool XSpersion"), some used terms that are not explicit about the flavor sensation (e.g., "Ruby Burst", "Aruba Sunrise", "Mykonos Nightfall", "Double Fusion Velvet", "Fusion Shine"). One pack from China had five different flavor capsules (birchleaf pear, rice, whiskey, orange peel, rose). There appears to be a proliferation of the prevalence of cigarette brand variants with flavor capsules, and a trend toward using flavor descriptors that are unconventional and non-characterizing. This should be considered as jurisdictions draft policies to restrict flavored tobacco products.

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## POS4-21

### COMPLIANCE WITH CHICAGO'S CITY ORDINANCE RESTRICTING SALES OF FLAVORED TOBACCO PRODUCTS NEAR SCHOOLS

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BACKGROUND: In July 2014, the City of Chicago became the first U.S. jurisdiction to restrict the sale of all flavored tobacco products—including electronic cigarettes—that contain a constituent that imparts a characterizing flavor (including menthol) in retail outlets within 500 feet of any public, private, or alternative elementary, middle or secondary school. We examined changes in retail availability of flavored tobacco products following policy implementation, which was delayed until July 2016 due to legal challenges and agency rule-making. METHODS: Data were collected in a panel of 396 stores using a standard protocol in June-September 2015 (pre-intervention), and November-December 2016 (post-intervention). We sampled policy intervention-area stores located within 500 feet of affected schools (196 stores); comparison-area stores located within 501-1,000 feet of these schools (99 stores); and comparison-area stores located >1,000 feet from these schools (101 stores). We analyzed pre-post changes in full policy compliance (no restricted products, of any type, observed for sale) using logistic re-



gression. RESULTS: Policy compliance rates increased significantly for all areas, with the greatest change observed in policy intervention-area stores (14% to 75%,  $p < .001$ ), followed by comparison-area stores located 501-1,000 feet of schools (2% to 14%,  $p = .005$ ) and beyond 1,000 feet of schools ( $< 1\%$  to 7%,  $p = .035$ ). In addition, we detected differential changes in compliance across tobacco product categories and store types. DISCUSSION: We found statistically significant reductions in flavored tobacco product availability in policy intervention area stores. Our findings suggest that Chicago's flavored tobacco product policy was beginning to work as expected, with a large proportion of affected retailers no longer offering these products for sale; however, recent legislative modifications to the policy effectively allow most Chicago retailers affected by the 2014 policy to once again offer flavored products for sale, thereby blunting the ultimate intended impact of the policy on flavored tobacco product use among youth.

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## POS4-22

### CONTENT AND LANGUAGE FEATURES OF SMOKEFREE TXT

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BACKGROUND: SmokefreeTXT (SFTXT) is a national smoking cessation text messaging program. Upon enrollment in SFTXT, users can set a quit date up to two weeks in the future. All users receive 6 weeks of daily intervention messages, designed to support and sustain their quit attempt. Users who set a quit date in the future also receive preparation messages, designed to build self-efficacy for quitting. OBJECTIVE: This study sought to examine the content features of the messages in the SFTXT library, identify prominent psychological constructs the program appeals to, and compare the composition of the preparation versus intervention messages. Quantified linguistic features can be used as basis for program evaluation and adjustment. METHODS: The analysis was based on all messages from the SFTXT adult library. This included 29 preparation messages, 99 intervention messages and 91 keyword prompt messages. A computerized text analysis using Linguistic Inquiry and Word Count (LIWC2015) was then conducted on the 219 messages to calculate the percent of words that reflect different types of emotions, thinking styles, motivations and social concerns. RESULTS: Messages in the SFTXT program are highly authoritative, reflect a moderate level of analytical thinking, and carry a neutral emotional tone. Words that display cognitive processes (12%) are more prevalent than affect (8%). Among the three motivational themes, social relationship like family and friends (13%) are mentioned more often than core drives and needs like achievement and reward (12%), which outnumbered biological concerns like body and health (9%). Compared to the preparation messages, the intervention messages convey more positive emotions more often; they are less likely to address smoking cessation from a health/illness perspective; their language is more tentative and uses a more informal speech style. CONCLUSIONS: Messages in SFTXT make more rational than emotional appeals and emphasize social relationships more than physical health. The preparation and intervention messages are largely congruent with a few exceptions. Study findings will inform adjustments to the SFTXT library to improve its effectiveness.

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## POS4-23

### PRELIMINARY RESULTS OF A MOST STUDY TO TEST THE IMPACT OF TAILORED MESSAGES ON RETENTION IN A SMOKING CESSATION TEXT-MESSAGING PROGRAM

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SIGNIFICANCE: Text-based cessation programs are effective, but high user drop-out rates diminish their potential benefit. The Multiphase Optimization Strategy (MOST) may help identify ways to successfully increase user retention. METHODS: A fully-crossed, six factor, factorial study was implemented in 3562 users of the National Cancer Institute smokefree.gov cessation program, SmokefreeTXT.

Factors were single texts added to the existing program. Four factors were tailored messages for age, gender, level of nicotine addiction, or frequency around other smokers. Two factors were non-tailored messages. One reminded users they could reset their quit date during the program; the other encouraged users to stay in the program. The outcome of interest was leaving the program by day three after the quit day. Logistic regression was used to estimate main and interaction effects of each factor on retention. RESULTS: Compared to users who received both tailored and non-tailored messages, those who received only tailored messages were 28% less likely to leave the program (OR: 0.72, 95% CI: 0.55-0.95). Users who received the message to stay in the program were 1.26 times more likely to leave the program by day three (95% CI: 1.01-1.56). There was a statistically significant interaction between this factor and smoking frequency. Specifically, users who smoked less than everyday and received the message were 4.08 times more likely to leave the program (95% CI: 1.73-9.63). The message did not have an effect for users who smoked every day (OR: 1.13, 95% CI: 0.90-1.41). The remaining five factors had no main or interaction effects. CONCLUSIONS: These findings indicate that a combination of tailored messages might be needed to improve program retention. Unexpectedly, the message encouraging users to stay in the program resulted in increased drop out. This effect was primarily driven by an interaction with users' smoking frequency. The results of these analyses are being used to develop and test new factors.

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## POS4-24

### TEXT MESSAGING PROGRAM SURVEY DATA UNDERESTIMATES CESSATION RATES COMPARED WITH EXTERNAL EVALUATION: AN ANALYSIS USING TEXT2QUIT DATA

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BACKGROUND: Interventions delivered by text message on mobile phones have shown promise in helping people quit smoking. As part of routine intervention delivery, these programs periodically survey participants about their smoking status. While external outcome evaluation data is generally considered superior, there are advantages to relying on program survey data for evaluation purposes. This study examined the consistency of reporting of smoking between an external evaluation survey and internal smoking cessation texting program data. METHODS: In both modes, participants were surveyed with the same item about their past 7-day smoking and text assessments were selected from a time window of 14 days pre and post the external survey date. Responses were compared for consistency for participants who reported smoking status both via external evaluation survey and program text message survey at one ( $n = 45$ ), three ( $n = 50$ ), and six ( $n = 42$ ) months post-enrollment. Using an intent-to-treat analysis, the study also compared abstinence rates for all participants ( $n = 262$ ) reported via the two assessment modes. RESULTS: Participants had consistent reports of smoking status at one (89%), three (88%) and six (88%) months post-enrollment in external evaluation and program text message surveys. Fair to substantial levels of association were found at one ( $\kappa = .23$ ), three ( $\kappa = .63$ ), and six ( $\kappa = .66$ ) month follow-ups. In the intent-to-treat analysis, using McNemar's tests, significant differences in smoking abstinence rates reported to the two modes were detected at each timepoint (1 month: internal 16%, external 31%; 3 months: internal 16%, external 33%; 6 months: internal 12%, external 32%; all  $p < .001$ ). Despite these differences, fair to moderate levels of association were found between the two modes. DISCUSSION: Results provide initial support for the use of internal program data, collected by text message, as a reliable mode of collecting study evaluation and outcome data on smoking behavior. When using intent-to-treat approaches, internal program data potentially underestimate quit rates. Efforts should be made to improve response rates to internal program assessments.

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**POS4-26****CIGARETTE SMOKING BEHAVIOR: UNIQUE ASPECTS OF INDIVIDUAL SMOKING TOPOGRAPHY**

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To date, little is known about individual smoking behavior and the exposure to smoke toxicants. The aim of the human study was to characterize natural human smoking topography, and to determine the intra- and interindividual differences in smoking behavior leading to a possible different exposure per smoker. To mimic a natural situation, a prospective observational human pilot study included 5 healthy males (25-34 years), used to smoking 13-25 Marlboro cigarettes per day. Habitual smoking behavior was observed in a homelike-atmosphere apartment for 36 hours. For each smoked cigarette, smoking topography (i.e. puff volume, duration, frequency, flow and inter-puff-interval) was recorded with the CRESS-micro, a portable smoking topography measurement device. Puffing profiles were created by linear regression (least squares method). Participants smoked cigarettes random during the day and showed a significantly different puffing profile when compared intra- and interindividual. Each participant showed only subtle differences between the single puff parameters per cigarette. When comparing all cigarettes of an individual participant, a constant trend of successive puff parameters could be observed, enabling the creation of a personal smoking topography profile. Especially the interindividual differences should be taken into account, while the intra-individual differences are limited. Interestingly, the participants' puff profiles exceed the Health Canada Intense parameters used in regulatory machine smoking. As puffing parameters influence the burning process at the rod of the cigarette and therefore the composition of the smoke, they greatly contribute to the smokers' exposure. In conclusion, the presented results underline the need for appropriate cigarette smoke exposure-measurements based on human smoking behavior and thus a change in regulatory machine smoking regimes.

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**POS4-27****MENTHOL AND FRUIT FLAVOR EFFECTS ON SUBJECTIVE RATINGS AND SELF-ADMINISTRATION OF E-CIGARETTES**

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Characterizing flavors are widely available in e-cigarettes and cited as a motivating factor for initiation and continued use. Flavors may enhance the appeal and facilitate development of addiction to tobacco products through modulation of tobacco products' reinforcing or aversive actions. Palatable flavors (e.g., fruit) may increase appeal through primary reinforcing properties. Menthol's cooling and anesthetic effects may increase appeal by counteracting nicotine's aversive effects. Genetics may provide a method for modeling individual differences in sensitivity to nicotine's effects. The CHRNA5 gene codes for the alpha 5 subunit of nicotinic acetylcholine receptor, is a well-recognized marker for smoking risk, and may contribute to individual differences in sensitivity to nicotine's aversive effects. This study tested whether sensitivity to the aversive qualities of nicotine delivered via e-cigarettes was reduced by menthol, relative to unflavored or fruit flavors. Participants (N=32) self-administered e-cigarettes containing e-liquids differing in nicotine level (0,24mg/ml) and flavor (unflavored, menthol, fruit-flavored) within directed and *ad libitum* e-cigarette paradigms. Subjective drug effects, number of puffs, smoking urges, nicotine withdrawal, positive and negative affect, cardiovascular effects, cognitive measures, blood levels of nicotine, nicotine and menthol metabolites, and genotype were collected. Menthol partially ameliorated nicotine's aversive effects. In the absence of nicotine, fruit-flavored e-liquid was generally rated more positively than menthol or unflavored. Individuals with the 'protective' (GG) genetic variant rated high nicotine e-liquids as more aversive and self-administered less nicotine during *ad libitum*, than individuals with the 'risk' variant. Menthol countered nicotine's aversive effects more effectively than fruit flavor. In nicotine's absence, fruit-flavor increased self-reported and choice preference relative to unflavored. Findings suggest menthol and fruit-flavor increase e-cigarettes' ap-

peal, but may do so through different mechanisms, and differentially depending on nicotine level.

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**POS4-28****THE INFLUENCE OF E-CIGARETTE PRODUCT CHARACTERISTICS ON VAPING BEHAVIOR AMONG EXCLUSIVE E-CIGARETTE AND DUAL USERS**

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It is important to know the socio-cognitive factors related to exclusive electronic cigarettes (e-cigarettes) use and to dual use of e-cigarettes and tobacco cigarettes (dual users). This study examined socio-cognitive behavioral determinants associated with both dual use and exclusive e-cigarette use. Differences between e-cigarette users, and dual users were assessed among adolescents (13 – 17 years) and adults (>18 years). A cross-sectional survey (n=1250) among non-users, smokers, e-cigarette users, and dual users was conducted in the Netherlands. The questionnaire assessed demographics, tobacco and e-cigarette behavior, product characteristics, knowledge, attitudes, social ties, risk perception, intention, and deliberation. Overall, 30% of the respondents were non-users, 33% smokers, 13% exclusive e-cigarette users, and 24 % were daily dual users. Ever use of e-cigarettes was 34%. Of the ever users, 28% used e-cigarettes daily, 22% weekly, and 12% on a monthly basis. E-cigarette users were more positive towards e-cigarettes in general than dual users. Correlations were investigated between risk perception, social ties, intention, attitude, flavor first used, flavor currently used, nicotine levels, and device used. Reasons for using e-cigarettes differed between exclusive e-cigarette users and dual users. All participants were more positive towards e-cigarettes than tobacco cigarettes, e-cigarette users reported stronger social ties with other e-cigarette users than dual users. In addition, dual users perceived smoking as less harmful than exclusive e-cigarette users. Flavors currently used varied among exclusive e-cigarette users and dual users. Determinants of smoking and vaping behavior differ between exclusive e-cigarette users and dual users. Linking determinants of behavior and product characteristics, we are able to predict exclusive e-cigarette use and dual use. These links provide policy makers, such as the correlation between a positive attitude, e-cigarette flavor, and nicotine levels with opportunities to target dual users and reduce tobacco cigarette use.

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**POS4-30****SMOKING CESSATION CARE RECEIPT, PREFERENCES, AND INTENTIONS: A COMPARISON OF HETEROSEXUAL AND LGBT CLIENTS IN ALCOHOL AND OTHER DRUG TREATMENT**

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SIGNIFICANCE: Lesbian, gay, bisexual and transgender (LGBT) populations are more likely to experience substance misuse and smoke tobacco at higher rates than heterosexual people however they are the subject of limited tobacco control research. The purpose of the current study was to examine receipt of smoking care and preferences for treatment in alcohol and other drug treatment. METHODS: An online cross-sectional survey was administered to clients who smoke tobacco from 31 AOD treatment services in four states and territories of Australia from February to August 2015. Smoking-related variables, receipt of cessation care during treatment, preferred quit strategies and characteristics were assessed. RESULTS: Among 896 clients surveyed, 100 individuals identified as LGBT. Of the LGBT sample, the majority (62%) were female and had an average age of 34 years (SD=10). Poly substance abuse was common among both groups, however LGBT persons were significantly more likely to use hallucinogens (10% vs 3%),



tranquilizers (49% vs 34%) and inhalants (13% vs 2%, all  $p < 0.05$ ). Moderate to high nicotine dependence was comparable (both 74%). On average, LGBT persons had made more quit attempts in the last 12 months (3 vs 2,  $p = 0.012$ ). Both groups reported receiving similar rates of cessation care however more LGBT persons reported receiving a prescription of Champix (31.5% vs 36.4%,  $p = 0.04$ ). Both groups reported wanting similar evidence-based quit strategies during treatment. CONCLUSIONS: The frequency of quit attempts and openness to receive multiple quit smoking strategies suggests the need to explore perceptions of substance use and tobacco smoking in the LGBT community in order to provide effective clinical treatment.

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## POS4-31

### EXPOSURE TO HEALTH WARNINGS FOR CIGARETTES AND NON-CIGARETTE PRODUCTS IN THE UNITED STATES

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SIGNIFICANCE: Tobacco users' exposure to health warnings is a necessary first step for warnings to have any impact on tobacco risk perceptions or behavior. While most warning research has focused on cigarettes, little is known about exposure to non-cigarette warnings, which is important given the growth in their use. Furthermore, baseline data about exposure to warnings for products newly added to the FDA's regulatory authority (including e-cigarettes, cigars and hookah) is needed to help evaluate new requirements coming in 2018 aimed at strengthening their warnings. METHODS: We conducted a secondary data analysis of warning exposure measures on Wave 1 (2013-2014) of the adult Population Assessment of Tobacco and Health Study (PATH). We provide weighted prevalence estimates for measures about noticing health warnings on the packages of cigarettes, smokeless tobacco, cigarillos, e-cigarettes and hookah in the past 30 days among current and former users of these respective products. Data reflect participants that reported noticing health warnings "sometimes", "often" or "very often" (versus "rarely" or "never"). RESULTS: The prevalence of having seen a health warning on tobacco product packaging at least sometimes in the last 30 days among current product users was similar for cigarettes (57.7%), snus pouches (55.1%) and other smokeless tobacco (57.4%). Fewer current cigarillo (28.7%), e-cigarette (16.8%), and hookah (14.9%) users reported noticing warnings on their respective products. Among e-cigarette users, there was little difference in noticing e-cigarette warnings between current established (17.2%) and experimental (16.5%) e-cigarette users, in contrast to other products. Among former users, noticing product warnings was most prevalent for snus pouches (25.5%), followed by cigarettes (23.3%). Across products, noticing warnings was more prevalent among males than females, among younger adults (ages 18-24), and those with lower levels of education. CONCLUSIONS: Future research should track if exposure to tobacco warnings change over time given changing requirements, and related associations with product perceptions and use.

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## POS4-33

### HOOCAH USE AMONG US YOUTH: A SYSTEMATIC REVIEW

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INTRODUCTION: Hookah is currently the second most commonly used tobacco product among U.S. youth; however there is limited understanding of how youth perceive hookah and associations between hookah use and use of other products. Given the Food and Drug Administration (FDA)'s authority to regulate hookah, more research is needed to inform regulations intended to prevent youth from using hookah. This systematic review summarizes and assesses the literature related to hookah use among adolescents (ages 11-18 years of age) in the U.S. from 2009 to 2017. METHODS: Database searches yielded 867 peer-review articles,

and after duplicates were removed, authors independently screened 461 articles to determine if they met eligibility criteria. Included articles ( $n = 55$ ) were coded under the following themes related to hookah use: 1) prevalence; 2) sociodemographic correlates; 3) psychosocial risk factors; 4) concurrent use of other tobacco products; and 5) concurrent use of other substances. Other themes were coded but are not presented here. Articles were also coded for study quality and their relevance to FDA's research priorities. A qualitative synthesis is presented by each theme. RESULTS: Thirty-five articles were cross-sectional studies, 9 were repeated cross-sectional studies, 8 were cohort studies, and 3 were mixed methods or qualitative studies. Twenty-one articles included themes on harm perceptions and other psychosocial risk factors, such as attitudes and peer use. The qualitative synthesis showed that youth perceive hookah to be less harmful than cigarette smoking, and these lower perceptions are associated with higher odds of hookah use. Measures of harm perceptions varied across studies. Prevalence of hookah use ( $n = 45$ ), sociodemographic correlates ( $n = 33$ ), concurrent use with other tobacco products ( $n = 35$ ), and other substances ( $n = 10$ ) were also common themes. All articles fell within FDA's research priority to understand behaviors related to diverse tobacco product use. CONCLUSIONS: Longitudinal studies are needed to determine the causal sequence between harm perceptions and hookah use to inform interventions and policies targeted to protect vulnerable youth.

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## POS4-35

### IMITATING HOOCAH: ANOTHER TOBACCO INDUSTRY ATTEMPT TO CREATE A SAFER CIGARETTE

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SIGNIFICANCE: Use of hookah has becoming increasingly popular in the U.S., especially among youth and young adults. However, existing research has not examined the tobacco industry's interest or involvement in this product and its technology. METHODS: We searched the University of California San Francisco Truth Initiative Tobacco Industry Documents beginning with the search terms "hookah", "waterpipe", "narghile", "shisha", "hooka", "e-hookah", "electronic hookah", "water filtration", and "hubble-bubble" and then expanded the search using snowball sampling. We focused our analysis on three products that had the documents suggested were inspired by hookah technology. Over 1,500 documents were reviewed and 34 were included in this analysis. RESULTS: The documents reveal that the tobacco industry has been attempting to replicate hookah technology since at least 1955. The industry developed and attempted to market three products: Aquafilter, Waterford Cigarettes and Rivage Cigarettes. Although these products proved unsuccessful in the marketplace and are no longer produced by any tobacco company, various forms of Aquafilters can still be found online or through smaller non-industry affiliated companies. CONCLUSION: The tobacco industry has been monitoring hookah technology for decades. With the rise of hookah bars and lounges in the U.S. it is imperative that the tobacco control community stays alert to the industry's attempts to enter into this marketplace.

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## POS4-36

### SECONDHAND SMOKE EXPOSURE AMONG AMERICAN INDIANS

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Studies have reported American Indians (AI) are more likely to smoke cigarettes and have lower quit rates than whites. Literature is less clear about disparities in home and car smoking bans, as well as exposure to secondhand smoke (SHS) at home, work, and in the car. Data from the National Adult Tobacco Survey (2013-2014) were used to examine the prevalence of home and car smoking bans and the percentage of AIs ( $n = 1,043$ ) exposed to SHS in their homes, cars, and workplaces, compared to whites ( $n = 56,972$ ). Weighted prevalence estimates were calculated, and the relationship between home and car smoking bans and covariates of interest in AIs were examined using weighted logistic regression models. AIs were less likely to report a total ban on smoking in their homes as compared to





whites (75.9% vs. 84.8%;  $p < 0.0001$ ). Similarly, car smoking bans were less likely to be reported by Als as compared to whites (71.8% vs. 78.4%;  $p = 0.0011$ ). The odds of SHS exposure on one or more days during the past week were higher for Als as compared to whites for home (OR = 1.79, 95% CI = 1.37, 2.34), car (OR = 1.99, 95% CI = 1.61, 2.48) and work (OR = 1.36, 95% CI = 1.05, 1.77). Factors associated with home bans for Als were marital status (married or living with a partner;  $p = 0.0012$ ) and smoking status (non-smoker or former smoker status;  $p < 0.0001$ ). Factors associated with car bans for Als were annual income of \$50,000 or more ( $p = 0.0303$ ) and non-smoker or former smoker status ( $p < 0.0001$ ). Education and perceived harm from smoking were not associated with home and vehicle smoking bans among Als. This study demonstrates disparities in SHS exposure for Als, both in terms of voluntary individual policies and actual self-reported exposure at home, work, and in the car. The lack of association between knowledge of the harms of smoking and the presence of smoking bans may indicate the need for interventions addressing smoking risks.

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## POS4-37

### BELIEVABILITY AND RISK PERCEPTIONS OF MODIFIED RISK CLAIMS ON SNUS: AN EXPERIMENT IN A NATIONAL PHONE SURVEY

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**SIGNIFICANCE:** The FDA has regulatory authority to approve modified risk tobacco products (MRTP). Approved MRTP can label the product as less harmful than other tobacco products. A recent MRTP application for Swedish Snus requested that standard warnings be removed and replaced with a modified risk claim. As little evidence exists on public understanding of MRTP warnings or claims on snus, we examined the impact of claims and warnings on believability and risk perception. **METHODS:** Data from a national phone survey of 4964 adults conducted from August 2016 to May 2017. Respondents were randomly assigned in a 3 x 3 experiment to hear 1 of 3 snus messages (a proposed MRTP claim: 'No tobacco product is safe, but this product presents substantially lower risks to health than cigarettes.' and 2 currently mandated warnings: 'This product can cause mouth cancer.' and, 'This product is not a safe alternative to cigarettes.') and 1 of 3 sources (no source, FDA, and tobacco industry). Participants rated the believability of the warning and their risk perception of snus. Logistic regression used to assess the impact of source and warning, controlling for demographic characteristics and cigarette smoking. **RESULTS:** Participants who heard the 'can cause mouth cancer' and 'not a safe alternative' snus messages were more likely to rate them as 'very believable' compared to the 'substantially lower risk' message. However, participants who heard the 'can cause mouth cancer' message were more likely to rate snus as a 'great risk' compared to participants who heard the 'substantially lower risk' message. There were no significant differences in believability or risk perception by source of the message. **CONCLUSIONS:** MRTP snus claims may not be as believable as standard snus product warnings. These claims also likely dampen risk perceptions of these products among adults.

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## POS4-38

### YOUNG ADULT SMOKING CESSATION STRATEGIES IN A NATIONAL POPULATION STUDY

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**SIGNIFICANCE:** Young adulthood is a key transition time for tobacco use. Given recent changes in the tobacco product landscape including rapidly increasing use of e-cigarettes among young adults, population studies on young adult smoking cessation in the US are needed. **METHODS:** We used a nationally representative sample of young adults (age 18-25; N=3,083) and older adults (age 26-64; N=8,634) from the Population Assessment of Tobacco and Health (PATH) Study who had regularly smoked conventional cigarettes within the year prior to Wave 1

(2013-2014) to address three objectives: (1) describe intentions to quit and cessation rates among young adult smokers compared to older smokers, (2) describe the relative frequency of tobacco cessation strategies (behavioral therapy, NRT, prescription drugs, product substitution, or cold turkey) for young adult and older smokers, and (3) examine variation in young adult cessation strategies by socioeconomic characteristics. We calculated survey-weighted cessation rates and last quit attempt strategy rates and conducted survey-weighted significance tests using Stata 14. **RESULTS:** Of adults who made at least one quit attempt in the previous year (N=5,654), young and older adults had similar cessation rates. Almost all current adult smokers intended to quit; however, young adults planned to quit farther in the future, and they were more confident they will be successful. For their last quit attempt, young adults were more likely to have tried to quit cold turkey than older adults and far less likely to have used nicotine replacement therapy or prescription drugs. Both young and older adults used product substitution, almost always with e-cigarettes, more than any other cessation strategy. Only race predicted behavioral counseling or pharmacotherapy use. Male gender, higher education, and Latinx ethnicity positively predicted product substitution. **CONCLUSIONS:** Results suggest young adults have similar intentions and attempts to quit as older adults but continue to underutilize evidence-based cessation strategies. Providers should continue to innovate ways in which to engage young adults in evidence-based smoking cessation strategies.

FUNDING: State; Federal

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## POS4-39

### EXTENT OF AGREEMENT BETWEEN SELF-REPORTED SMOKING STATUS AND URINE COTININE BIOCHEMICAL VERIFICATION AMONG PREGNANT SMOKERS ENROLLED IN A CONTINGENCY MANAGEMENT INTERVENTION TRIAL

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**SIGNIFICANCE:** Reducing smoking among pregnant women is an important goal. One intervention that has showed promise is contingency management, which incentivizes women for abstaining from smoking during pregnancy. An important question for the feasibility of widespread dissemination of the intervention is the accuracy of self-reported smoking and the need for biochemical verification. This study investigated the extent and predictors of biochemical verification of self-reported smoking among pregnant women enrolled in a contingency management intervention trial. **METHODS:** Women who reported current cigarette smoking or recent quitting at enrollment in prenatal care (N=297) were assigned by clinic to one of three groups – a high level financial incentive group, a low level financial incentive group, and a control group. Women in the incentive groups were given gift cards when they reported abstinence from smoking at each prenatal care visit, and urine cotinine tests were conducted by clinic staff. Generalized linear mixed models were performed on rates of biochemical verification (1=verified, 0=not verified) across all clinic visits for all women, with a random effect to account for repeated measures within women for each visit in which the participant self-reported not smoking in the 30 days prior to the visit. Age, race, education, number of smokers in the household, and study group were entered as predictors. **RESULTS:** Out of 406 total visits, 184 (45.3%) were biochemically verified. Predictors associated with verification at 100 ng/mL were younger age ( $p = .03$ ), higher educational attainment ( $p = .02$ ), fewer household members who smoke ( $p = .03$ ), and enrollment in the low ( $p = .004$ ) and high ( $p = .02$ ) incentive groups. **CONCLUSIONS:** In this study, the overall rate of verification of self-reported abstinence was relatively low. However, the rate was higher in the incentive groups compared to the control group, after controlling for demographic factors and number of smokers in the household. In addition, number of smokers in the household was negatively associated with verification suggesting that secondhand smoke exposure might play a role in producing non-verified results.

FUNDING: State

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## POS4-40

### CONVERSATIONAL TRAJECTORIES ABOUT PICTORIAL CIGARETTE PACK WARNINGS: MESSAGE CHARACTERISTICS AND DEMOGRAPHIC PREDICTORS

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**SIGNIFICANCE:** Conversations about pictorial warnings are one of the ways warnings exert their influence on quit attempts, but the number of conversations often decrease over time. We sought to identify covariates that predicted the trajectories of conversation frequency over time. **METHODS:** We analyzed data from the intervention group of 1,071 US adult smokers who we randomly assigned to have their cigarette packs labeled with pictorial warnings for four weeks. They completed surveys about demographic characteristics, conversation frequency, and reactions to the pictorial warnings during the baseline visit and each of the subsequent four weekly visits. We analyzed the data using latent growth curve modeling. **RESULTS:** During the first week of having pictorial warnings on cigarette packs, older smokers had fewer conversations than younger smokers. Conversations during the first week were also more common among smokers who were white, low-income, had greater perceived message effectiveness of the warning, and had stronger negative emotional reactions to the warnings (all  $p < .05$ ). Conversations declined during the second week, but these declines were more gradual for minority and older smokers, leading to more conversations throughout the study. **CONCLUSIONS:** Conversations about cigarette pack warnings decreased over time. Greater perceived message effectiveness of the warnings and stronger negative emotional reactions to the warnings were associated with more conversations during the first week of smoking from packs with pictorial warnings. We should design pictorial warnings that elicit strong negative emotions and high levels of perceived effectiveness in order to spark conversations.

**FUNDING:** Academic Institution; Federal

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## POS4-41

### SCHOOL PROXIMITY AND CENSUS TRACT CORRELATES OF ELECTRONIC CIGARETTE SPECIALTY RETAIL OUTLETS IN CENTRAL TEXAS

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**SIGNIFICANCE:** This study investigates the proximity of electronic cigarette specialty retail outlets (vape shops) to schools, as well as socio demographic determinants of vape shop situation by census tracts in Austin, Texas. Electronic Nicotine Delivery Systems (ENDS) are now the most widely used tobacco product among US youths, yet their health effects are still poorly understood. A surge in the use of this product by adolescents in recent years is a particularly of concern. It is therefore imperative to gain insights on e-cigarette retailer behaviors. **METHODS:** Geo-spatial analysis was conducted on geocoded vape shops to determine their proximity to middle and high schools located in the city of Austin, Texas, using ArcGIS. Sociodemographic correlates of census tracts were mapped and geovisualized to describe pattern of vape shop distribution by tract sociodemographic characteristics. Local and global Morans I autocorrelation analysis was conducted to evaluate clustering of sociodemographic variables and vape shops by census tracts. **RESULTS:** Ninety-five percent of e-cigarette specialty retail outlets in Austin, Texas are situated within a 1.5-mile radius of middle and high schools. Most vape shops are situated in census tracts in Austin that are multiracial and densely populated. Socioeconomic disparities were found in the e-cigarette retail environment. **CONCLUSION:** Regulation is required to impose restrictions on situation of vape shops in Austin, Texas. Findings from this study may contribute to the formulation and enforcement of regulations that may curb adolescent tobacco product use.

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## POS4-42

### CHARACTERIZING COLLEGE STUDENTS' EXPOSURE AND ENGAGEMENT WITH TOBACCO AND NICOTINE PRODUCT MESSAGING ON SOCIAL MEDIA

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Tobacco industry marketing profoundly influences tobacco use. Tobacco companies are flooding social media which is inexpensive, lacks stringent marketing regulations, and is popular among young people. This study characterizes young adult exposure to and engagement with tobacco and nicotine product marketing and messaging on social media. Participants were 4,390 18-29 year old students (mean age=20.4 SD=2.31; 64.5% female; 35.5% non-Hispanic white) from 24 Texas colleges who completed wave 6 of an online survey (spring, 2017). Descriptive statistics were generated to examine the prevalence of exposure and engagement with tobacco and nicotine social media messaging. Chi-square tests examined differences in prevalence by age, gender, race/ethnicity and school type. During the past 30 days, 94.1% of students viewed content (exposure) and 90.4% liked, shared, posted or commented (engagement) on social media. Over 30% reported exposure to product advertising via social media, with the highest recall on Facebook (22.4%), then YouTube (13.7%), Instagram (15.1%), Twitter (10.4%), Snapchat (9.3%), Reddit (8.2%), and Pinterest (6.9%). Recall of electronic nicotine delivery systems (ENDS) advertising was most prevalent across social media (20.1%), followed by cigarettes (18.1%), hookah (14.0%), cigars (9.0%), and smokeless tobacco (8.3%). Students reported engagement by posting links to pro- (3.7%) and anti- (10.7%) tobacco/ENDS related messaging, posting their own comments about the positive (4.5%) and negative (9.2%) aspects of tobacco/ENDS use, encouraging (3.2%) and discouraging (12.9%) people from using, posting about their own use (4.7%), and reposting tobacco/ENDS content that was originally posted by someone else (2.3%). Four-year university students were significantly more likely than two-year students to report exposure to tobacco/ENDS social media messaging ( $p < .05$ ). Differences by demographic characteristics in prevalence of engagement were not significant. Recall of tobacco and ENDS social media exposure and engagement is prevalent among college students. This study highlights a need for counter-marketing campaigns and regulation of tobacco marketing on social media.

**FUNDING:** Federal

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## POS4-43

### INTERNALIZING/EXTERNALIZING PSYCHIATRIC AND SUBSTANCE USE DISORDERS ARE ASSOCIATED WITH THE EVER AND CURRENT USE OF HOOKAH AMONG YOUNG ADULTS IN THE US IN 2014-2015

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**PURPOSE:** To examine the association in the past year between (i) internalizing (IPD) and externalizing psychiatric disorders (EPD) as well as (ii) substance use disorder (SUD) and the use of hookah among young adults in the U.S. **METHODS:** Secondary data analysis of young adults (ages 18 to 24 years old) from the Population Assessment of Tobacco and Health wave 2 study. Outcome variables were ever and current use (past 30 day) of hookah. Exposures examined were IPD, EPD and SUD after collapsing each into high, moderate or low scores. Adjusted odds ratios (AOR), controlling for sex, race/ethnicity and education, examined the association between these exposures and ever and current use of hookah. **RESULTS:** Forty-seven percent (N=30,262,085; n=8,174) and 13.0% (N=3,934,021; n=1,244) of young adults, reported ever and current use of hookah, respectively. After controlling for covariates, the odds of ever use of hookah was higher for respondents with high IPD scores (OR: 1.29 95%CI: 1.13 -1.48) and high EPD scores (OR: 1.36 95%CI: 1.14 -1.62) in comparison to respondents with low scores. Similarly, the odds of ever use of hookah was higher for respondents with high SUD scores (OR: 3.77 95%CI: 2.96 - 4.79) and moderate SUD scores (OR: 2.30 95%CI: 2.04 - 2.60) in comparison to respondents with low scores. In addition, high (OR: 2.20 95%CI: 1.74 - 2.78) and moderate (OR: 1.91 95%CI: 1.62 - 2.26) SUD scores were significantly associated with current use of hookah. Neither IPD nor EPD scores were associated with current use of hookah. **CONCLUSION:** While internalizing



and externalizing psychiatric disorders were associated with ever use of hookah, substance use disorder was associated with both ever use and current use of hookah. Further examination to determine if SUD predicts initiation of hookah use appears warranted. Analyses exploring the associations between IPD and EPD and other tobacco behaviors, for example by sex or race/ethnicity, are important to identify subgroups at higher risk.

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## POS4-44

### BARRIERS AND FACILITATORS OF ORGANISATIONAL CHANGE FOR TOBACCO DEPENDENCE TREATMENT IN A SUPERVISED INJECTING FACILITY

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**SIGNIFICANCE:** Tobacco smoking among injection drug users exceeds 90%. Supervised injecting facilities may be a potential setting for the delivery of smoking cessation care. This is the first study internationally to integrate smoking cessation care into routine delivery at a supervised injecting facility. This study provide a qualitative exploration of staff acceptability, perceived facilitators and perceived barriers to implementing six core components of an organisational change intervention to integrate smoking cessation care in a supervised injecting facility. Staff and client views on the acceptability, facilitators and barriers to the provision of smoking cessation care were also examined. **METHODS:** Face-to-face semi-structured staff interviews (n=14) and two client focus groups (n=5 and n=4) were conducted at a supervised injecting facility in Sydney, Australia between September-October 2016. Recruitment continued until data saturation was reached. Thematic in-depth analysis informed the analysis. **RESULTS:** Staff viewed the organisational change intervention as acceptable. Commitment from leadership, the importance of a designated person to keep the change on the agenda, access to resources and the congruence between the change and the facility's ethos were important facilitators of organisational change. Less engaged staff was the sole barrier to the intervention. Smoking cessation care was deemed suitable. Key facilitators of smoking cessation care included: written protocols, ongoing training and visually engaging information. Key barriers of smoking cessation care included: lack of access to nicotine replacement therapy (NRT) outside of business hours, practical limitations of the database and concerns about sustainability of NRT. **CONCLUSIONS:** This study develops our understanding of factors influencing the implementation of an organisational change intervention to promote sustainable provision of smoking cessation care in the supervised injecting facility setting.

**FUNDING:** Federal

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## POS4-45

### TOBACCO CESSATION BEHAVIORS OF ALASKA NATIVE PEOPLE IN NORTON SOUND

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**SIGNIFICANCE:** Alaska Native (AN) people smoke at high prevalence and are disproportionately affected by tobacco's harms to health. Heart disease is the leading cause of death among smokers. Though most smokers want to quit, most attempts to quit smoking are unsuccessful. **METHODS:** The current study examined quit attempts, motivations to quit, and reasons for relapse among AN people at risk for heart disease living in the Norton Sound Area of Alaska. Findings will inform intervention strategies. Participants were AN adults living in the Norton Sound region of Alaska, smoking 5+ cigarettes per day (cpd), and identified with high cholesterol,

high blood pressure, or both. **RESULTS:** The sample (N=197; 50% women; age M=48 years, SD=14) averaged 12 cpd (SD=11); 65% smoked within 30 minutes of waking. Most (86%) reported a 24-hr lifetime quit attempt; 40% in the past year. Stage of change for quitting smoking was 22% precontemplation, 44% contemplation, and 33% preparation. On scales of 1 (low) to 10 (high), desire to stop smoking was M=5.3 (SD=2.7); expectation of success was M=4.9 (SD=2.8); and perceived difficulty with staying smoke-free was M=6.4 (SD=2.9). Leading motivations for past quit attempts were health concerns (39%), the price of tobacco (10%), pregnancy (10%), and other (17%). In past quit attempts, triggers for relapse included use of tobacco by family/friends (36%), the habit (32%), addiction (31%), stress (29%), cravings (24%), and boredom (14%). Men were more likely to identify craving and habit as triggers for relapse than women. Smoking within 30 minutes of waking (an indicator of addiction) vs. later was associated with heavier smoking (M=14 vs. 9 cpd) and greater perceived difficulty of preventing relapse (M=6.7 vs. 5.8), both p-values < .05; desire to quit and stage of change did not differ by time to first cigarette. **CONCLUSIONS:** With a focus on AN people in the Norton Sound region of AK, our findings indicate strong interest but also challenges in successfully quitting smoking. Treatment targets include both facilitators (health concerns, pregnancy, price) and barriers (addiction, habit, social, stress, cravings) to quitting.

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## POS4-46

### THE VALENCE OF MEDIA COVERAGE OF E-CIGARETTES AND OTHER TOBACCO PRODUCTS

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**SIGNIFICANCE:** The valence of combustible tobacco product media coverage has primarily been against its use (anti). This is unsurprising since the health hazards of combustible tobacco use have been known for many decades. In contrast, the valence of e-cigarette media coverage might be more mixed (pro (supportive) and anti) since they potentially reduce harm. However, little is known about the actual valence of e-cigarette and tobacco media coverage. **METHOD:** We collected all texts coded to be primarily related to e-cigarettes (6,394) or tobacco (18,230) published from May 2014-June 2017 in four media sources: the AP, 50 major newspapers, 8 broadcast news sources, and more than 100 popular websites. We crowd-sourced valence rating of two random samples of 2,000 texts (all texts; e-cigarette texts) on Mturk. Each text was coded as either mostly pro or mostly anti by at least nine Mturk workers. Finally, using these human-labeled texts, we trained supervised machine learning classifiers to identify pro and anti tobacco and e-cigarette valence. **RESULTS:** Ten percent of all texts were rated as pro-tobacco while 55% were anti-tobacco, with the rest not assigned a clear valence. Surprisingly, the valence of e-cigarette-related texts were even more negative than the tobacco valence of all texts: 9% were pro and 65% were rated as anti-e-cigarette. Tobacco valence in e-cigarette texts (some containing tobacco content) was even less likely to be pro (5%) and more likely to be anti (65%) than tobacco valence in tobacco only texts (pro 11% and anti 52%). **CONCLUSIONS:** Overall, current media discussions of e-cigarettes, like current and historical coverage of tobacco, are heavily against its use. Also tobacco valence in e-cigarette texts is likely to be a little more negative than tobacco valence in tobacco only content. The literature argues that media coverage of tobacco is negatively valenced and expects it will reduce youth smoking behavior. However, those studies were conducted before e-cigarettes came on the market, and when most tobacco coverage was known to be anti. E-cigarette media coverage appears to play some role in spreading anti-tobacco information.

**FUNDING:** Federal

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## POS4-47

### COMPARISONS OF PUFF TOPOGRAPHY AND CO-EXPOSURE IN LITTLE CIGAR AND CIGARETTE SMOKING

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Little Cigars (LCs) are popular among youth and young adults, especially flavored LCs. LC smokers are more likely to be male and African American than non-smokers. Although LCs resemble cigarettes in size and shape, LCs are cheaper and perceived as less harmful than cigarettes. Smoke from both flavored and non-flavored LCs has been shown to have similar levels of toxicity, suggesting that both types of LCs are equally harmful. Depending on puffing behavior, LCs may pose a different risk from smoke exposure than cigarettes. The goal of this study was to evaluate the differences in puff topography and CO exposure from flavored vs. "unflavored" LCs compared to cigarettes. A within-subject cross-over trial was conducted using a cherry and original, unflavored LC of the same brand and a popular cigarette. Fifty-one current smokers (Male=54%; African American=52%) visited the laboratory on three separate days and smoked a single product assigned in counterbalanced order. Measures on puffing topography and CO boost were obtained for each product smoked. Significant differences were found on most puffing topography measures between LCs (either flavored or unflavored) and cigarettes. No significant differences were found between flavored and unflavored LCs. Participants had higher numbers of puffs, longer smoking time, longer puff duration, higher level of CO boost, but smaller total and average puff volume for LCs than cigarettes (mostly  $p < 0.001$ ). Overall, male smokers had smaller numbers of puffs, shorter smoking time, but larger average puff volume and longer puff duration than female smokers. African American smokers had larger average puff volume and longer puff duration than white smokers. Although LCs and cigarettes look similar, users may smoke these products differently, which has important implications for potential smoke exposure. Differences in smoking behaviors between LCs and cigarettes are important considerations in and directly inform FDA CTP's efforts to regulate LCs.

FUNDING: Federal

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## POS4-48

### MULTI-YEAR REENROLLMENT PATTERNS IN A STATEWIDE CESSATION PROGRAM

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BACKGROUND: Research shows quitline users are interested in reenrolling in more treatment, but little is known about reenrollment patterns over time with expanded services. Minnesota's statewide cessation program, QUITPLAN@ Services, was expanded in 2014 to offer more services including a Helpline (phone counseling and NRT), Individual Services (two week NRT starter kit, text and email support and quit guides) and a new media campaign. We tracked participants who initially enrolled soon after the redesign to see if and when they reenrolled in additional services. METHODS: Utilization data for a cohort of 9,024 QUITPLAN Services participants initially enrolled between April and September 2014 were analyzed for 29 months to determine the extent to which they reenrolled in services without proactive outreach. Registration and utilization data were used to calculate an overall reenrollment rate, assess demographic and service selection differences between those who did and did not reenroll, and examine reenrollment patterns and timing. RESULTS: 11.3% (n=1,023) of participants reenrolled in one or more QUITPLAN Services and 58% of those reenrolled within six months. Compared to those who did not reenroll, those who reenrolled were: older, more likely to be female, lived in neighborhoods with lower average median home values, less likely to use smokeless tobacco in the past 30 days, and were more likely to have initially enrolled by phone than web (all differences statistically significant,  $p \leq .005$ ). No differences were found for initial service type, cigarette/cigar/pipeline use at registration, or race ( $p \geq .273$ ). Initial Helpline participants took longer on average to reenroll than those who initially enrolled in Individual Services (12.3 vs. 7.7 months, ( $p \leq .0001$ )) and overall 35% reenrolled in a more intense service, 43% in the same intensity, and 22% in less intense services. DISCUSSION: This study demonstrates that tobacco users will return to statewide cessation

services offering multiple service options, and that some may have more than two years between enrollments. Quitlines should use multiple strategies to encourage relapsed tobacco users to reenroll.

FUNDING: Independent Non-Profit funded with state tobacco settlement dollars

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## POS4-49

### SUSCEPTIBILITY TO SMOKE CIGARETTES: A PREDICTIVE MEASURE OF SMOKING AMONG EARLY ADOLESCENTS IN ARGENTINA AND MEXICO

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SIGNIFICANCE: Experimenting with cigarettes is related to future smoking so, identifying adolescents who may be more likely to try a cigarette, could help prevention strategies. Susceptibility to smoking is the absence of a firm decision not to smoke in the future. We aimed to assess the validity of a 2-item Spanish version of a standard measure of smoking susceptibility for predicting cigarette use in a sample of early adolescent in Argentina and Mexico. METHODS: A school-based longitudinal survey was conducted in 2014-16 among first year secondary students, in 3 large cities in Argentina and 3 in Mexico. *The primary dependent variable* was smoking behavior at follow up. The main independent variable was smoking susceptibility ("If one of your best friends were to offer you a cigarette, would you smoke it?" and "Do you think you will be smoking cigarettes one year from now?"). The analytic sample included students who were never smokers of regular cigarettes or e-cigarettes at baseline and had completed both surveys. Multilevel logistic regression models with random intercepts for schools were used to assess the association between independent variables and cigarette initiation and current tobacco use at follow-up. RESULTS: Overall, 3172 in Argentina and 7147 in Mexico completed the baseline survey. Of these, 1680 (67.3%) in Argentina and 4878 (68.3%) in Mexico were eligible for our analysis. In the multivariate analysis, the susceptibility to smoking was an independent predictor for both cigarette initiation (Argentina: AOR 2.28; 95% CI 1.66-3.14; Mexico: AOR 2.07; 95% CI 1.74-2.45) and current smoking (Argentina: AOR 3.61; 95% CI 2.48-5.24; Mexico: AOR 1.69; 95% CI 1.29-2.22). The susceptibility to smoking measure was a stronger predictor of experimentation and current smoking than was the existence of smokers among either the family or the best friend network. CONCLUSION: This short measure of cigarette susceptibility was a valid tool to predict future cigarette smoking in this sample of early Latin-American adolescents.

FUNDING: Federal

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## POS4-50

### REDUCING HEALTHCARE COSTS BY IMPLEMENTING AN INPATIENT TOBACCO-DEPENDENCE TREATMENT SERVICE

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SIGNIFICANCE: Tobacco use accounts for a greater proportion of healthcare costs. For hospitalized patients, it interferes with the management of care and is a risk factor for readmission due to factors such as anesthesia complications, heart strain, damage to blood vessels and clotting, reduced pulmonary function and poor wound healing. The benefits of tobacco treatment are well documented. The Joint Commission (JC) recommends that hospitals screen all patients for tobacco use and offer tobacco treatment services and follow up support within one month of discharge. Unfortunately, few hospitals implement the JC tobacco treatment quality standards partly because the financial benefits to hospitals and insurers have yet to be documented. METHODS: Our hospital implemented an inpatient tobacco treatment service (TDTS) consisting of bedside counselling and post-discharge follow-up calls via Interactive Voice Response (IVR) technology. We explored the cost of healthcare utilization following hospitalization. Models compared healthcare costs among tobacco users hospitalized before and after





program implementation, with analyses from the perspective of hospitals, insurers and patients. Models were adjusted for age, sex, insurance status, Charlson score, and total comorbidities and weighted by inverse probability of treatment weights. RESULTS: The average total charge for those who did not receive the intervention was \$78000, consisting of \$57000 for inpatient, \$12000 for ED visits, and \$9000 for outpatient visits. When compared to those who did not receive the TDTs, patients who received it had on average about \$11000 savings in total charges (\$8500 for inpatient, \$2000 for ED visits, and \$500 for outpatient visits). We detected an overall decreasing trend in 30-day hospital re-admissions (January 2012-January 2015) suggesting that other factors were driving change since before the inception of the TDTs. CONCLUSIONS: Unplanned hospital re-admissions and emergency department (ED) visits were the biggest driver of healthcare costs. One might speculate about the effect that the Affordable Care Act and other financial incentives that might have contributed to this trend.

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## POS4-51

### USE OF E-CIGARETTES BY PREGNANT SMOKERS

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Pregnancy is considered a contraindication for the use of FDA approved quitting aids and, therefore, few pregnant smokers use them. E-cigarettes remain largely unregulated in the U.S. and many smokers chose to use them as an aid to quit smoking. It has not been clear whether smokers are using these products during pregnancy and, if they are, whether this use impacts their ability to quit smoking. This study used a subsample (N=66013) of the 2016 Behavioral Risk Factor Surveillance System (BRFSS, N=486,303) that included women age 18-44 who answered the question "To your knowledge, are you now pregnant?" The analyses compared those currently pregnant to those not pregnant on their smoking status and e-cigarette use. Pregnant and non-pregnant women had similar rates of ever having smoked (25.2% and 27.7%, respectively) but pregnant women were half as likely to be current smokers than non-pregnant women (7.1% vs. 15.5%). Said differently, smokers who became pregnant quit at higher rates, no doubt motivated by the pregnancy. In fact, among women who smoked in the last year, 56.4% of pregnant women quit smoking compared to only 17.0% of women who were not pregnant. Likewise, pregnant women and non-pregnant women had similar rates of ever having used e-cigarettes (24.1% vs. 26.1%) and pregnant women were much less likely to be current e-cigarette users than non-pregnant women (1.9% vs 4.8%), i.e., they quit at higher rates. Although it is not possible to determine the timing of the use of e-cigarettes relative to the pregnancy or to conclude that e-cigarettes were responsible for these women quitting smoking, it is encouraging to see that pregnant smokers are quitting smoking and their use of e-cigarettes does not decrease their quitting success.

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## POS4-52

### STOKING THE COALS: AN ANALYSIS OF INDOOR AIR QUALITY AND LEAD PRESENCE IN WATERPIPE CHARCOAL BRANDS AND AN ELECTRIC ALTERNATIVE

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SIGNIFICANCE: Waterpipe tobacco (hookah) smoking is becoming popular in the USA, and increased hookah smoking has led to indoor charcoal combustion. This study aims to analyze particulate matter (PM2.5), carbon monoxide (CO), and lead (Pb) content in second hand smoke (SHS) emissions across charcoal brands to determine whether they are a health risk and if electric charcoals (EC) are a harm reduction alternative. METHODS: 18 smoking sessions with four different types of charcoal, CocoNara, 3-Kings, Fantasia, and EC, were conducted. The waterpipe was smoked with a Borgwaldt Shisha Smoker in an enclosed room (40m3). Side-

Pak and Qtrak monitors recorded corrected PM2.5 and CO levels during smoking sessions. Pb was analyzed in charcoal prior to and after the smoking session using graphic furnace atomic absorption spectroscopy. RESULTS: Each session yielded PM2.5 and CO SHS emissions significantly higher than ambient levels (p less than 0.05). Across brands, mean PM2.5 emissions were not related to the mass of charcoal consumed (p=0.936); CO and mass of charcoal consumed were directly related. CocoNara and 3-Kings brands had mean PM2.5 emissions significantly greater than Fantasia and EC. Fantasia, CocoNara, and 3-Kings had higher average CO emissions than EC. Charcoal analyses found that smokers or bystanders could inhale 102 ppb of lead on average per session for Fantasia brand. CONCLUSION: All waterpipe use, regardless of heat source, caused a significant increase of harmful toxins in the air, however EC emitted less than carbon charcoal into SHS. Differences in CO, PM2.5, and lead emission between brands demonstrate a need for FDA regulation in charcoal marketing, and action among lawmakers to prohibit indoor charcoal burning. Further research could include extended heavy metal analysis, investigation of the PM2.5 emissions and mass of charcoal consumed, and relationship of coal/ tobacco temperature to PM2.5 emissions.

FUNDING: State; Academic Institution

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## POS4-53

### AWARENESS OF THE FDA REAL COST EDUCATIONAL CAMPAIGN AMONG ADULTS: AN EXPERIMENT IN A NATIONAL PHONE SURVEY

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BACKGROUND: The U.S. Food and Drug Administration (FDA) launched "The Real Cost" educational campaign in 2014 using ads that graphically illustrate the long-term hazardous health effects of smoking and associated loss of control due to addiction. Early findings suggest the education campaign successfully attained national awareness among youth. This study examines the diffusion of "The Real Cost" education campaign among U.S. adults. METHODS: A national phone survey of adults age 18-65 (N = 4964) conducted from August 2016 to May 2017 asked whether respondents had ever seen or heard any ads with the slogan, "The Real Cost". Interviewers gave participants brief verbal descriptions of one of three randomly assigned FDA Real Cost ads (i.e., the Bully, the Creature, and the Smokeless ad themes) and asked if respondents had ever seen or heard the ad in the past year. If yes, participants were then asked if they felt more negative, more positive, or no different about tobacco products after seeing the ad. RESULTS: Sizable percentages of U.S. adults report having seen or heard ads for the "The Real Cost" campaign. Ad recall was higher for the more recent ad themes (Smokeless; 49%; and the Creature; 31%) than for one of the older Real Cost ad themes (Bully; 25%). Weighted estimates for the slogan recall measure indicate 26% of U.S. adults recalled seeing or hearing the "The Real Cost" slogan. For participants who had seen the Smokeless ad, 62% reported more negative feelings towards tobacco. CONCLUSIONS: These results indicate that a considerable amount of diffusion has occurred for "The Real Cost" educational campaign among adults in the U.S. Notably, novel ad themes directed at youth likely increase more negative feelings towards tobacco among adults, augmenting campaign effects.

FUNDING: Federal

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## POS4-54

### YOUTH USE OF E-CIGARETTES FOR DRIPPING

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E-cigarettes electrically heat and vaporize e-liquids to produce inhalable vapors. These devices are being used to inhale vapors produced by "dripping" e-liquids directly onto atomizers. Earlier evidence from our group observed that many high school e-cigarette users were also dripping (Krishnan-Sarin et al, *Pediatrics*, 2017). The current study had two aims. First, we re-evaluated rates of dripping in a new cohort of high school adolescent e-cigarette users. Further, expanding on





our prior research, we evaluated the devices, nicotine levels and flavors used for dripping. We surveyed four high schools from different District Reference Groups in Southeastern Connecticut (n=2945) during May-June 2017. In this cohort, 1005 (35.73%) youth had tried e-cigarettes in their lifetime. We also presented youth with descriptions of dripping behavior, and pictures of devices used for dripping, and assessed whether they had ever tried dripping, how frequently they had tried dripping in the past 30 days, and what devices, nicotine levels and flavors they had used for dripping. Two hundred and eleven (21%) youth who reported having tried e-cigarettes, also reported dripping (65% male, 84% white and the average age 16.6+1.18 years). During the past 30 days, 111 (52.6%) of these youth reported using e-cigarettes for dripping on an average of 12.6+11.03 days. The most popular devices used for dripping were Rebuildable Dripping Atomizer (n=88, 41.7%), followed by Mechanical Mods (n=82, 38.9%). The top flavors used when dripping were fruit (41.2%), candy (28.0%), mint (23.7%), and vanilla (19.4%). More than half of the youth who reported dripping (n=108, 51.2%) learned how to drip from their friends. The typical nicotine levels used when dripping were as follows: 0mg: 20.4%, 3-6mg: 56.5%, and 12-24mg: 23.2%. Consistent with the earlier findings, males had a higher rate on dripping when compared with females (32.4% vs. 14.8%, p<.01). Further analyses on reasons for dripping will also be presented.

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## POS4-55

### STATE-LEVEL DETERMINANTS OF YOUTH TOBACCO CESSATION: A COMPARATIVE CASE STUDY OF TWO STATES WITH DIVERGENT HEALTH PROFILES

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**SIGNIFICANCE:** Youth tobacco cessation programs are considered important components for state implementation of tobacco control. Like the adolescent smoking behavior they are directed at, they can be influenced by higher level environmental forces such as the economics, politics, and demographics of the state wherein they are enacted. Variation in macro-factors mirrors between-state variation of tobacco related health outcomes, but there is limited understanding whether and how they influence the reach and adoption of youth tobacco cessation programs. Measuring and comparing the relationships between these factors and program outcomes in divergent states can offer practical insights on better achieving youth tobacco cessation. **METHODS:** The present study applied a multi-level socio-environmental model and mixed-methods to identify state macro-level economic, political and demographic factors that could impact reach and adoption in two states with divergent health profiles, CO and WV. Variables representing these factors were pulled in from numerous data sources to create a state-level database. Using retrospective data from a state-based adolescent smoking cessation program (2010-2014), program reach and adoption estimates were calculated. Longitudinal pooled time series analysis with fixed effects was conducted to detect the influence of specific macro-factors on reach and adoption. An in-depth thematic review of the literature was used to collect contextual qualitative data. **RESULTS:** Reach and adoption of the cessation program were higher in CO than in WV in all 5 years. Prevalence of youth tobacco use in CO showed a corresponding decline to improvements in reach and adoption. State economic factors (such as state tobacco control funding), tobacco excise tax and youth tobacco access laws factored significantly in influencing outcomes in both states. **CONCLUSION:** State level macro-factors can influence adolescent smoking cessation programming and outcomes. Tobacco control programs can reach more youth and are more readily adopted in states that have comprehensive tobacco control legislation. This significantly contributes to lowered prevalence of tobacco use in youth.

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## POS4-56

### DEVELOPING AN OUTCOME INDICATOR GUIDE TO IDENTIFY AND ELIMINATE TOBACCO-RELATED DISPARITIES: WHAT WE KNOW, DO NOT KNOW, AND IMPLICATIONS FOR FUTURE RESEARCH

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**SIGNIFICANCE:** Tobacco use remains disproportionately higher among certain U.S. population groups, including racial/ethnic minorities, LGBT populations, persons with low socio-economic status, and persons with mental illness. These populations may not be covered by evidence-based interventions, and tobacco control programs may face challenges in monitoring tobacco-related indicators and measuring the impact of interventions among these population groups. This poster will present a disparities logic model, summarize key finding from the literature review used to inform the model, including research gaps, and discuss implications of developing an outcome indicator guide for interventions to reduce tobacco-related disparities. **METHODS:** To support state and territorial programs in planning and evaluating tobacco-related disparities work, CDC's Office on Smoking and Health (OSH) worked with national partners to develop a research-based, tobacco-related disparities logic model and to conduct a comprehensive literature review to document the current science on tobacco-related disparities. The logic model depicts the sequence of events and the population-based changes to prevent initiation of tobacco use, eliminate secondhand smoke exposure, and increase cessation among disparate populations. **RESULTS:** The results from the literature review, based on a detailed abstraction of 111 research articles, assessed the evidence base across the logic model elements, identified 129 indicators to measure tobacco-related disparities, and noted existing gaps in the scientific literature. Findings suggest that tobacco control practitioners may benefit from additional studies to assess the effectiveness of interventions among certain population groups, such as persons with mental health and substance use disorders. These results will be used to help inform an outcome indicator guide, with a logic model and measurable indicators. **CONCLUSION:** The developed tobacco-related disparities logic model can serve as a resource to help states plan evidence-based interventions and measure their progress in reducing the burden of tobacco use among people who experience tobacco-related disparities.

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## POS4-57

### HOW PUBLIC KNOWLEDGE OF THE FDA'S TOBACCO REGULATORY MISSION MAY AFFECT PUBLIC PERCEPTIONS AND CREDIBILITY OF THE FDA

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**SIGNIFICANCE:** This research offers the first experimental evidence on improving perceptions of the FDA's role in regulating tobacco products. Three factors were manipulated in a between subjects design and effects on FDA knowledge and credibility and views of the tobacco industry were assessed. **METHODS:** 1,770 smokers and non-smokers were recruited via MTurk and were randomly assigned to messages that varied three types of information including: (1) FDA roles - *The FDA regulates the manufacture, marketing, and distribution of tobacco to safeguard people's health*; (2) Scientific basis of regulations - *FDA regulations are based on scientific evidence*; and (3) The protective function of FDA regulations - *FDA regulations are designed to protect Americans from the activities of the tobacco industry*. Factorial ANOVA was used to examine main and interactive effects of each type of information and smoking status on outcomes: knowledge and credibility of FDA, support for tobacco regulations, and perceptions of tobacco industry. **RESULTS:** Participants exposed to information on FDA roles had greater perceived knowledge of FDA and reported greater FDA credibility than controls. Participants exposed to information on the scientific basis of FDA regulations had more negative perceptions of the tobacco industry than those not exposed to this information. Participants who learned of FDA's commitment to protecting the public reported higher credibility of FDA and stronger support for tobacco regulations than controls. No significant interaction effects were observed. **CONCLUSIONS:**



Disseminating information that clarifies the FDA's role, the scientific basis of FDA regulations, and the FDA's protective function each have a positive impact on public perceptions of the FDA and the agency's tobacco-related regulations.

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## POS4-58

### TIME PREFERENCES AND TIME DISCOUNTING AMONG CURRENT, NEVER, AND FORMER SMOKERS

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**BACKGROUND:** Cigarette smokers make intertemporal choices involving time discounted trade-offs between short-term rewards and longer-term health consequences of smoking. However, the extent to which smokers are more likely to be present-biased—characterized by time-inconsistent discounting—is not well understood. **OBJECTIVE:** This study examines the association between smoking and two aspects of personal time discounting: (1) person's individual discount rate and (2) time-inconsistent, hyperbolic discounting, when a person is less patient in their inter-temporal choices in the near future than in the distant future. **METHODS:** This study used the 2016 Tobacco Products and Risk Perceptions Survey, a nationally representative survey of 6,014 US adults. The final study sample was restricted to 5,572 respondents who reported consistent answers to their recent and future time preferences. Time preferences were assessed according to one's personal discount rate, measured by asking participants to select among hypothetical rewards to be redeemed at different time points. Ordinary least squares and logit regression models were applied to investigate the relationships between smoking and time preferences and between smoking and hyperbolic discounting, while controlling for individuals' socio-demographic characteristics. **RESULTS:** Our findings indicate that being a smoker, having lower educational attainment, and earning a lower income are associated with a higher time discount rate, indicating that people with these characteristics are less patient, and more heavily discount future consequences. The same factors are also associated with a higher likelihood of being a hyperbolic discounter. **CONCLUSION:** This study provides empirical estimates of individual time discount rates, identifies the existence of present bias in inter-temporal decision-making, and finds associations between cigarette smoking and time preferences/hyperbolic discounting. This study contributes to a better understanding of smokers' decision-making processes. Our results provide important evidence for the FDA's impact analysis for tobacco regulations.

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## POS4-59

### ADOLESCENT PERCEPTIONS OF HARM AND BENEFITS OF E-CIGARETTES AND THE ASSOCIATION WITH USE

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**SIGNIFICANCE:** E-cigarette use is prevalent among adolescents in the United States. Little is currently known about adolescent perceptions of risks and benefits associated with e-cigarettes and how they relate to use. **METHODS:** Data from the 2016 Florida Youth Tobacco Survey were analyzed. Participants who were in high school (grades 9-12) aged 14-17 were included (n=22,884; 51% male). Six tobacco use groups were created based on lifetime and past 30 day use of cigarettes, electronic vapor products (EVPs), cigars, smokeless tobacco, and hookah, and intentions to use e-cigarettes in the future. Logistic regression was used to compare groups on perceived risks and benefits of EVP use. **RESULTS:** Overall, 53.5% of the sample were committed never EVP users, 14.2% were susceptible never EVP users, 9.5% reported lifetime EVP use, 2% reported past 30-day EVP use, 18.1% reported lifetime polytobacco use including EVP, 2.7% reported past 30 day polytobacco use including EVP. After controlling for age, sex, race/ethnicity, and metropolitan status, susceptible never users and all EVP use groups

were less likely than committed never users to report that EVPs were harmful to health (AORs: .14-.38), people can get addicted to EVPs (AORs: .49-.67), and that smoke from other's EVPs were harmful (AORs: .12-.32). Furthermore, susceptible never users and all use groups were more likely than the committed never users to report that it would be easy to quit using EVPs (AORs: 1.71-6.19). Susceptible never users and all use groups were also more likely to report benefits of EVP use compared to committed never users including having more friends (AORs: 1.55-3.72), looking cool or fitting in (AORs: 2.41-5.19), feeling more comfortable in social situations (AORs: 1.98-4.02) and stress relief (AORs: 1.79-5.78). **CONCLUSIONS:** Results suggest that youth who are susceptible to use, currently use, or have used EVPs are less likely to report harm and more likely to report benefits associated with EVP use compared to committed never users. Harm and benefit perceptions may be an important target for interventions designed to reduce e-cigarette use among adolescents.

FUNDING: None

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## POS4-60

### GENDER DIFFERENCES IN SMOKING CESSATION OUTCOMES AMONG CALLERS AT A STATE QUIT LINE

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**SIGNIFICANCE:** Smoking prevalence tends to be higher among men than women. Although there are mixed findings, some research indicates that women have poorer smoking cessation outcomes than men. Little is known about gender differences in cessation within quitline settings. The purpose of this study was to examine gender differences in smoking cessation among callers to the Arizona Smokers' Helpline (ASHLine). **METHODS:** The study sample included callers enrolled in ASHLine between January 2011 and June 2016. At the 7-month follow-up, callers self-reported on current smoking status. Individuals who completed the follow-up survey and provided gender information at baseline were included in the analyses (n=16,345). ASHLine provides weekly coaching calls for up to three months and up to four weeks of nicotine replacement therapy among eligible callers. The association between gender and self-reported seven-day abstinence was tested using logistic regression models in Stata 15.0. We also explored interactions between gender with treatment, age, and chronic health conditions. **RESULTS:** Slightly more than half of the callers were women (55%). Women were older (52.3±13.4 vs. 50.4±14.0, respectively; p<0.01) and had lower Fagerström scores (4.7±2.3 vs. 4.8±2.3, respectively; p<0.01) than men. Unadjusted analyses indicated that women had significantly lower odds of reporting smoking abstinence at month seven than men (OR=0.84, 95% CI = 0.79, 0.90). **RESULTS:** remained significant, though slightly attenuated, after adjusting for age, race/ethnicity, education, health insurance, chronic health conditions, mental health conditions, previous quit attempts, confidence to quit, and Fagerström scores (OR=0.90, 95% CI=0.83, 0.97). **CONCLUSIONS:** Among ASHLine callers, women have lower odds of successfully achieving smoking cessation. These findings may be used by quitlines to inform and develop gender-specific protocols to enhance quitting among women.

FUNDING: State; Federal

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## POS4-61

### USE OF PRICE DISCOUNTS AMONG US ADULTS WHO CURRENTLY USE ELECTRONIC VAPOR PRODUCTS

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**SIGNIFICANCE:** Sales of electronic vapor products (EVPs) in the U.S., including e-cigarettes, increased from only a few million dollars per quarter in 2010 to more than \$175 million in the last quarter of 2014. This increase may be driven by price discounts offered by manufacturers. This study assessed the use of price discounts among U.S. adult EVP users, using pooled data came from the 2015 and 2016 Summer Styles, a consumer-based web panel of U.S. adults aged ≥18 years (n=8,127). **METHODS:** Current EVP users were those who used EVPs (e-cigarettes; e-hookahs, hookah pens, or vape pens; or other electronic vapor product

such as e-cigars or e-pipes) in the past 30 days. The use of price discounts was assessed using the question, "In the past 30 days, did you use coupons, rebates, discount codes, or any other special price-related promotions when you bought electronic vapor products, such as electronic cigarettes (e-cigarette), electronic hookah (e-hookah), or vape pens?" Multivariate logistic regression was used to assess factors associated with price discount use. Assessed covariates included age, sex, race/ethnicity, marital status, education, cigarette smoking status, EVP use frequency, place of last EVP purchase, and survey year. RESULTS: Overall, 3.9% of respondents were current EVP users during 2015-2016. Of these, 15.1% reported using price discounts. The adjusted odds of using price discounts were higher among respondents who last purchased EVPs from a gas station, convenience store, grocery store, drug store, or the internet (adjusted odds ratio [aOR]=3.2, 95% confidence interval [CI]=1.3-7.7) than those who purchased from a mall or shopping center kiosk/stand, or a vape shop; and those who used EVPs products  $\geq 20$  days in the past 30 days than those who used  $\leq 10$  days (aOR=2.8, CI=1.2-6.4). CONCLUSION: More than 1 in 7 current adult EVP users reported using price discounts during 2015-2016. Variations in price discount use exist across subpopulations, with use being higher among more frequent EVP users. Further research is warranted to assess the extent to which price discounts influence EVP use among adults.

FUNDING: None

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## POS4-62

### "BUT I'M NOT A TOBACCO USER!" TOBACCO-RELATED SELF-IDENTITY AND PERCEIVED HARM AMONG US YOUTH TOBACCO USERS, 2016

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SIGNIFICANCE: Youth who perceive themselves as non-tobacco users despite using tobacco products ("phantom tobacco product users") might have altered perception of their risk for adverse tobacco-related outcomes. We assessed "phantom tobacco product use" patterns among a nationally representative sample of U.S. students. METHODS: Data were from the 2016 National Youth Tobacco Survey of U.S. 6<sup>th</sup>-12<sup>th</sup> graders (n=20,675). Participants were asked questions on past-30 day use of specific tobacco products (e.g., "During the past 30 days, on how many days did you use e-cigarettes?"), followed by a general question on the use of any tobacco product: "During the past 30 days, on how many days did you use any tobacco product(s)?" Perceived harm regarding all tobacco products and four individual products were assessed using the question: "How much do you think people harm themselves when they use [tobacco product type] some days but not every day?" Responses were: 'no harm', 'little harm', 'some harm', and 'a lot of harm'. Among exclusive users of e-cigarettes (n=558); cigars (n=233); hookahs (n=159); smokeless tobacco (n=119); and cigarettes (n=124), we computed weighted percentages of those denying being "tobacco product" users, and explored harm perceptions. Logistic regression was used to determine correlates of denial. RESULTS: Among exclusive users, the percent that denied being "tobacco product" users were as follows: e-cigarettes (59.7%), cigars (56.6%), hookahs (44.0%), smokeless tobacco (38.5%), and cigarettes (26.6%). Generally, frequency but not duration of use was associated with denial. Among those who believed "all tobacco products" were harmful, the following reported conflicting beliefs that their own products were not harmful: e-cigarettes (74.6%); hookah (56.0%); smokeless tobacco (41.8%); and cigarettes (15.5%). CONCLUSION: Among U.S. adolescents, denial of being a "tobacco product" user was highest for e-cigarettes and lowest for cigarettes. Discordant beliefs regarding harm of tobacco products aligned with this pattern. Comprehensive approaches, including health education on the dangers of all tobacco products, might help reduce tobacco product use.

FUNDING: None

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## POS4-63

### YOUTH EXPOSURE TO SECONDHAND SMOKE AND SECONDHAND AEROSOL IN PUBLIC PLACES: UNITED STATES, 2016

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SIGNIFICANCE: The adverse health effects of secondhand smoke (SHS) exposure are well established. In addition, exposure to secondhand aerosol (SHA) from e-cigarettes is not harmless. This study assessed SHS and SHA exposure in indoor and outdoor public places among U.S. students. METHODS: Data came from the 2016 National Youth Tobacco Survey (n=20,675), a school-based survey of U.S. students in grades 6-12. Self-reported exposure to SHS and SHA in indoor and outdoor public places within the past 30 days was assessed. Outcomes included either SHS or SHA exposure, any SHS exposure, any SHA exposure, exclusive SHS exposure, exclusive SHA exposure, and exposure to both SHS and SHA. Point estimates and corresponding population totals for each outcome were assessed overall and by covariates. Adjusted prevalence ratios (aPR) were used to assess determinants of exposure. Covariates included sex, school level, race/ethnicity, current (past 30 day) e-cigarette use, current (past 30 day) other tobacco product use (cigarettes, cigars, smokeless tobacco, pipe, hookah, and/or bidis), household member tobacco product use, and SHS harm perceptions. RESULTS: In 2016, past 30 day exposure among all students was 57.7% (14.9 million) for either SHS or SHA, 53.4% (13.9 million) for any SHS, 26.5% (6.9 million) for any SHA, 31.3% (8.1 million) for exclusive SHS, 4.4% (1.1 million) for exclusive SHA, and 22.1% (5.7 million) for both SHS and SHA. After multivariable adjustment, self-reported exposure to either SHS or SHA was higher among females (aPR=1.27, vs. males), high school students (aPR=1.09, vs. middle school), current e-cigarette users (aPR=1.42, vs. non-users), current other tobacco products users (aPR=1.26, vs. non-users), and with a household member who used tobacco products (aPR=1.42, vs. no use). CONCLUSIONS: In 2016, a majority of U.S. middle and high school students (14.9 million) reported exposure to secondhand tobacco product emissions in indoor or outdoor public places. Smoke-free policies that are modernized to include e-cigarettes are critical to protect youth from secondhand exposure to combustible and electronic tobacco products in indoor public environments.

FUNDING: None

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## POS4-64

### ASSOCIATIONS BETWEEN EXPOSURE TO RETAIL TOBACCO OUTLET ADVERTISING AND USE OF CIGARETTES AND E-CIGARETTES AMONG COLLEGE STUDENTS IN TEXAS

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OBJECTIVE: This study examined the relationship between exposure to retail tobacco outlet (RTO) cigarette and e-cigarette advertisements and past 30-day use of cigarettes and e-cigarettes among young adults. METHODS: Participants included 3,459 young adult students (mean age=20.0; 64.2% female; 35.1% non-Hispanic white) who attended 24 colleges in Texas and completed the Wave 2 survey (spring 2015) of Project M-PACT. Only students who reported going to RTOs (i.e. gas stations, grocery/convenience/liquor/drug stores, tobacco shops) were included. Trained data collectors audited 276 RTOs within one mile around the colleges one week to two months before students completed the survey. All outdoor and indoor tobacco advertising was documented. Weekly advertisement exposure was estimated by multiplying the number of times students visited RTOs by the total number of cigarette and e-cigarette ads observed and collapsed into quartiles. Separate multivariable logistic regression models were used to examine the association between exposure to cigarette and e-cigarette RTO ads and past 30-day use, controlling for age, sex, and race/ethnicity. RESULTS: Students saw a median of 359 cigarette (IQR=475.8) and 60.9 (IQR=82.9) e-cigarette ads per week. Approximately 16% of students had used cigarettes in the past 30 days while 14% used e-cigarettes in the past 30 days. The adjusted odds (AOR) of past 30 day cigarette use was higher for those students exposed to 341-650 ads per week (AOR=1.82, 95% CI: 1.34-2.48) and for students exposed to greater than 650 ads per week (AOR=3.63, 95% CI: 2.69, 4.91) compared to those exposed to less than 191 ads per week. The odds of past 30 day e-cigarette use was higher for those students exposed to 31-60 ads





per week (AOR=1.59, 95% CI: 1.11-2.29), those exposed to 61-120 ads per week (AOR=2.15, 95% CI: 1.49, 3.10) and for those exposed to greater than 120 ads per week (AOR=3.67, 95% CI: 2.55, 5.28) compared to those exposed to less than 31 ads per week. DISCUSSION: Findings from this study extend work with young adults and document the importance of the retail tobacco outlet environment as a risk factor for tobacco use among young adults.

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## POS4-65

### EXPLORING ALTERNATIVE WAYS TO MEASURE PROVIDER ASSISTANCE IN STATEWIDE SURVEILLANCE SYSTEMS

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**SIGNIFICANCE:** Health care provider assistance with quitting is an evidence-based intervention that increases the chances that a smoker will quit. Provider assistance with a quit attempt is measured with standard questions which assess smoker reports of a provider prescribing/recommending nicotine replacement therapy or stop-smoking medications, suggesting setting a quit date, a cessation class/program, the Quitline, or providing self-help materials. The current study explored alternative methods for measuring provider assistance. Alternative methods involved expanding which respondents are asked questions about provider assistance and adding questions about guideline-recommended methods, such as the 5 R's (Relevance, Risks, Rewards, Roadblocks, and Repetition). **METHODS:** We changed the skip pattern, asking all smokers who had seen a provider in the past 12 months if they were assisted, regardless of whether they were advised to quit. We added two questions regarding key 5 R's components. Using 2015-2017 New York Adult Tobacco Survey data, we conducted preliminary analyses of these alternative methods to assessing provider assistance. We conducted descriptive statistics and used Adjusted Wald tests to compare the estimates of provider assistance. **RESULTS:** Rates of provider assistance are approximately 5 percentage points higher with the new skip pattern (50.7% vs. 56.1%). Two-thirds (66.7%) of current smokers report provider assistance when measures of the 5 R's are included, compared with about half (51.8%) of current smokers using the traditional estimate. More than half (56.8%) of current smokers reported that their provider talked to them about why they should quit (from the 5 R's measures), which was higher than any other type of provider assistance. About 15.0% of current smokers in NY reported receiving assistance via one of the 5 R's items and no other assist components. **CONCLUSIONS:** Alternative ways to measure provider assistance may offer alternative, meaningful ways to capture provider tobacco cessation counseling. Considering updating or complementing Assist estimates may allow for more nuanced surveillance.

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## POS4-66

### FINDINGS FROM THE TUS-CPS: TRENDS IN DEMOGRAPHIC DISPARITIES AMONG MENTHOL USERS

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**SIGNIFICANCE:** Prior research has documented the potential harms of menthol cigarette use and the existence of disparities in menthol and non-menthol cigarette use, particularly among vulnerable groups. This work examines trends in the prevalence of menthol cigarette smoking by demographic, geographic and employment variables over time using pooled, cross-sectional data from the Tobacco Use Supplement to the Current Population Survey (TUS-CPS). **METHODS:** The TUS-CPS is an NCI-sponsored, nationally-representative survey of tobacco use that is part of the US Census Bureau's and Bureau of Labor Statistics' CPS. Data from the 2003, 2006-2007, 2010-2011 and 2014-2015 cycles were analyzed to assess trends in menthol cigarette smoking across population subgroups, and all analyses were conducted in SAS/SUDAAN. **RESULTS:** Almost one third (32.5%)

of current smokers reported their usual cigarette type as menthol in 2014-2015; this prevalence has increased over time from 26.7% in 2003. States where the largest percentage of smokers reported menthol as their usual brand in all waves included the District of Columbia (62.5% in 2014-2015) and Hawaii (56.2%). Regionally in 2014-15, more menthol smokers lived in the Northeast (39.9%) than in the Midwest (32.3%), South (34.4%) or West (21.4%), a trend which has persisted over time. Menthol use disparities by sex have also continued; in every wave of TUS-CPS data, menthol use has been higher among females than males (38.1% of Females and 27.7% of Males in 2014-2015). Non-Hispanic Black smokers were most likely to report menthol smoking, however those who endorse Hispanic ethnicity have had the highest increase in relative use over time (9% points). **CONCLUSIONS:** Menthol cigarette use has tobacco control consequences across the smoking continuum; it has been previously associated with increased smoking initiation, greater addiction potential and less successful quitting. Certain groups are disproportionately more likely to smoke menthol cigarettes. The TUS-CPS is a national dataset with unique linkages and strengths that can be used to investigate questions surrounding menthol cigarette use.

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## POS4-67

### BELIEFS AND RULES ABOUT VAPING IN HOME AND SMOKE-FREE PUBLIC PLACES: FINDINGS FROM THE ITC 4-COUNTRY PROJECT

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**SIGNIFICANCE:** This paper compares beliefs about the relative harms of exposure to secondhand electronic cigarette (EC) vapor compared to cigarette smoke, rules about smoking and vaping in the home, and adherence to rules restricting vaping in public places in Australia (AU) and Canada (CA) which have generally more restrictive policies on the marketing of ECs compared to England (EN) and the United States (US) which have less restrictive policies. **METHODS:** Data came from 12,411 adult (aged 18 years and older) current and former smokers and vapers who participated in the 2016 International Tobacco Control (ITC) Four Country Survey carried out in AU (n=1491), CA (n=3801), EN (n=4339) and US (n=2780). The web-based survey recruited participants from online panels in each country with selection criteria intended to generate representative samples of current and former smokers and vapers in each country. **RESULTS:** The majority of respondents in each country believed that exposure to secondhand EC vapor was less dangerous compared to exposure to smoke. Across all countries vapers were more likely than non-vapers to believe that exposure to secondhand EC vapor was less dangerous compared to exposure to smoke. The overwhelming majority of respondents in all countries did not allow smoking in their home, while most allowed vaping. Rules about whether smoking was permitted inside the home were more permissive among smokers whereas rules about vaping were more permissive among vapers. Nearly all vapers reported that they do not vape in public places when it is prohibited. **CONCLUSIONS:** Being a vaper or smoker was more strongly associated than restrictiveness of EC regulations with beliefs about the dangers of secondhand EC vapor exposure, rules people have about allowing smoking and vaping in their homes, and adherence to rules restricting vaping in public places.

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## POS4-68

### COMMERCIAL HOOKAH TOBACCO PRODUCTS MAY HARBOR METABOLICALLY ACTIVE BACTERIAL COMMUNITIES

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**SIGNIFICANCE:** Waterpipes use, such as hookah, has been steadily increasing among young adults over the past decades. In addition to carcinogenic com-



pounds, hookah users are also exposed to bacterial agents that may lead to the development of infectious and chronic diseases. However, the bacterial communities associated with hookah products have been largely unexplored. Our study aimed to characterize the total and metabolically active bacterial constituents of commercial hookah products. **METHODS:** Two hookah tobacco brands and three flavors for each brand were characterized: Al Fakher (flavors: Two apple, Mint, Watermelon) and Fumari (flavors: White gummy bear, Ambrosia, Mint chocolate chill). For each brand/ flavor, we conducted time-series experiments using three different storage conditions. Total DNA was extracted from subsamples on days 0, 5, 9 and 14, PCR-amplified for the V3V4 region of the 16S rRNA gene followed by sequencing. Samples also underwent BrdU (5-bromo- 2'-deoxyuridine) labelling followed by 16S rRNA gene sequencing to identify active bacterial communities. The sequences were analyzed using QIIME, and the R Phyloseq package. **RESULTS:** Alpha-diversity analysis showed significant differences between products. For example, Fumari Ambrosia was characterized by lower bacterial diversity (Shannon) for all conditions when compared to the other products. In addition, flavoring of hookah tobacco seemed to significantly alter bacterial community composition. Across all products, the top genera observed, and the most metabolically active - were *Pseudomonas*, *Bacillus*, and *Paenibacillus*. *Pseudomonas* bacteria were predominant in Al Fakher product, and their relative abundance increased over time. **CONCLUSIONS:** Our data show that hookah tobacco bacterial communities are diverse, metabolically active and differ across brands. Additionally, compositional differences are induced by the addition of flavor, which has critical implications regarding exposure to specific bacteria among hookah users. These results could be used to inform whether regulations targeting the microbiology of tobacco may be needed to protect public health.

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## POS4-69

### PRIMARY CARE CLINIC STAFF ATTITUDES TOWARDS ADDRESSING TOBACCO USE BEFORE AND AFTER IMPLEMENTING A SMOKING TREATMENT REFERRAL PROGRAM

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Although the majority of smokers receive primary care, few receive smoking treatment at outpatient visits. This study analyzed primary care staff attitudes regarding tobacco dependence treatment importance, efficacy, acceptability, and process efficiency before (N=220) and 6 months (N=162) after implementing either fax to a Quit Line or EHR electronic referral to a smoking treatment study. In the EHR referral process, roomers from 2 healthcare systems were trained to ask smokers if they were interested in learning about a research study to reduce or quit smoking. Staff from 30 clinics (18 EHR referral and 12 fax referral clinics), responded at the rate of 30-40% across systems. Mean responses indicated a high level of agreement regarding the importance of addressing tobacco use with patients, but lower confidence about how to do this well and whether patients would be receptive. Assessment of attitudes in these two areas documented more confidence post-launch compared to pre-launch. The degree of attitude change did not differ between fax and EHR referral clinics, and did not differ across healthcare systems. In EHR clinics, mean pre-launch perceived clinic support for addressing tobacco among roomers was moderately associated with interim research study referral ( $r=.47$ ) and enrollment rates ( $r=.41$ ). Roomer beliefs that few patients will stop smoking, even with treatment, were modestly associated with lower referral rates ( $r=.26$ ), but weakly related to treatment enrollment ( $r=.15$ ). Clinic referral and enrollment rates were not significantly or substantially related to other attitudes (all  $r$ 's < .17). There were no significant differences in any responses between EHR and fax referral clinics, or between the two healthcare systems. **RESULTS:** suggest that healthcare staff believe that treating tobacco use is important, but have less confidence that patients will be receptive, or that referral will be efficient and successful. Perceived clinic support for addressing tobacco use may predict clinic implementation success. Clinics varied markedly in staff responses. Ongoing qualitative research will identify key factors associated with staff attitudes and implementation.

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## POS4-70

### EXPOSURE TO SMOKING IN THE HOME: A KEY TO REDUCING ETHNIC DISPARITIES IN SMOKING AMONG ADOLESCENTS?

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**SIGNIFICANCE:** New Zealand's Maori (indigenous) population bears a disproportionate burden of tobacco harm, and 39% of adult Maori are current smokers compared with 16% overall. Reducing ethnic disparities in tobacco use, with the participation of indigenous communities, is vital. While regular (at least monthly) smoking prevalence among Maori 14-15 year olds has declined in recent years, at 11% it remains twice that of 14-15 year olds overall. We set out to investigate the relative importance of risk factors for smoking uptake among young Maori, and how these have changed over time, to inform prevention efforts. **METHODS:** We used repeat cross sectional data, 2003 – 2015, from a nationally representative survey of 14-15 year olds (N=20,443 - 31,833 per year). We calculated adjusted odds ratios (OR) for each year to assess the association between regular smoking and potential risk factors (one or more parents smoke, best friend smokes, one or more older sibling(s) smoke, and past week exposure to smoking in the home) for the whole population and for Maori. Population attributable risk (PAR) for each potential risk factor was calculated for 2003 and 2015. **RESULTS:** After adjusting for parental smoking and other potential confounders, OR for exposure to smoking in the home increased from 1.8 (1.7-2.0) to 2.6 (2.1-3.1) in the whole population, and from 1.8 (1.6-2.1) to 3.4 (2.5 – 4.5) for Maori. OR for 'best friend smokes' also increased over the study period, while OR for parental smoking remained unchanged and was not a significant independent risk factor in most years. PAR for exposure to smoking in the home increased from 18% to 33% overall, and from 28% to 56% for Maori, while PARs for other risk factors decreased. **CONCLUSIONS:** Over time, exposure to smoking in the home has become a stronger predictor of smoking uptake and an increasingly important risk factor at the population level (independent of parental smoking), particularly for Maori. Because Maori are both more exposed and more affected by exposure, interventions aimed at reducing exposure to smoking in the home, and developed with the participation of Maori, have the potential to decrease ethnic disparities.

**FUNDING:** Academic Institution

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## POS4-71

### E-CIGARETTES AND TECHNOPHILIA: IS THE GENERAL TENDENCY TOWARD NEW TECHNOLOGY ADOPTION ASSOCIATED WITH E-CIGARETTE TRIAL AND USE AMONG EARLY ADOLESCENTS?

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**BACKGROUND:** The appeal of e-cigarettes may be explained by the concept of "technophilia," which draws attention to the pleasure involved in adopting new technologies. This study aimed to validate a measure of technophilia among Mexican adolescents, while also evaluating its association with e-cigarette trial and use. **METHODS:** We analyzed cross-sectional data from a 2016 survey of 8747 middle school students from the three main cities in Mexico. The technophilia scale included eight questions on use of videogames, the internet, and technological devices. Exploratory factor analysis (EFA) assessed scale dimensionality, and scale reliability was assessed. To evaluate content validity, the technophilia scale was regressed on covariates with which the scale should be associated (e.g., SES indicators, sensation seeking). Separate logistic regression models regressed trial and current use of e-cigarettes, as well as cigarettes, on technophilia scale quartiles (Qts). Multinomial models regressed first tobacco product used (i.e., e-cigarette, cigarette, neither-reference) on scale Qts. Fully adjusted models controlled for key tobacco use risk factors. **RESULTS:** EFA indicated the technophilia scale was unidimensional, and scale reliability was adequate (Cronbach's alpha =0.70). All hypothesized correlates were independently associated with the scale, as expected. In fully adjusted models that regressed trial and current use of each tobacco product on the technophilia scale, technophilia was independently associated with only e-cigarettes trial (OR Qt 4 vs 1=1.54, 95%CI=1.24, 1.90). In fully adjusted multinomial models for first product used, a dose-response association was found between technophilia and e-cigarettes (OR Qt 2 vs 1=1.18, 95%CI=0.85, 1.64; OR Qt 3 vs 1=1.52, 95%CI=1.10, 2.09; Qt 4 vs 1=1.79, 95%CI=1.30, 2.46), and no association was found for using cigarettes first. **CONCLUSIONS:** The technophilia scale appears valid and associ-



ated with e-cigarette initiation among Mexican adolescents, although other factors appear to account for continued use of e-cigarettes.

FUNDING: State

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## POS4-72

### HARM PERCEPTIONS OF INTERMITTENT TOBACCO PRODUCT USE AMONG US YOUTH: NATIONAL YOUTH TOBACCO SURVEY, 2016

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**SIGNIFICANCE:** Most youth tobacco product users report using tobacco products intermittently rather than daily. This study assessed youth harm perceptions towards intermittent use of four tobacco products: cigarettes, smokeless tobacco, hookah, and e-cigarettes. **METHODS:** Data came from the 2016 National Youth Tobacco Survey, a questionnaire administered to a nationally representative sample of U.S. students in grades 6-12 (n=20,675). For each tobacco product, respondents were asked: "How much do you think people harm themselves when they [use the product] some days but not every day?" Response options included: "no harm", "little harm", "some harm", and "a lot of harm". Weighted prevalence estimates and 95% confidence intervals for perceived harm were calculated overall and by sex, school level, race/ethnicity, current (past 30-day) use of each respective product, frequency of use, current use of other tobacco products, and tobacco product use by household members. Adjusted prevalence ratios of the association between current tobacco product use and harm perceptions were calculated. **RESULTS:** Nationally, the prevalence of students who perceived that intermittent use causes "no" or "little" harm was 9.7% for cigarettes, 12.0% for smokeless tobacco, 18.7% for hookah, and 37.5% for electronic cigarettes. More than half of current hookah and e-cigarette users reported there was "little" or "no" harm in using these products some days. For each product, youth who reported higher frequencies of use within the past 30 days generally perceived the least harm from intermittent use. Compared to those who reported "a lot of harm," current tobacco product use was more likely among those with lower harm perceptions. **CONCLUSIONS:** Many U.S. youth, particularly those currently using tobacco products, remain unaware of the harms of intermittent tobacco product use. Given the variability in perceptions about tobacco product harms and the association between less perceived harm and current use, these findings underscore the importance of public health efforts to educate youth on the harms of intermittent tobacco use across a range of tobacco products, including e-cigarettes and hookah.

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## POS4-73

### WHAT DO WE KNOW ABOUT WHO IS STILL SMOKING IN CANADA?

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**SIGNIFICANCE:** In 2015, 18% (5.3 million) of the Canadian population aged 12+ were current cigarette smokers. While the prevalence of cigarette smoking is decreasing in Canada, it is important to understand the characteristics of the population who currently smoke, who have stopped smoking, and who have never smoked cigarettes, in order to inform policy and program decisions. **METHODS:** Data were from the 2014 Canadian Community Health Survey (CCHS). The CCHS is a cross-sectional survey that collects information related to health status, health care utilization and health determinants for the Canadian population. The CCHS covers the population 12 years of age and over living in the ten provinces and the three territories. The CCHS provides socio-demographic information (e.g. age, sex, income, marital status, education, urban/rural), along with smoking status, at the national population level. Descriptive analyses were conducted to assess the prevalence of current, former and never cigarette smoking within select socio-demographic categories, as well as the socio-demographic composition of those within each smoking status. **RESULTS:** More than half of current smokers live in Canada's most populous provinces: Ontario (37%) and Quebec (25%). In

contrast, while the three territories have the highest smoking rates in Canada, they have only a small fraction of the current smokers (<1%). The prevalence of current cigarette smoking was highest in the lowest household income category; however only 7% of current cigarette smokers fell into this income category. Prevalence of current cigarette smoking was higher among those with lower educational attainment whereas almost half (49%) of current cigarette smokers reported the highest educational attainment. **CONCLUSIONS:** Relying solely upon prevalence provides one perspective and one set of policy and program options, while relying solely upon counts provides a different perspective and another set of policy and program options. Ideally, both perspectives should be used to develop the best combination of policy and program options.

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## POS4-74

### EFFECTIVENESS OF MOBILE-PHONE TEXT MESSAGES TO INCREASE PERCEIVED RISK OF USING HOOKAH, E-CIGARETTES, AND REGULAR CIGARETTES AMONG COMMUNITY COLLEGE STUDENTS: A RANDOMIZED TRIAL

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**SIGNIFICANCE:** Community college students represent an underserved population, and are more susceptible to use of nicotine and tobacco products than those attending 4-year colleges. As a result of pro-tobacco marketing, community college students have exhibited relatively low knowledge about different tobacco products, and a reduced perception of the risk of such products, compared to other young adults. One innovative strategy to communicate about the risks of tobacco use is the application of mobile phone text messages (SMS). The current study evaluates a mobile-phone SMS program, *Project Debunk*, with the goal to examine and compare the efficacy of different types of SMS messages, with different tobacco products, to increase perceived risk of tobacco use. **METHOD:** Within a randomized trial in Houston community college campuses, 646 young adults were randomized to receive one of eight types of SMS messages, based on the combination of three message-attributes: emotional versus rational, gain-framed versus loss-framed, and simple versus complex. We conducted two campaign-waves of one month each, delivering 2 messages per day. Data were collected on perceived risk of using regular cigarettes, hookah, and e-cigarettes at baseline, 3-months post-baseline, and 6-months post-baseline. **RESULTS:** Overall, by 6-months post-baseline (28% retention to date), participants increased their perceived risk of using hookah (P<0.001), e-cigarettes (P<0.001), and regular cigarettes (P=0.011). Participants who received simple, gain-framed, rational messages were more likely to increase in perceived risk of using hookah (P=0.011) and e-cigarettes (P=0.016) than those receiving any other combination of message-types. No particular combination of message types was more effective than another in increasing perceived risk of using regular cigarettes. **CONCLUSION:** Mobile-phone SMS-based campaigns can be an effective strategy to increase perceived risk of using nicotine and tobacco products. This novel approach could be used to disseminate information about tobacco risks. Simple, gain-framed, rational text messages are particularly effective with new and emerging products.

FUNDING: Federal

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## POS4-75

### EFFECTIVENESS OF AN E-LEARNING PROGRAM FOR TRAINING HEALTH PROFESSIONALS IN SMOKING CESSATION

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**SIGNIFICANCE:** E-learning has several advantage of convenience, flexibility in learning, and lower costs compared to traditional mode of classroom learning. We



evaluated the effectiveness of an e-learning program for training health professionals in smoking cessation treatment which aims at the acquisition of practical knowledge and skills, and obtain basic data for future smoking cessation programs. **METHODS:** The training program consisted of three versions: smoking cessation treatment, smoking cessation advice, and smoking cessation support. A total of 1,526 health professionals, who completed the program between 2010 and 2013, were used for analysis. Comparisons were made to investigate the changes in knowledge, attitude, self-efficacy, and behaviors related to the support and treatment in smoking cessation. Also examined was whether the previous disparities in knowledge and other indicators were reduced after training. **RESULTS:** Knowledge, attitude, self-efficacy, and behaviors improved significantly with all three versions of the training program upon its completion. By dividing participants into three groups based on the scores prior to the training and comparing the changes after training, those in the lowest scoring group demonstrated significantly greater improvement in knowledge, attitude, self-efficacy and behavior compared with the other groups. After training, the disparity was reduced for all indicators as well. **CONCLUSION:** The results of evaluating the training program, which utilizes e-learning to incorporate practical knowledge and skills, suggest that it is effective in improving the knowledge, attitude, self-efficacy and certain interventional behaviors among those completing the program. It also reduced disparity in knowledge and other indicators after training.

**FUNDING:** Nonprofit grant funding entity

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## POS4-76

### HOME SMOKING POLICY AND SECONDHAND SMOKE EXPOSURE IN CHILDREN

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**SIGNIFICANCE:** Almost a quarter of children younger than age 18 live with an individual who smokes. Thus, children are especially vulnerable to secondhand smoke exposure (SHSe) and its adverse health effects. SHSe within homes is largely unregulated, and few studies have provided evidence for the effectiveness of implementing home smoking policies for reducing the risk of SHSe among children. This study assessed the effect of different home smoking policies on children's cotinine levels. **METHODS:** Saliva samples were collected from 285 children, aged 3-12 years, from Durham, NC. SHSe was defined as having a cotinine concentration of  $\geq 1$  ng/ml. Home smoking policies were measured using maternal self-reports. Differences in cotinine concentrations were assessed using the Mann-Whitney U test, which compared homes with different smoking policies. Risk of having SHSe was estimated using logistic regression models, controlling for maternal race, education level and household income. **RESULTS:** Children's cotinine values were significantly lower in homes without smokers (Mean=0.48, SD=0.07) than in those with at least one smoker (Mean=2.34 ng/ml, SD=0.33,  $p<0.001$ ). Compared to children living in households that allow smoking inside or outside the home, children in households that do not allow smoking had significantly lower cotinine levels (Mean = 1.75 ng/ml, SD = 0.25 vs. Mean=0.50 ng/ml, SD=0.08;  $p<0.001$ ). Findings were consistent after controlling for potential confounders. Risk of having SHSe was significantly higher in homes with at least one smoker (OR=7.37,  $p<0.001$ ) and that allow smoking inside or outside the home (OR=4.41,  $p<0.001$ ). However, the risk for having SHSe was not significantly reduced by limiting smoke location to porch or balcony (OR=2.38,  $p=0.16$ ). **CONCLUSIONS:** Implementing smoking restrictions within homes helps to reduce SHSe in children. However, home smoking policies that only partially limit smoking to certain locations tend to be ineffective. Findings underscore the importance of limiting smoking in and around the home. Additional research is needed to further evaluate the effectiveness of home smoking policies as a method of reducing SHSe in children.

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## POS4-77

### NON-DAILY AND DAILY CIGARETTE SMOKING AMONG PEOPLE WITH COMMON MENTAL HEALTH AND SUBSTANCE USE PROBLEMS IN THE UNITED STATES, 2005-2015

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**SIGNIFICANCE:** Prior studies have found that the overall prevalence of cigarette smoking is higher among those with specific mental health problems, with mixed findings on trends in smoking over time among those with and without specific mental health problems. Mental health and substance use problems tend to co-occur, yet prior studies have not examined trends among those with and without these problems on a broader scale. The current study estimates trends in the prevalence of daily and non-daily cigarette smoking among those with any common mental health or substance use problem (MHSUP), compared with those without any MHSUP, from 2005 to 2015. **METHODS:** Data came from 409,718 individuals in the 2005-2014 National Survey on Drug Use and Health (NSDUH) public use data files. Linear time trends of current, daily, and non-daily cigarette smoking among those with and without MHSUP were assessed using logistic regression models with continuous year as the predictor. **RESULTS:** In 2015, the prevalence of current smoking among those with MHSUP was more than twice that of those without any MHSUP. Non-daily smoking increased significantly from 2005 to 2015 among those with MHSUP in contrast to a decline in non-daily smoking among those without MHSUP. The rate of change differed significantly. Daily smoking declined significantly from 2005 to 2015 among those with and without MHSUP. **CONCLUSIONS:** The prevalence of non-daily smoking is increasing among those with common mental health and substance use problems, while it is simultaneously declining among those without these vulnerabilities. Though daily smoking is declining, the disparity in prevalence of smoking between those with and without common MHSUP remains substantial. Conclusions about how to reach the tobacco endgame may need to be reconsidered to develop targeted tobacco control public health approaches that address common MHSUP in the community.

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## POS4-78

### HARM PERCEPTIONS OF VARIOUS TOBACCO PRODUCTS OVER 2 YEARS: RESULTS FROM LONGITUDINAL COHORTS OF YOUTH AND YOUNG ADULTS

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**SIGNIFICANCE:** There is limited longitudinal data describing how harm perceptions of various tobacco products change as young people age. This study aims to: 1) identify changes in perceived harm of tobacco products (cigarettes, cigars, hookah, smokeless tobacco, and e-cigarettes) over a 2-year period, from 2014-2016; and 2) determine if harm perceptions differ between tobacco products in a sample of youth and young adults. **METHODS:** Data were drawn from 2 longitudinal cohort studies in 4 metropolitan areas in Texas. Students were surveyed on tobacco use behaviors every 6 months. Mixed effects logistic regression models tested for changes in the proportion of youth ( $n=2,123$ ) and young adults ( $n=3,511$ ) reporting each tobacco product was "not at all" harmful to health over time. Significant linear time trends were determined if survey wave, which was an independent variable, had a  $p$ -value  $< .05$  (aim 1). Non-overlapping 95% confidence intervals, calculated post-estimation, provided evidence for significant differences between perceptions of various tobacco products (aim 2). **RESULTS:** In both youth and young adults, the proportion of students who reported, at baseline, that cigarettes (youth: 2.9%; young adults: 1.4%), smokeless tobacco (youth: 3.6%; young adults: 1.8%), and cigars (youth: 3.5%; young adults: 1.6%) were not at all harmful did not change over time; however, the proportion of students who reported e-cigarettes (youth: 14.8% to 9.3%; young adults: 6.9% to 4.5%) and hookah (youth: 8.8% to 7.2%; young adults: 5.6% to 4.7%) were not at all harmful significantly decreased over time. At all points in time, a significantly greater proportion of youth and young adults reported that e-cigarettes and hookah were not at all harmful to health compared to the other products. **CONCLUSION:** While a greater proportion of students reported that e-cigarettes





and hookah were not at all harmful compared to other tobacco products, harm perceptions for e-cigarettes and hookah became more accurate as students aged. Health communication campaigns targeted to young people should aim to correct misperceptions about the harms of e-cigarettes and hookah.

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## POS4-79

### TOBACCO USE DIAGNOSIS AND KNOWLEDGE IN SMOKING CESSATION TREATMENT: ASSESSING SENIOR MEDICAL STUDENTS IN MEXICO

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**SIGNIFICANCE:** Smoking remains a major public health concern in Mexico as 16.4% of adults smoke. In Mexico, 19.3% of smokers report being advised to quit by a health care provider in the past year. Simulated patients have shown to be an effective way to evaluate tobacco use diagnosis and smoking cessation knowledge in medical students. **OBJECTIVE:** To assess knowledge on tobacco use and nicotine dependence diagnosis, and development of a smoking cessation plan among last year medical students in Mexico. **METHODS:** Senior medical students were evaluated with 12 simulated patients. One simulated patient prompted medical students to conduct a complete medical history, including tobacco use and nicotine dependence. Another simulated patient was a 36 years old heavy smoker (12 CPD), without medical conditions, who was interested in quitting tobacco. Medical students had 6 minutes per simulated patient, and were evaluated by trained physicians on following the clinical guidelines and standardization of practices. **RESULTS:** A total of 55 medical students were evaluated. Less than 5% asked about tobacco use during the medical history. In the second simulation, while 98.1% assessed levels of cigarette consumption, only half of the students inquired about reasons and previous attempts to quit, as well as use of smoking cessation resources. While establishing a therapeutic plan, 78.1% recommended cognitive behavioral therapy to support the quit attempt, however, recommend cessation strategies without clinical evidences (tapering and e-cigarettes). Approximately, two third of students recommended pharmacotherapy (NRT products) to quit smoking but they did not accurately addressed dosage, indications and/or contraindications. **CONCLUSION:** Smoking is an underdiagnosed disease by senior medical students in our sample. Education on smoking cessation treatment is urgently necessary. As 83.3% of medical students in Mexico do not move into residency, medical schools need to prioritize clinical evidence practices to significantly improve morbi-mortality; for example quitting smoking.

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## POS4-80

### FLAVORED E-CIGARETTE USE AND CIGARETTE SMOKING BEHAVIORS AMONG YOUNG ADULT SMOKERS: A POPULATION-BASED STUDY

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**SIGNIFICANCE:** About a third of young adult smokers in the U.S. concurrently use e-cigs, especially flavored e-cigs. However, little is known about young adult smokers' socioeconomic characteristics and their behaviors of cigarette smoking and e-cig use based on the e-cig flavors used. This study sought to fill these research gaps. **METHODS:** Longitudinal data (Waves 1 and 2) of the Population Assessment of Tobacco and Health (PATH) Study were used, including a sample of young adult (aged 18-34) cigarette smokers (n=4,645) at wave 1 and a sub-sample of current e-cig users (n=844) at wave 2. Univariate and multivariate regressions were conducted to characterize those who use flavored e-cigs in terms of demographics and smoking behaviors, as well as the association of flavor use with smoking reduction over the past year. **RESULTS:** At wave 2, 18.2% of the respondents currently used e-cigs, and 6.7%, 5.2%, and 6.3% used e-cigs with tobacco/menthol (TM) flavors, one non-tobacco/non-menthol (NTM) flavor,

and multiple NTM flavors, respectively. Users of multiple NTM flavors were more likely to be younger, have smoked at least 10 years, and smoke every day than nonusers and users of TM flavors ( $p < .001$ ). Users of TM flavors were more likely to be male and have high cigarette dependence than nonusers ( $p < .001$ ). Users of NTM flavors were more likely to have used more cartridges and vape daily than TM flavor users ( $p < .05$ ). E-cig users with one (AOR=2.5, 95% CI=1.6-3.8) and multiple NTM flavors (AOR=3.0, 95% CI=2.1-4.3) were more likely to have reduced smoking than non-users, whereas the TM flavor users did not reduce smoking. **CONCLUSIONS:** Young adult smokers with various socioeconomic statuses and tobacco use backgrounds choose to use different e-cig flavors. Users of TM flavors were more likely to be long-term, cigarette-dependent smokers who use e-cigs less frequently than users of NTM flavors. The results can inform public health practitioners regarding the risk factors and behaviors associated with cigarette and e-cig dual use and how e-cigs of various flavors are used concurrently with cigarettes by young adults.

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## POS4-81

### EXPOSURE AND REACTIONS TO THE REAL COST: SMOKELESS CAMPAIGN AMONG RURAL BOYS

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**BACKGROUND:** The U.S. Food and Drug Administration (FDA) developed a multi-strategy youth-targeted public education campaign to reduce the public health burden of tobacco, including a rural smokeless tobacco prevention campaign, *The Real Cost - Smokeless*. An initial goal of the campaign was to reach approximately three quarters of its target audience—12 to 17 year old boys in 46 predominantly rural Designated Market Areas (DMAs) across the United States including a national digital video ad buy. In this study, we present preliminary findings on exposure and reactions to campaign messages among its target audience. **METHODS:** The evaluation team conducted a randomized field trial in 30 rural DMAs in the U.S. with 15 to serve as study treatment markets and 15 as controls. A longitudinal cohort of 1,947 male youth aged 11 to 16 years residing in these DMAs were surveyed to measure awareness of the Campaign. We calculated descriptive statistics for awareness of and reactions to video ads. Measures of reaction include "this ad grabbed my attention," "this ad is informative," and "this ad is convincing." **RESULTS:** At the first post-intervention launch survey, Campaign brand awareness was 74.8% among respondents in the intervention group. Awareness of any video ad was 85.9% in the intervention group compared to 59.5% in the control group ( $p < 0.001$ ). Youth responded positively to the ads. For example, in one ad called "Movie Monster" a man on a date succumbs to his urge to place a dip in his mouth despite obvious disapproval from his date. Awareness of this ad was 64.1% and 62.7% reported that the ad was convincing. **CONCLUSION:** The FDA met its goal of achieving 75% recall of Campaign ads at first follow-up. The Campaign ads generated positive audience reactions. Based on prior literature showing the predictive relationship between audience reactions and longer-term behavior change, these findings provide a foundation for future measurement of the campaign's impact on changes in smokeless tobacco related knowledge, attitudes, and beliefs.

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## POS4-82

### PATTERNS AND TRENDS OF CIGARETTE, CIGAR, AND MARIJUANA USE AMONG COLLEGE AND NON-COLLEGE PERSONS AGED 18-22 YEARS: UNITED STATES, 2002-2015

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**SIGNIFICANCE:** Since 2012, recreational or retail marijuana has become legal for persons aged  $\geq 21$  in several states, raising concern about increased access to marijuana by youth. Young adults, including college students, are at high risk for



use of both tobacco products and marijuana. However, there are no recent, nationally representative data on use of these products among U.S. college students. **METHODS:** We analyzed data from the 2002-2015 National Survey on Drug Use and Health among college students aged 18-22 ( $n = 73,272$ ) and young adults aged 18-22 not enrolled in college ( $n = 85,244$ ). Prevalence and trends of past 30-day use were assessed for: 1) exclusive cigarette or cigar use, 2) exclusive marijuana use, and 3) dual use of both marijuana and either cigarettes or cigars. Prevalence estimates were computed overall and by sex, race/ethnicity, college enrollment status (full/part-time). Linear trends were measured using logistic regression analyses adjusted for sex and race/ethnicity. Between group differences were examined by chi-squared tests at  $p < 0.05$ . **RESULTS:** During 2002–2015, among college students overall, exclusive cigarette/cigar use declined from 24.8% to 10.9% while exclusive marijuana use increased from 3.4% to 8.4% ( $p < 0.05$ ). Similar trends were seen within all population subgroups. Dual use declined from 14.6% to 11.7% among overall college students ( $p < 0.05$ ). During 2015, prevalence of exclusive marijuana use was higher among college students (8.4%) than adults not enrolled in college (6.7%) ( $p < 0.05$ ). Prevalence of exclusive cigarette/cigar use and dual use were both lower among college students than adults not enrolled in college (10.9% vs. 23.7%; 11.7% vs. 13.7%, respectively) ( $p < 0.05$ ). **CONCLUSION:** Exclusive use of marijuana increased significantly while exclusive smoking of cigarettes/cigars decreased among U.S. college students during 2002 to 2015. Continued surveillance of tobacco product and marijuana use could help inform efforts to prevent and reduce tobacco product and marijuana use among college students.

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## POS4-83

### CHRONIC RESPIRATORY SYMPTOMS AMONG YOUNG ADULTS WITH A HISTORY OF ADOLESCENT E-CIGARETTE USE

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**SIGNIFICANCE:** Rates of adolescent electronic (e-) cigarette use are high. Components of e-cigarette aerosol have known pulmonary toxicity, but there has been little study of the chronic effects of e-cigarette use on respiratory health. We investigated prospectively the association of e-cigarette use with bronchitic symptoms and shortness of breath in young adults. **METHODS:** Use of e-cigarettes by 1358 Southern California Children's Health Study participants was assessed in a self-completed baseline questionnaire in 11th and 12th grade in 2014 and in two follow-up waves in 2015-2016 and 2017. The association of e-cigarette use with subsequent chronic bronchitic symptoms (chronic cough, phlegm or bronchitis) and with shortness of breath when walking on level ground or slightly uphill in 2017 was assessed in a prospective analysis of follow-up data using logistic regression models. **RESULTS:** Baseline e-cigarette use was reported by 298 participants (22%). Risk of bronchitic symptoms at follow-up was increased by almost two-fold among participants with a baseline history of e-cigarette use (odds ratio (OR) 1.86; 95% confidence interval (CI) 1.29, 2.68). The association was modestly attenuated after adjustment for sociodemographic characteristics, baseline report of second-hand smoke exposure, and lifetime cumulative history of cigarettes smoked at follow-up (OR 1.61; 95%CI 1.10, 2.34). Baseline e-cigarette use was weakly associated with increased odds of shortness of breath at follow-up (OR: 1.43; 95% CI 0.94, 2.19) in the fully adjusted model. However, past 30-day use of e-cigarettes in all 3 waves of data collection was strongly associated with shortness of breath at follow-up (OR: 3.58, 95% CI: 1.38, 9.30). **CONCLUSIONS:** Adolescent e-cigarette use was a risk factor for the development of chronic respiratory symptoms in early adult life. Further investigation of the long-term effects of e-cigarettes on respiratory health is warranted.

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## POS4-84

### WHAT FACTORS ACCOUNT FOR LGBQ YOUNG ADULT TOBACCO USE DISPARITIES?

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**INTRODUCTION:** Elevated tobacco use among lesbian, gay, bisexual, and queer (LGBQ) individuals compared to their heterosexual peers is well documented. Disparities are frequently attributed to: 1) higher social acceptability of tobacco use in LGBQ communities, 2) tobacco marketing that targets LGBQ spaces, and 3) experiences of stress related to LGBQ identity (minority stress). The purpose of this study was to examine factors that may account for the tobacco use disparities for LGBQ young adult college students. We hypothesized that more favorable tobacco social norms, more tobacco marketing in bars, and depressive symptoms (a proxy for minority stress), would mediate, or account for, the association between LGBQ identity and current/past 30-day tobacco use. **METHODS:** Participants were 4,096 18-29 year-old ( $M = 21.8$ ,  $SD = 2.3$ ) college students (35.6% male, 88.7% heterosexual, 35.9% non-Hispanic White) participating in the third wave of Project M-PACT (Fall 2015). Social norms were assessed by averaging responses to three items, rating tobacco's social acceptability, the number of close friends who use tobacco, and the likelihood of dating a tobacco user (range 1-5). Exposure to tobacco marketing in bars was assessed by averaging the frequency of seeing branded tobacco advertising, interacting with a tobacco representative, and being in a bar when free samples were distributed (range 0-3). Depressive symptoms were assessed using the CES-D scale (range 1-30). **RESULTS:** In mediation analyses, LGBQ identity was significantly associated with higher social norms and depressive symptoms ( $p < .001$ ), but not tobacco marketing. Social norms and tobacco marketing were significantly associated with current tobacco use ( $p < .001$ ). Only social norms demonstrated a significant mediating effect on the association between LGBQ identity and current tobacco use ( $b = 0.36$ ,  $SE = .06$ ). **CONCLUSIONS:** Higher social norms explain a significant portion of the disparity in tobacco use between LGBQ young adults and their heterosexual peers. Interventions aimed at altering norms that are more permissive of tobacco use may help relieve the disproportionate tobacco burden experienced by LGBQ young adults.

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## POS4-85

### DIFFERENTIAL QUIT RATES BETWEEN HISPANIC AND WHITE EVER-SMOKERS ARE ACCOUNTED FOR BY DEMOGRAPHICS BUT NOT ACCULTURATION PROXIES

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**OBJECTIVE:** Prominent addiction theories predict that Hispanic smokers should have more success at quitting than white smokers due to less physical dependence on average, but extant findings are mixed. This might be due in part to lack of attention to confounding demographic and acculturation-related variables. This study compared lifetime quit rates of white and Hispanic men and women of different language proficiency, nativity and residency statuses, controlling for age, education, and poverty level. **METHODS:** Data was utilized from 123,574 white and Hispanic adult participants in the 2011-2015 National Health Interview Surveys who endorsed smoking  $\geq 100$  cigarettes in their life. Six logistic regression analyses each for men and women compared white smokers' likelihood of ever quitting to that of Hispanics endorsing: 1) high versus low English proficiency; 2) native- versus foreign-born status, and; 3)  $< 5$  versus  $\geq 5$  years of U.S. residency. Parameters and missing data were estimated with full information maximum likelihood. **RESULTS:** Estimated quit rates were significantly higher for white men compared to all others ( $p < .01$ ), but differences were small (Cohen's  $d = .06-.08$ ). In unadjusted analyses, no consistent pattern in the prediction of smoking status emerged. In analyses adjusted for age, education, and poverty level, Hispanics consistently demonstrated significantly higher likelihood of ever quitting compared with whites ( $p < .01$ ). Among Hispanics, there were no differences in likelihood of being a former smoker between language proficiency, nativity, or residency statuses. **CONCLUSIONS:** Hispanic men and women demonstrate higher lifetime quit rates compared with whites when demographics are accounted for. Ethnic dif-



ferences in cessation may be more accurately described when demographics are considered. Among Hispanics, age, education, and poverty level may be more important determinants of quitting in one's lifetime than acculturation-related characteristics.

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## POS4-86

### AN E-CIGARETTE BY ANY OTHER NAME: EXAMINING HOW USERS DESCRIBE AND CATEGORIZE ENDS PRODUCTS

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**SIGNIFICANCE:** As demand for ENDS continues to grow, researchers and policy makers are grappling with the diversity of device types that comprise this product category. The terms used to identify and categorize devices is equally diverse due to a lack of consensus in language used by researchers, manufacturers, and consumers alike. **METHODS:** A focus group study was conducted with adult ENDS users from four U.S. cities (N=156) fielded from June-August 2016. Groups were segmented by geographic region (urban; rural), age (18-29; 30+), and primary device type (cigalike vs. tank). To explore how users describe and categorize device types, findings were triangulated from three data sources: responses to an open-ended question on a pre-discussion questionnaire, an image sorting task from the focus group, and group discussion on terms used to describe all ENDS products. **RESULTS:** When asked to write-in the "type of electronic nicotine product" they used most often, cigalike users commonly supplied the brand name of their device (e.g., "blu") or "e-cig" (or derivation). Tank users, on the other hand, commonly wrote in "tank" or "tank system." During the group image sorting task, across segments, cigalike products were commonly classified as an "e-cigarette"; rechargeable/refillable products (without a tank) were most often classified as a "vape" or "vape pen"; and tank-style devices were typically classified as a "tank" or "vape". Some groups did not reach consensus for how to classify one (or more) device types depicted, and a few groups were unable to identify some of the devices. Lastly, when prompted to discuss if there was a term that could describe all devices in the sorting task, participants generally agreed "vape" or "e-cig" could be applied as the overarching term. **CONCLUSION:** Adult users of cigalikes and tanks used different terms to describe and categorize device types. Across groups, they differentiated between several device types with different terms, and in some cases the same terms were applied differently. The diversity of ENDS device types, and the lack of consensus in what to call them, presents unique challenges for communicating about them.

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## POS4-87

### AN EXPERIMENTAL STUDY OF HYPOTHETICAL MODIFIED RISK TOBACCO PRODUCTS (MRTPS): EXAMINING THE EFFECTS OF RISK AND EXPOSURE MODIFICATION CLAIMS ON PERCEPTIONS AND INTENTIONS

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**SIGNIFICANCE:** Section 911 of the FD&C Act authorizes the marketing of a "modified risk tobacco product" (MRTP) if FDA determines that the product will significantly reduce harm and the risk of tobacco-related disease to individual tobacco users and benefit the health of the population. Little is known about how risk modification (RM) and exposure modification (EM) claims may affect consumer perceptions and intentions to try a product. Moreover, despite its importance to consumer behavior, no studies have examined the impact of brand on consumer reactions to potential MRTPs. **METHOD:** We conducted an online experiment May-June 2017 with adult current and former cigarette smokers (N = 1,557) to examine the effects of RM/EM claims on reactions to a hypothetical MRTP. Participants were randomly assigned to view images of a cigarette pack and ad displaying a claim (RM or EM) or not (control), on either: their own brand; another brand; or a novel brand. Thus, the study employed a 3(claim type: RM vs. EM vs. control)

x 3(brand type: own vs. other vs. novel) between-subjects factorial design. Afterwards, perceptions and intentions to try the hypothetical MRTP were assessed. **RESULTS:** Two-way ANOVAs showed significant main effects of claim condition on perceived harm/risk and main effects of both claim and brand on intentions. Compared to control, cigarettes with RM and EM claims were perceived as less harmful and posing less risk of all tobacco-related diseases ( $p$ -values < .001). The EM, but not RM, claim increased intentions to try the product, relative to control ( $p$  < .001). Additionally, a significant interaction effect suggests brand moderated the effect of claim on perceived risk ( $p$  = .001). **CONCLUSIONS:** Results suggest the RM and EM claims in this study similarly affected perceived harm/risk, though only the EM claim affected intentions. Not surprisingly, brand affected consumer reactions to the MRTP; they were most interested in the product from their brand. Findings provide insight into how consumers might react to potential MRTPs and factors that could affect those judgments. Future research can inform the extent to which these findings generalize to other claims.

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## POS4-88

### BANNING SMOKING IN THE HOME AND CAR: WHO DOES IT? WHAT ARE THE IMPLICATIONS FOR YOUTH?

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**SIGNIFICANCE:** A large proportion of the population is regularly exposed to secondhand smoke (SHS), including 41% of children. Voluntary smoking bans in the home and car would reduce SHS exposure and potentially reduce youth tobacco use by sending a clear anti-smoking message to youth; however, there are few population-based studies on full smoking bans (i.e., home and car). **METHODS:** Data for this study were from the Minnesota Adult Tobacco Survey, a statewide telephone survey, and the Minnesota Youth Tobacco Survey, a statewide school-based paper and pencil survey (N=1,327). Weighted analyses of descriptive and multivariate logistic regression examined (1) prevalence and predictors of full smoking bans, focusing on adult smokers and non-smokers, and (2) how smoking bans influence youth tobacco use and SHS exposure. **RESULTS:** *Adults.* Among adult smokers, most implemented home-only bans (43.1%) or did not implement any ban (31.4%); the majority of non-smokers implemented full bans (85%). Low-income status was negatively associated with implementing a full ban (AOR=0.57), and having a child in the home was not associated with ban type for smokers. *Youth.* Among youth who were living with a smoker, youth exposed to a partial ban or no ban were more likely to have smoked in the past 30 days than were youth whose household had a full ban (respectively, AOR=2.20 and 2.45). Youth with full bans were less likely to try any tobacco product. The expected number of days exposed to smoke in the home within the past seven days increased by a factor of 1.34 and 1.55 for youth who experienced partial bans and no bans compared to youth whose households had full bans. Similar findings were observed for SHS exposure in the car: the expected number of days increased by a factor of 3.68 and 4.63 for youth who experienced partial bans and no bans compared to youth whose households had full bans. **CONCLUSIONS:** This study suggests that voluntary smoking bans in the home and car help protect youth from tobacco use and SHS exposure. Public health practitioners should address the majority of adult smokers who do not implement full bans, particularly parents and populations with low socioeconomic status.

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## POS4-89

### THE ROLE OF ACCULTURATION AND BINGE DRINKING ON SMOKING STATUS AMONG MEXICAN AMERICANS: COMPARISON BY BORDER RESIDENCE

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**BACKGROUND:** Border Mexican Americans (MA) are exposed to poverty, under-education, and more tobacco marketing, all of which are predictors of cigarette

smoking. **METHODS:** This study analyzed two epidemiologic surveys among border and non-border MA. In the border sample, interviews were conducted among self-identified MA living in U.S.-Mexico border counties of California, Arizona, New Mexico, and Texas. The non-border sample consisted of MA respondents and was interviewed in Los Angeles, Houston, New York, Philadelphia, and Miami. Analyses were stratified by gender, adjusted for age and education covariates, and modeled the effects of acculturation and binge drinking on cigarette smoking behavior. **RESULTS:** There were 2,595 respondents, 1307 residing in border counties and 1,288 from 5 other cities. There was no difference in cigarette smoking in the past 12 months between border and non-border MA among men (25.8% vs. 29.4%) or women (9.4% vs. 9.9%), respectively. Acculturation was not significantly related with cigarette smoking among men; however, women with high acculturation levels were more likely to be past year smokers than those with low acculturation (RRR =2.28, 95% CI 1.32-4.66). Binge drinking was associated with being past year smoker in both men (RRR=3.41, 95% CI=2.26-5.15) and women (RRR=2.33, 95% CI 1.32-4.49), but not with being a former smoker. **CONCLUSIONS:** Border residence did not influence cigarette smoking behavior among Mexican Americans and both groups had significant associations between smoking and binge drinking. Future public health interventions focused on smoking and alcohol may use similar strategies with border and non-border MA.

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## POS4-90

### DEVELOPMENT AND PSYCHOMETRIC EVALUATION OF A NOVEL MEASURE OF SENSORY EXPERIENCES ASSOCIATED WITH E-CIGARETTE USE

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**SIGNIFICANCE:** Measures of e-cigarette dependence exist but do not assess sensory aspects of vaping that may influence use. We developed a new measure of sensory e-cigarette experiences (SE-E) and evaluated its psychometrics. **METHODS:** 610 adult e-cigarette users completed an online survey in Summer 2017 that included 23 SE-E items (48.7% male, 84.9% White, 37.41[12.15] years old). Psychometric analyses included evaluating latent structure, internal consistency, measurement invariance, mean differences, and test-criterion relationships. **RESULTS:** Factor analyses indicated that the SE-E (9-items) comprised 3 subscales (taste/smell, pleasure/satisfaction, vapor cloud production). Each was internally consistent and scalar invariant by sex, race, smoking status (current/not), vaping status (daily/non), e-liquid nicotine content (yes/no), and device type (cig-a-like/2nd generation, vape-pen/APV/Mod). Women, daily vapers, and nicotine e-liquid users reported stronger SE-Es related to taste/smell and pleasure than their counterparts. Non-White individuals reported stronger SE-Es related to vapor clouds than did Whites. Cig-a-like users reported the weakest SE-Es related to taste/smell. APV and mod users reported greater SE-Es linked to cloud production than cig-a-like users. The SE-E subscales correlated positively with nicotine dependence (mean  $r = .42$ ). Finally, SE-Es predicted vaping frequency (days/week; times/day) and habitual e-cigarette use concurrently and incrementally beyond nicotine dependence; SE-Es related to taste/smell were associated with more frequent vaping, while SEs related to pleasure and cloud production were associated with greater habitual e-cigarette use in all models. **CONCLUSIONS:** The SE-E can be used to assess three sensory experiences in adults: taste/smell, pleasure/satisfaction, and vapor cloud production. The SE-E was internally consistent; sensitive to mean differences; related, yet distinct from nicotine dependence; and evidenced concurrent and incremental validity. Future research should evaluate how SE-Es relate to product characteristic preferences and patterns of e-cigarette use, including the development and maintenance of addiction.

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## POS4-91

### TOBACCO USE AND RISK FACTORS AND EXPERIMENTATION WITH SHISHA SMOKING AMONG SCHOOL STUDENTS IN THE GAMBIA

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**SIGNIFICANCE:** Tobacco consumption, and consequent morbidity and mortality, are expected to grow most markedly over coming decades in low and middle income countries (LMICs). Since evidence from rich countries indicates that most smokers begin smoking before age 18, preventing tobacco experimentation and uptake among young people in LMICs is vital. However, data on smoking among young people in the world's poorest nations, particularly in sub-Saharan Africa, remain sparse. **METHODS:** We used two-stage cluster random sampling to select students in upper basic and senior secondary schools throughout The Gambia, and a self-administered questionnaire to collect data on their tobacco use, risk factors, and demographic details. **RESULTS:** Of 10,392 eligible students, 10,289 (99%; 55% girls and 44% boys, aged 12-20 years) participated. The prevalence of ever smoking cigarettes, cigars or pipes was 16.7% (25.7% boys and 9.4% girls) and current (past 30 days) smoking 4.5% (7.9% boys and 1.5% girls). Smoking these products was more common in older boys, and among students in private schools, of non-Muslim faith, who lived in homes where smoking was allowed, or had family or friends who smoked. Half of all smokers found it very easy to purchase cigarettes regardless of age. Most (55.6%) smokers reported wanting to stop smoking and had tried to quit in the last year (54.5%), but less than 25% received any stop smoking support. The prevalence of ever smoking of shisha, at 8.1%, was unexpectedly high, and relatively prevalent among girls (11.4% of boys and 5.4% of girls) when compared with cigarette smoking. **CONCLUSIONS:** Tobacco use is common among young people in the Gambia. Shisha smoking is also common in this population, and in relative terms especially among girls. Further work is required to determine whether this is a problem local to The Gambia, or reflects a wider pattern of tobacco use in sub-Saharan Africa.

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## POS4-92

### VAPING-RELATED STIGMA AND DUAL USE: A QUALITATIVE ANALYSIS

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**SIGNIFICANCE:** Despite on-going debate over the effects electronic nicotine devices (ENDS) will have on population health, researchers generally agree that ENDS pose fewer health risks than smoked tobacco. However, smokers must transition fully from smoking to vaping if they are to reduce the risks they would otherwise face. Several studies have reported high dual use levels and suggested the different physical experiences offered by smoking and vaping, including varied hand and mouth-feel, and changed inhalation sensations, have contributed to dual use. Fewer studies have examined the social factors that may prompt dual use, particularly vaping-related stigma. **METHODS:** Using in-depth interviews with 20 ENDS users who continued to smoke, we explored how participants responded to social cues regarding vaping and probed their experiences of stigma. We used an inductive thematic analysis approach to interpret the data and identified four stigma-related themes. **RESULTS:** First, vaping was sometimes derogated because it lacked the authenticity and overt riskiness of smoking. Participants responded by adjusting their behavior to fit with normative practices, depending on their social context. Second, negative vapor stereotypes as pretentious or 'geeks' challenged some participants' self-perceptions; while some welcomed the opportunity to establish themselves as technical experts, others sought mainstream identities inconsistent with these stereotypes. Third, vaping's acceptability was context-dependent: conspicuous vapor clouds, particularly in public settings, could attract criticism that was not always offset by the affirmation social groups provided. Finally, some participants felt that vaping, like smoking, framed them as 'addicted' and lacking in self-control, and so saw little incentive to transition completely, particularly if they missed physical attributes of smoking. **CONCLUSIONS:** Social pressures prompting dual use have received little attention but may be crucial to promoting full movement from smoking to vaping. Policy measures man-





dating more smokefree settings and increasing the cost of smoking relative to vaping could reduce vaping-stigma and dual use.

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## POS4-93

### MORTALITY RISKS OF DUAL- AND POLY-USERS OF CIGARETTES WITH OTHER TOBACCO PRODUCTS IN THE UNITED STATES: RESULTS FROM THE NATIONAL HEALTH INTERVIEW SURVEYS

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**BACKGROUND:** A growing number of US adults use cigarettes in combination with other tobacco products. Yet, the mortality risks of dual- or poly-use of cigarettes with other tobacco products are not clear. **METHODS:** We harmonized data from 97,804 adults, aged 18-84, who participated in the 1991, 1992, 1998, 2000, and 2005 National Health Interview Surveys, which included detailed assessment of cigarettes and other tobacco products. We identified current exclusive cigarette smokers and those who used cigarettes in combination with other combustible tobacco (cigars, pipes) and smokeless tobacco (chewing tobacco and snuff). Mortality was ascertained via linkage to the National Death Index. We computed hazard ratios (HR) and 95% confidence intervals (CI) for all-cause mortality and deaths from tobacco-related causes of death using multivariable-adjusted Cox proportional hazards regression. Covariates included sex, race/ethnicity, education, and survey year. Age was used as the underlying time metric. The models were stratified by 5-year birth cohort. **RESULTS:** Of 29,633 current cigarette users, 884 (3.1%) also used other combustible tobacco products, 526 (2.2%) also used smokeless tobacco, and 175 (0.7%) used both other combustible and smokeless tobacco (poly-use). The number of cigarettes smoked in the past month varied substantially between exclusive cigarette users and those who also used other tobacco products. Nevertheless, the HRs for mortality were similar in each examined tobacco use category. Relative to never tobacco users, the HRs for all-cause mortality were 2.35 (95%CI=2.22-2.48) for exclusive cigarette smokers, 2.47 (95%CI=1.99-3.06) for dual-users of cigarettes and combustible tobacco, 2.62 (95%CI=1.98-3.45) for dual-users of cigarettes and smokeless tobacco, and 2.61 (95%CI=1.59-4.28) for poly-users. **CONCLUSIONS:** Mortality risks among dual- and poly-users of cigarettes and other tobacco products were similar to or slightly higher than risks among exclusive cigarette smokers.

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## POS4-94

### PRODUCT-SPECIFIC DEPENDENCE AMONG DUAL USERS OF CIGARETTE AND E-CIGARETTE: FINDINGS FROM WAVES 1 AND 2 OF THE PATH STUDY

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**INTRODUCTION:** While the prevalence of cigarette smoking among US adults has steadily declined in the recent years, rapid increase in the use of e-cigarettes and concurrent use of cigarettes and e-cigarettes is observed. Effect of exposure from multiple tobacco products may pose greater health risk and nicotine dependence relative to single tobacco product use. The aim of this study is to evaluate product-specific dependence among dual users of e-cigarettes and cigarettes. **METHODS:** Data from the adult Waves 1 and 2 of the Population Assessment of Tobacco and Health (PATH) study were used. The study focused on 9,830 respondents from Wave 1 and 8,713 respondents from Wave 2 who were current established users of cigarettes and/or e-cigarettes. Study participants were categorized into three mutually exclusive groups; cigarette only, e-cigarette only, and dual users of cigarette and e-cigarette. Product-specific dependence was assessed by the Heaviness of Smoking Index (HSI), sum of 12 items from Wisconsin Inventory of Smoking Dependence Motives (mWISDM), and 3 items related to Hooked on Nicotine Checklist assessing loss of control and craving. **RESULTS:** Among study participants, 6.9% (n=709) at Wave 1 and 9.0% at Wave 2 were dual users. HSI

and mWISDM scores for smoking dependence were significantly higher among dual users than exclusive cigarette smokers. Dual users were twice as likely to have symptoms of cigarette cravings compared to exclusive cigarette smokers (Wave 1 aOR: 2.1, 95% CI: 1.5-2.9; Wave 2 aOR: 2.1, 95%CI:1.6-2.8). Dual users had significantly lower withdrawal symptoms and mean mWISDM scores for e-cigarette dependence compared to exclusive e-cigarette users. Similar findings were observed for dual users whose tobacco use status did not change over time (cigarette cravings aOR: 2.1, 95%CI:1.4-3.2; e-cigarette withdrawal symptoms aOR: 0.5, 95%CI:0.3-0.8). **CONCLUSION:** There are variations in the product-specific dependence among dual users. Dual users demonstrate stronger cigarette dependence but lower e-cigarette dependence compared to the exclusive users of cigarettes and e-cigarettes.

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## POS4-95

### THE SELF-REPORT HABIT INDEX: ASSESSING HABITUAL CIGARETTE, E-CIGARETTE, AND MARIJUANA USE

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**SIGNIFICANCE:** Substance use is driven, in part, by habitual processes that are automatic in nature, occur in response to environmental cues, and play integral roles in how individuals organize their daily lives and conceptualize their identity. However, measures of habitual substance use are lacking. Thus, the current study was designed to validate the Self-Report Habit Index (SRHI) for assessing habitual cigarette, e-cigarette, and marijuana use. **METHODS:** We examined the SRHI's psychometrics in samples of 371 adult cigarette smokers, 239 adult e-cigarette users, and 359 young adult marijuana users who completed anonymous surveys. **RESULTS:** Ultimately, a 6-item, single-factor solution evidenced good fit across products (CFI cigarettes/e-cigarettes/cannabis = .996/.994/.996, RMSEA = .067/.068/.046, SRMR = .010/.015/.017) as well as excellent internal consistency ( $\alpha$ =0.95/0.91/0.88). The SRHI was scalar measurement invariant for sex and race. However, independent-samples t-tests only indicated differences in habitual substance use by sex; women endorsed stronger habitual e-cigarette use and men endorsed stronger habitual marijuana use. The SRHI also was invariant across product type (i.e., cigarette/e-cigarette) in a matched sample of 371 dual-users of cigarettes and e-cigarettes. Dual-users reported slightly stronger habitual cigarette use than e-cigarette use (Cohen's  $d$  = 0.11,  $p$  < .05). Finally, the SRHI evidenced concurrent relationships with smoking, vaping, and marijuana use frequency above and beyond demographic covariates (partial eta squared = 0.31/0.17/0.26). **CONCLUSIONS:** These results suggest that the SRHI is a psychometrically sound tool for measuring habitual smoking, vaping, and marijuana use in adults. The SRHI could detect between-groups differences in habitual e-cigarette and marijuana use by sex and product type and was associated significantly with the frequency of using each substance. Future research should document the degree to which SRHI predicts the development or maintenance of addiction, and further research is needed to determine whether the SRHI is appropriate for use with other substances and/or other age groups (e.g., adolescents).

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## POS4-96

### SATISFACTION FROM A CIGALIKE E-CIGARETTE: RELATIONSHIP WITH CONTINUED E-CIGARETTE USE 1 MONTH LATER

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**INTRODUCTION:** Subjective pleasure or "satisfaction" (SAT) from smoking is related to the transition from occasional to daily smoking and difficulty quitting. A satisfying e-cigarette (ECIG) could be an acceptable alternative for smokers



who are unable or unwilling to quit. The purpose of this study was: 1) to describe characteristics of smokers who obtain more SAT from ECIGs; 2) to model change in ECIG SAT over the first 2 weeks of use; and 3) to examine whether early ECIG SAT is related to later use. METHODS: The Moment Study was an intensive longitudinal study of factors influencing ECIG use among adult smokers. Participants were provided with cigalike ECIGs and reported ECIG SAT via text over 2 weeks of intensive monitoring. A 30-day follow-up survey assessed cigarette (CIG) and ECIG use. Multilevel and multinomial logit models were used to examine the trend of ECIG SAT over time and its influences on follow-up ECIG use. RESULTS: Participants (n=96) reported using ECIGs 2,926 times over 21 study days. Participants were 53.1% women, 41.2 years old on average (SD=12.3), and reported 1.2 quit attempts in the last year (SD=4.2). At baseline, younger age, later age of first cigarette, and greater confidence to quit were associated with higher ECIG SAT ratings ( $p$ 's <0.05). Average ECIG SAT was 6.3 (SD=2.2, range 1-10), with significantly lower ratings in the evening and higher ratings on the weekend ( $p$ 's <0.05). Thirty+ ECIG puffs/day were associated with a .36 points/day increase in ECIG SAT compared to those with <16 puffs/day ( $p$ <0.01). Participants with higher ECIG SAT were more likely to be moderate (OR=1.3) and heavy (OR=1.9) vapers at follow up. CONCLUSIONS: Among those who used the product heavily, ECIG SAT increased during 2 weeks of intensive monitoring; higher SAT predicted continued ECIG use at the 30-day follow up.

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## POS4-97

### ASSESSING E-CIGARETTE DEPENDENCE AMONG ADOLESCENT E-CIGARETTE USERS

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BACKGROUND: E-cigarettes have gained popularity among adolescents, yet little is known about the potential of e-cigarettes to produce dependence in youth. A recently validated measure of e-cigarette dependence, the PROMIS-E, provides a new tool to evaluate this question and the factors associated with greater levels of e-cigarette dependence in youth. METHODS: Students (n = 2945) completed a survey about e-cigarette use that was conducted in 4 high schools from different District Reference Groups in Southeastern Connecticut during May-June 2017. Students reported on lifetime and past-month e-cigarette use and on e-cigarette dependence (PROMIS-E). The PROMIS-E comprises 4 items rated from never (0) to almost always (4). An example item is: "When I haven't been able to vape for a few hours, the craving gets intolerable." RESULTS: In total, 1005 students (35.73%) reported trying an e-cigarette at least once in their lifetime and 629 (21.4%) used e-cigarettes in the past 30 days. However, the analytic sample comprised only the 520 current 30-day e-cigarette users who also completed the PROMIS-E. The average PROMIS e-cig dependence score for this sample was 0.6 (sd = 0.98). Males reported higher dependence than females (0.7, sd = 1.14 vs. 0.46, sd = 0.77), but the difference was not statistically significant ( $p$  = 0.10). Students who reported using e-liquids with higher nicotine concentrations reported higher levels of dependence (0mg, mean = 0.1, sd = 0.31; 3-6 mg, mean = 0.6, sd = 0.74; 12-24 mg, mean = 1.3, sd = 1.49,  $p$ <.01). Dependence was negatively correlated with the age of first e-cigarette use ( $r$  = -0.23) and positively associated with vaping frequency (days in past month,  $r$  = 0.44). CONCLUSIONS: These data suggest that adolescent e-cigarette users endorse dependence symptoms. Male gender, earlier onset of use, use of higher concentrations of nicotine and more frequent use are associated with higher levels of dependence.

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## POS4-98

### ARE THERE DIFFERENCES IN THE VAPING PATTERNS OF YOUTH IN CANADA, USA, AND ENGLAND?

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SIGNIFICANCE: Regulations on vaping differ across countries but share a common goal of discouraging use among youth. CA, EN, and the US all have minimum age restrictions, but differ in the availability and marketing of vaping products. To date, there is little evidence on differences in vaping patterns among youth across countries with different regulatory frameworks. METHODS: Data are from Wave 1 of the ITC Tobacco and E-cigarette Youth Survey (2017), a web-based cohort survey of 13,500 16- to 19-year-olds recruited from a commercial panel in CA (n=4,500), EN (n=4,500) and the US (n=4,500). Detailed information on prevalence and patterns of vaping and cigarette smoking was collected. RESULTS: 'Ever vaping' was lower among youth in CA (28.8%) than in EN (34.4%;  $p$ <.01) or the US (32.9%;  $p$ <.01), with a similar pattern for vaping in the past 30 days (CA=7.7%, EN=8.6%, US=11.0%) and use in the past week (CA=4.5%, EN=4.6%, US=6.2%). In all countries, 'never smokers' were substantially less likely to vape (past 30-day prevalence: CA=2.1%, EN=1.6%, US=2.9%) compared to 'ever smokers' (CA=35.5%, EN=34.3%, US=51.9%). Many users reported only experimentation: more than one-third of 'ever vapers' in all countries reported vaping for only one day in their life (37.8%), while 7.5% of 'ever vapers' reported vaping on 100 or more days, with significant differences across countries (CA=7.4%, EN=5.8%, US=9.4%;  $p$ <.01). Among those who used more than one nicotine product, approximately one-third reported using e-cigarettes first across countries (CA=30.2%, EN=28.9%, US=32.6%). Two thirds of 'ever vapers' reported only using e-cigarettes with no nicotine, or did not know if they contained nicotine (CA=63.8%, EN=62.3% US=54.6%). CONCLUSIONS: Vaping was most prevalent in the US and England, although samples from these countries also had greater proportions of smokers. Approximately one third of 'never smokers' in all countries had vaped, although frequent use was rare. In contrast, virtually all current smokers had vaped and dual use was common. Overall, differences in patterns of use were modest relative to the different regulatory approaches.

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## POS4-99

### EFFECTS OF EXPOSURE TO VAPING CUES WITHIN E-CIGARETTE ADVERTISING ON SMOKING AND VAPING URGES AMONG COLLEGE STUDENTS

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SIGNIFICANCE: Advertisements portraying persons using e-cigarettes and producing vapors are currently unregulated. Such portrayals may cue young adults, the main targets of these ads, to experience increased urge to smoke conventional cigarettes or vape e-cigarettes. METHODS: Online survey experiment among 3344 enrolled students in a large Midwestern university (mean age 24 years, 71% female, 86% White, 87% non-users, 7% smokers only, 4% vapers only, and 2% dual users of cigarettes and e-cigarettes). Random assignment to: 1) Vaping cue condition (5 e-cigarette ads containing vaping cues), 2) No vaping cue condition (5 e-cigarette ads without vaping cues), or 3) Neutral condition (5 bottled water ads). All ads were edited to 30 seconds in length. Post-test measures were smoking urges (QSU-brief total score), vaping urges (modified from QSU-brief), and urge to vape after viewing each ad (averaged score of 5 items). One-way ANOVA and planned comparisons were conducted using two-tailed tests at the Scheffe-corrected  $p$ <0.05 cutoff among non-users, smokers, vapers, and dual-users. RESULTS: Non-users: Higher averaged urge to vape after each ad ( $p$ =0.001) in the vaping cue vs. neutral conditions. Smokers: Higher vaping urges (modified QSU-brief) ( $p$ =0.028) and averaged urge to vape after each ad ( $p$ <0.001) in vaping cue vs. neutral condition; Higher averaged urge to vape after each ad ( $p$ =0.045) in vaping cue vs. no vaping cue condition. Vapers: No significant differences in vaping urges across conditions. Dual users: Higher averaged urge to vape after



each ad ( $p=0.027$ ) in no vaping cue vs. neutral conditions. There was no significant difference in urge to smoke across conditions. **CONCLUSION:** Results suggest that brief exposure to vaping portrayals within e-cigarette ads may increase urge to vape among college students who are non-users or smokers. Vaping cue effects did not spillover to smoking urges. Further research is needed to inform regulations on e-cigarette advertising content to reduce uptake of e-cigarettes.

FUNDING: State

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## POS4-100

### CONSTITUENTS DISCLOSURES ON CIGARETTE PACKS: A RANDOMIZED CLINICAL TRIAL

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**SIGNIFICANCE:** Federal law requires public disclosure of information about harmful and potentially harmful chemicals in cigarette smoke, but the impact of these disclosures is uncertain. We sought to assess the impact of putting disclosures about toxic chemicals on smokers' cigarette packs. **METHODS:** We enrolled a convenience sample of 719 adult cigarette smokers in California, US from September 2016 through March 2017. We placed informational messages on the right side of smokers' cigarette packs for three weeks, a different label each week. We randomly assigned smokers to receive either messages about chemicals in cigarette smoke and their health harms (intervention arm) or messages about not littering cigarette butts (control arm). The labels in the two arms were matched for size, color and word length. The primary trial outcome was intentions to quit smoking in the next month, assessed at the end of the three-week intervention. These results are preliminary until publication of final paper. ClinicalTrials.gov identifier: NCT02785484 **RESULTS:** In intent-to-treat analyses ( $n=719$ ), smokers whose packs had chemical disclosures did not have higher intentions to quit smoking at the end of the trial than those whose packs had a control message (mean [SD] intentions 2.6 [1.0] vs. 2.6 [1.1],  $p = .56$ ). Compared to the control messages, disclosures led to greater awareness of the chemicals (28% vs. 15%,  $p < .01$ ) and health harms (60% vs. 52%,  $p = .02$ ) that were in the disclosure messages. The trial arms did not differ with respect to awareness of the chemicals and health harms not in the disclosure messages. Chemical disclosures led to greater negative affect, thinking about the chemicals in cigarettes and the harms of smoking, conversations about the disclosures, and foregoing a cigarette (all  $p < .05$ ). **CONCLUSIONS:** Chemical disclosures on cigarette packs did not lead to greater intentions to quit smoking. Our trial findings suggest that implementing chemical disclosures on cigarette packs in the United States would inform smokers but may not lead to a population-wide reduction in smoking.

FUNDING: Federal

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## POS4-101

### SHISHA WARNING EXPOSURE AMONG YOUNG ADULTS: A POPULATION-BASED ANALYSIS OF THE PATH STUDY

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**SIGNIFICANCE:** While FDA-mandated waterpipe tobacco (shisha) warnings are not required until August 2018, some manufacturers already include them on shisha packaging. To our knowledge, no studies in the US have monitored exposure to shisha warnings or associations with risk perceptions and use. **METHODS:** We used data from Wave 2 (2014-2015) of the Population Assessment of Tobacco and Health (PATH) Study, a nationally representative study of US adults. We conducted weighted analyses to examine frequency of past month exposure to shisha warnings and associations with demographics, risk perceptions, and use behaviors among current young adult (18-24) waterpipe users ( $n=1,226$ ). **RESULTS:** Forty percent of young adult waterpipe users reported past month exposure to shisha warnings (95% CI 36.8%, 43.3%). Frequency of exposure ranged from rarely (47.4%, CI 41.8%, 53.1%), to sometimes (29.0%, CI 24.0%, 34.5%), often

(12.0%, CI 9.4%, 15.1%), and very often (11.6%, CI 8.7%, 15.3%). Exposure varied among the three most commonly used brands: Fantasia (52.3%, CI 42.6%, 61.9%), Starbuzz (42.7%, CI 35.5%, 50.2%), and Al Fakher (39.6%, CI 27.4%, 53.2%). Exposure was higher among those who purchased shisha in person (47.1%), compared to those who purchased online (19.5%), by phone (33.4%), or did not purchase shisha (34.1%;  $F=10.8$ ,  $p<.0001$ ). There were no differences between exposure and non-exposure based on gender, ethnicity, race, perception of risk, or frequency of use. **CONCLUSIONS:** Just under half of young adult waterpipe users reported exposure to shisha warnings prior to implementation of FDA-mandated warning label policies. Exposure was not related to demographics, risk perceptions, or frequency of use. Fantasia, Starbuzz, and Al Fakher currently display text warnings, in small text, about health effects related to use, on a side or back panel. In contrast, the mandated warning will be required to occupy at least 30% of each of the principal display panels. Findings suggest the mandated warning may result in high exposure among users; however, it will be critical to assess exposure and impact on risk perceptions and behavior after the FDA-mandated warnings are in place.

FUNDING: Federal

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## POS4-102

### IT'S A TRAP! AN EXAMINATION OF WATERPIPE SMOKERS AND NON-SMOKERS' REACTIONS TO ANTI-WATERPIPE PSAs

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**SIGNIFICANCE:** Waterpipe (WP) smoking can lead to negative health outcomes, and while cigarette smoking has decreased among youth and young adults, WP smoking is increasing. In order to communicate the risks of WP smoking, public service announcements (PSAs) have been employed. Research has examined the effects of anti-cigarette PSAs, but no research has examined the effects of anti-WP PSAs on WP smokers and WP non-smokers. **METHODS:** Current WP smokers ( $n = 20$ ) and never WP smokers ( $n = 25$ ) were randomized 2:1 (PSA:Control) to view either three anti-WP PSAs, created by the Truth campaign, or three control videos. Participants ( $N = 45$ ;  $n_{\text{Male}} = 24$ ;  $M_{\text{Age}} = 22.4$  years; 64.6% White) answered questions pertaining to message reactance, perceived risk, message acceptance, and motivations for quitting or avoiding WP after viewing each message. **RESULTS:** WP non-smokers reacted more positively than WP smokers toward the PSAs in terms of message acceptance ( $p < .001$ ) and attitude towards the message ( $p < .01$ ). While importance, readiness, and commitment to quit smoking WP stayed low for WP smokers, these constructs increased over time. Interestingly, even though WP smokers who saw the PSAs felt quitting was less important ( $p < .001$ ) and were less ready to quit ( $p < .001$ ) than WP non-smokers, they had increased confidence ( $p < .05$ ) and commitment to quit over time ( $p < .05$ ). **CONCLUSIONS:** Anti-WP PSAs may deter WP non-smokers from initiation, and while WP smokers may not respond positively toward the message, over time they may increase their confidence and commitment to quit the more they are exposed to PSAs. This shows that WP smokers may be harder to persuade, but over time and with increased messaging may be more open to quitting WP. WP smoking status and type of message exposure affects how individuals react to anti-WP PSAs. These responses should be taken into account when designing effective health communication campaigns focusing on WP.

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## POS4-103

### PROFILE OF SOCIAL SMOKING AND ALTERNATIVE TOBACCO PRODUCT USE: A LATENT CLASS ANALYSIS

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**SIGNIFICANCE:** Social smoking is an emerging phenomenon among college students. Most social smokers are light and intermittent smokers who only smoke when others are smoking. Previous studies associate social smoking with use of alternative tobacco products, such as hookah. However, it is not clear if there are distinct groups of social smokers who are multiple tobacco product users. We sought to identify and characterize social smokers in a sample of college student current cigarette users. **METHODS:** Participants were 1161 18-29 year old (M age=21.15; SD=2.72; 52.7% female; 41.2% non-Hispanic white) current or past 30-day smokers, drawn from a larger study (N=5482). All participants attended one of 24 colleges in Texas and completed an online tobacco survey (Nov 2014 – Feb 2015). Latent class models were developed using five dichotomized tobacco use measures including social smoker identity, current e-cigarette use, current cigar use, current hookah use, and current smokeless tobacco use. Model fit indices were used to develop the optimal model. Logistic regression was used to examine associations between sociodemographic correlates and latent classes. **RESULTS:** The majority of current smokers self-identified as social smokers (57.1%). The optimal models distinguished two latent classes: 1. "social smokers who also use other tobacco products" (31.4%) and 2. "exclusive cigarette smokers" (68.6%). About 72% of the members in class 1 self-identified as social smokers; 67.5% of them used e-cigarettes and almost 100% of them used hookah during the past 30 days. Half of the members in class 2 reported social smoker identity, but their rates of current other tobacco use were much lower than class 1 members (i.e. 30.1% for e-cigarette and 5.5% for hookah). Demographic characteristics that are positively related to being members in class 1 included being ethnic minorities, younger, past 14 day binge drinking and current marijuana use. **CONCLUSIONS:** Longitudinal studies are needed to investigate changes in smoking intensity and nicotine dependence among different types of social smokers over time.

**FUNDING:** Federal

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## POS4-104

### MODES OF MARIJUANA CONSUMPTION AND PERCEPTIONS OF HARM AMONG YOUNG ADULT TOBACCO USERS AND NON-USERS

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**SIGNIFICANCE:** With increasing state-level policies legalizing marijuana, there has been an increase in alternative modes of marijuana consumption. The tobacco landscape is also changing with increased use of non-cigarette tobacco products particularly among young adults. Understanding how young adults consume marijuana, perceptions of harm and how this may vary with tobacco use is important when developing programs and policies to reduce use. **METHOD:** In Spring 2017, we conducted an online survey of a cohort of 1893 young adults originally recruited in 2010 from 11 colleges in North Carolina and Virginia. We examined the association between modes of marijuana consumption, co-use with tobacco products (past 30-day use of cigarettes, little cigars/cigarillos, waterpipe, e-cigarettes or smokeless tobacco) and perceived harm of mode (1=not at all harmful to 4=very harmful) among 469 current marijuana users. **RESULTS:** During the past month, 83.8% of marijuana users smoked marijuana in a joint, bowl, bong or other device followed by ingesting edibles (27.7%), vaping (27.7%), smoking in a blunt (25.4%) and dabbing (14.3%). Co-use was reported by 45.4% of marijuana users. Compared to non-tobacco users, tobacco users were significantly more likely to smoke marijuana in a blunt (30.1% vs 21.5%) and in a joint, bowl, bong or other device (87.3% vs 80.9%) and marginally less likely to use edibles (23.5% vs 31.3%;  $p=0.06$ ). Among all users, dabbing was rated the most harmful ( $m=2.19$ ) followed by smoking ( $m=2.10$ ), vaping ( $m=1.83$ ) and ingesting edibles ( $m=1.56$ ). Co-users perceived smoking marijuana regularly to be significantly less harmful than non-tobacco users. **CONCLUSIONS:** Although smoking marijuana is the most prevalent mode of consumption, more than a quarter of users have vaped or

ingested edibles in the past month and perceive these modes less harmful. Tobacco users were more likely to use combustible modes than non-tobacco users and perceived smoking marijuana to be less harmful. These findings highlight the need to tailor prevention programs and policies to specific patterns of use.

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## POS4-105

### DRIPPING TECHNOLOGY USE AMONG YOUNG ADULT E-CIGARETTE USERS

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**SIGNIFICANCE:** The standard e-cigarette involves an electric heating coil that vaporizes a liquid solution. The liquid is typically delivered to the heating coil via saturated wicking material. However, "dripping" is another method that involves the application of liquid to the coil of a Rebuildable Dripping Atomizer (RDA). In addition, Automated Dripping Devices (ADD) are devices advertised as allowing for the benefits of dripping, but are less complicated to use. Little is known about dripping or ADD use, especially among young adults or college students. The health impact of dripping is controversial, but some have suggested dripping may produce increased levels of toxic compounds, such as formaldehyde. **METHODS:** This is a secondary analysis of a larger project (N=733) to develop Electronic Nicotine Vaporizer Outcomes (ENVO), an e-cigarette expectancy questionnaire. Young adult ever-users of e-cigarettes (N=368,  $M_{age}=20.6$ , SD=4.5, 54.1% White) from a community college in a Southeastern city completed questionnaire items in the summer of 2017. We compared e-cigarette ever-users who had tried dripping versus those who had not tried dripping. In addition, we examined use of ADD. Expectancies were measured using a modified version of the BSCQ-A ( $\alpha$  range=0.69-0.93). **RESULTS:** Over two-fifths ( $n=161$ , 43.7%) of e-cigarette ever-users reported dripping. Almost a third ( $n=133$ , 30.7%) reported trying an ADD, although fewer reported it was the device currently used most often ( $n=26$ , 7.1%). Compared to e-cig ever-users who have not tried dripping, ever-drippers were more likely to be male (OR:1.58), less likely to have a post-secondary degree (OR:0.42), and more likely to have smoked cigarettes (OR:2.72) and hookah (OR:2.37). With respect to expectancies, ever-drippers were more likely to consider e-cigarette use stimulating, social, boredom-reducing, flavorful, weight-reducing, and addictive (all  $p<.001$ ). **CONCLUSIONS:** Over 2 in 5 college students who had ever used e-cigarettes reported trying dripping. ADD use was also common. These early findings point to the importance of gaining a greater understanding of the drivers and consequences of e-cigarette dipping behavior.

**FUNDING:** Federal

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## POS4-106

### EVER USE AND REASONS FOR USE OF ELECTRONIC VAPOR PRODUCTS FOR "DRIPPING" AMONG US ADULTS, 2017

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**SIGNIFICANCE:** Some electronic cigarettes and other electronic vapor products (EVPs) can be modified by users for various purposes. Research indicates that a technique known as "dripping" is common among youth; however, use among adults is uncertain. The objective of this study was to assess ever use and reasons for use of EVPs for "dripping" among U.S. adults. **METHODS:** Data came from the 2017 Styles Survey, a national, web-based survey of U.S. adults aged 18 years or older (N=4,107). Respondents who reported ever use of EVPs ( $n=593$ ) were asked: "Dripping" is a method of heating electronic vapor product liquid by dripping drops directly onto a heating element and then immediately inhaling. Have you ever used the dripping method to add e-liquid to your electronic vapor product?" Those who responded "yes" were then asked, "Why did you use the dripping method?" Respondents could select one or more response options. Descriptive statis-



tics were calculated overall and by sex, age, race/ethnicity, and past 30-day EVP use. Logistic regression was used to calculate adjusted odds ratios among ever EVP users (OR). RESULTS: In 2017, 6.3% (95% Confidence Interval: 4.3%-9.3%) of EVP ever users reported that they had ever tried dripping, including 20.4% of past 30-day EVP users (13.1%-30.4%). Among those who had ever tried dripping, "I was curious" was the most common reason for dripping (49.0%), followed by "makes a thicker cloud of vapor" (44.1%), "makes a stronger throat 'hit'" (25.2%), "makes the flavor taste better" (23.1%), and "other reason" (13.8%). Among adults who had ever used EVPs, the odds of ever use of EVPs for dripping were significantly higher among: adults aged  $\leq 29$  years (OR=2.8) than those  $\geq 30$  years; males (OR=3.2) than females; and current EVP users (OR=8.9) than non-users. CONCLUSION: About 1 in 5 U.S. adults who currently use EVPs have ever used the "dripping" method. Curiosity and "thickness" of the emissions are primary reasons for use. Further research is warranted to more fully explore the use of this technique, as well as the potential short and long term health effects, among U.S. youth and adults.

FUNDING: Federal

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## POS4-107

### AWARENESS AND EVER USE OF "HEAT-NOT-BURN" TOBACCO PRODUCTS AMONG US ADULTS, 2017

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SIGNIFICANCE: Although not currently available for sale in the U.S., various "heat-not-burn" tobacco products have appeared in U.S. test markets over the past three decades. Consumer receptivity to these products has been low in the past; however, industry analysts project rapid increases in global consumption of newer "heat-not-burn" products. Awareness and ever use of these products is uncertain; therefore, this study assessed awareness and ever use of "heat-not-burn" tobacco products among U.S. adults. METHODS: Data came from the 2017 Styles Survey, a national, web-based survey of U.S. adults aged 18 years or older (N=4,107). Respondents were asked: "Heat-not-burn" tobacco products heat tobacco sticks or capsules to produce an aerosol or 'vapor.' They are different from electronic vapor products such as e-cigarettes, which heat a liquid to produce an aerosol or 'vapor.' Some brands of 'heat-not-burn' tobacco products include iQOS, glo, Ploom TECH, and Revo. Before today, have you heard of 'heat-not-burn' tobacco products?" Those who responded "yes" were then asked, "Have you ever tried a 'heat-not-burn' tobacco product, even just one time?" Descriptive statistics were calculated overall and by sex, age, race/ethnicity, and cigarette smoking status. Logistic regression was used to calculate adjusted odds ratios (OR). RESULTS: In 2017, 5.2% of adults reported awareness of "heat-not-burn" tobacco products, including 9.1% of past 30-day cigarette smokers. Overall, 0.7% of U.S. adults reported ever use of "heat-not-burn" products. Odds of awareness were higher among adults aged  $\leq 29$  years (OR=1.67) than those  $\geq 30$  years; males (OR=1.98) than females; and current cigarette smokers (OR=2.01) than never smokers. Odds of ever use were higher among current smokers (OR=4.20) than never smokers. CONCLUSION: In 2016, few U.S. adults have ever used "heat-not-burn" tobacco products. However, about 1 in 20 U.S. adults are aware of the products, including 1 in 10 U.S. cigarette smokers. Given that tobacco companies have expressed intent to market "heat-not-burn" tobacco products in the U.S., these data provide a baseline to inform future surveillance.

FUNDING: Federal

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## POS4-108

### AWARENESS AND INTEREST IN HEAT-NOT-BURN IQOS AMONG YOUTH IN THREE COUNTRIES: CANADA, USA, AND ENGLAND

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SIGNIFICANCE: Heat-not-Burn (HnB) products, such as iQOS (Philip Morris International), have been introduced in a growing number of international markets, including CA and EN. PMI has reported considerable consumer interest in IQOS in these countries, and has recently submitted an application to the US FDA to classify iQOS as a modified risk tobacco product. To date, little is known about perceptions of and interest in trying HnB products among youth. METHODS: Data are from Wave 1 of the ITC Youth Tobacco and E-cigarette Survey (2017), a web-based cohort survey of 13,500 16 to 19 year olds from CA (n=4,500), EN (n=4,500) and the US (n=4,500). Respondents were shown an image of IQOS and asked about their awareness ("Have you heard of a product called IQOS, which heats a stick of tobacco instead of burning it?"). Respondents were also asked an established measure of susceptibility for 'regular' cigarettes (interest in trying if a best friend offered), which was adapted for IQOS and e-cigarettes/vaping. RESULTS: Overall, 7.5% of youth reported awareness of IQOS (EN=6.1%, CA=7.4%, and US=9.1%). Awareness was higher among 'former' (13.5%), 'experimental' (12.1%) and 'current smokers' (8.9%) than 'never smokers' (5.0%, p<.01). Across all countries, approximately half (54.8%) of youth reported they would "definitely not" try IQOS if offered by a friend (EN=49.2%, CA=57.2%, and US=57.9%). Only 2.9% of 'current smokers' reported they would "definitely not" try IQOS, compared to 25.7% of 'experimental smokers', 27.4% of 'former smokers', and 71.1% of 'never smokers'. In all countries, levels of susceptibility for IQOS were higher than for 'regular' cigarettes (62.1% "definitely not"), but lower than for e-cigarettes/vaping (49.8% "definitely not"). CONCLUSIONS: Awareness of HnB products such as IQOS is emerging among youth in CA, EN, and US. Interest in trying these products is very high among smokers and former smokers, but also present among non-smokers. Results will also be presented on the extent to which perceptions of regular cigarettes and vaping products are associated with interest in trying HnB products.

FUNDING: Federal

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## POS4-109

### QUITTING BEHAVIORS AMONG DUAL CIGARETTE/E-CIGARETTE USERS AND EXCLUSIVE CIGARETTE USERS ENROLLED IN THE TOBACCO USER ADULT COHORT (TUAC)

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SIGNIFICANCE: Dual use of combustible and electronic cigarettes (e-cigs) has been characterized as a method to reduce harm, and possibly quit all tobacco products. We examined quitting behaviors among dual users of cigarettes/e-cigs relative to exclusive users of cigarettes over time with regard to: 1) quit attempts; 2) quitting cigarettes; and 3) quitting all tobacco products. METHODS: Rural and urban adults (age 18 and older) enrolled in the Tobacco User Adult Cohort were interviewed every six months, through 18 months, and self-reported current product(s) used, cessation interest, quit attempts and seven day point prevalence abstinence from cigarettes and all products. This longitudinal analysis describes results for members who reported daily use of cigarettes and at least some days/week use of e-cigs (DC/EC) (n=88) or daily use of cigarettes only (CIG) (n=617) at enrollment. RESULTS: There were no differences in baseline mean age, region (rural/urban), gender, education, marital and employment status, nicotine dependence, stage of change, menthol cigarette use and product risk perceptions by user group. A higher percentage of DC/EC users were white (p=0.027) and reported higher median cessation interest (p=0.002), as compared to CIG users. The number of quit attempts at 6, 12 and 18 months follow-up did not differ by user group or time of follow-up. Compared to EC users, DC/EC users were more likely to report abstinence from cigarettes (p=0.049). Additionally, the likelihood of abstinence increased over time (p<0.001). There was no significant difference in abstinence from all products by user group. CONCLUSIONS: While user group differences in quit attempts or abstinence from all products were not detected, there



was a significant difference in abstinence from cigarettes. Dual use of cigarettes daily and e-cigs at least some days/week was associated with a higher likelihood of quitting cigarettes, as compared to exclusive daily cigarette use in this observational cohort study. Further examination in larger prospective trials is warranted.

FUNDING: Federal

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## POS4-110

### E-DECIDETE: ADVANCING SMOKING CESSATION IN MEXICO ONE SMS AT TIME

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**SIGNIFICANCE:** A total of 14.3 million Mexicans adults (16.4%) are current smokers, and it is expected that more than 4 million will die of tobacco-related diseases in the next decade if smoking prevalence remains unchecked. The smoking prevalence may be partly attributable to the fact that less than 10% of Mexican smokers use evidence-based approaches to smoking cessation. Overcoming the burden of tobacco in Mexico demands affordable, accessible, and effective technology-based solutions. **OBJECTIVE:** To assess a low-cost, personalized, and interactive SMS intervention tailored to Mexican smokers in a primary healthcare center. **METHODS:** A total of 40 Mexican smokers were recruited via Facebook and posters in a primary healthcare center to participate in *e-Decidete*, a 12-week smoking cessation SMS program. *e-Decidete* follows the Social Cognitive Theory and consists of prescheduled messages with a relapse track (475 SMS), keyword-driven messages (e.g. family, health, crave), and interactive messages answered by trained counselors. The program offered NRT at no cost. Levels of interactivity via keywords and ad-hoc messages were analyzed. A 12-week follow-up assessment was completed. **RESULTS:** Average age of participants was 36 years old, primarily male (65%), with at least an undergraduate degree (62.5%). Most of participants (95%) smoked daily and were interested in quitting in the next 7 days. All eligible participants for NRT requested an initial supply, and 60% requested refill. Participants showed high levels of interaction averaging 30 messages per participant, 62.5% using keywords, 55% interacting with their counselor, and 40% notifying they had relapse. At 12 weeks, 37.5% of participants were biochemically verified abstinent using intent-to-treat (87.5% follow-up rate). Over 84% of participants reported being very to extremely satisfied with *e-Decidete*. **CONCLUSION:** The program is highly relevant for LMICs, which have limited access to cessation treatments. This capitalizes on the unique strengths of the Mexican health care system, founded on a network of comprehensive primary healthcare clinics. Future steps include conducting a cost-effectiveness study.

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## POS4-111

### SCIENTIFIC REVIEW OF THE EFFECTS OF MENTHOL IN CIGARETTES ON ADDICTION

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**SIGNIFICANCE:** Menthol is a widely-used compound found in drug products, food, cosmetics, and as a distinct flavor additive in cigarettes. Although Tobacco Control Act Section 907(a) bans artificial and natural characterizing flavors in cigarettes and cigarette smoke, this ban excluded menthol. The purpose of this review was to determine the impact of menthol in cigarettes on addiction. Specifically, the role of menthol in cigarettes on age of smoking initiation, progression to regular cigarette use, sensory perception, smoking topography, dependence, and cessation were explored through a comprehensive, reproducible, transparent review of the publically-available scientific literature. Understanding the presence of menthol in tobacco products and its effect on public health can inform potential regulatory action on menthol in cigarettes. **METHODS:** Articles were identified through PubMed, Web of Science, EMBASE, and EBSCHost, and through hand-searching articles for references. Articles were separated into tiers: human longitudinal analyses

had the greatest weight (Tier 1), followed by human cross-sectional (Tier 2), and non-clinical (Tier 3). Within each tier, individual articles were scored based on previously published scoring methods. Using a weight of evidence approach, the percentage of strong, moderate, and weak studies within each tier was calculated for each menthol-related study outcome. **RESULTS:** The reviewed literature suggests that youth who initiate smoking menthol cigarettes are more likely to progress to regular smoking than those who initiate smoking non-menthol cigarettes, and sensory effects of menthol contribute to use of menthol cigarettes. Additionally, menthol may have an effect on reduced cessation success among African-American cigarette smokers. There is inadequate evidence to suggest that menthol in cigarettes has an effect on smoking topography or nicotine dependence. No effect was found for initiation age. **CONCLUSIONS:** This review reveals research gaps related to menthol and addiction, and highlights several research areas that may have the potential to impact tobacco control and regulatory policies.

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## POS4-112

### SYMPTOMS REPORTED BY ADULT E-CIGARETTE USERS IN A NATIONAL SURVEY

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**SIGNIFICANCE:** Despite high rates of electronic cigarette (e-cigarette) use, little is known about the health symptoms attributed to use. **METHODS:** Between September 2016 and May 2017, we conducted a nationally representative telephone survey of 4,964 adults (ages 18 and over). Those who reported ever using e-cigarettes were asked to indicate whether they experienced any of six symptoms or side effects they thought were caused by e-cigarette use. We identified 14 health symptoms through literature review and surveyed e-cigarette users recruited through Amazon's Mechanical Turk to identify the most frequently occurring symptoms to include in the telephone survey. We conducted chi-square tests to compare symptoms reported by users who smoke cigarettes and users who do not smoke. **RESULTS:** Participants were 50.6% female, 70.6% white, with mean age 37.9 (SD=14.9). A third of respondents (33.2%) reported ever using e-cigarettes, 59.6% of whom reported at least one symptom. Cough was most frequently reported (41.4%), followed by dry or irritated mouth or throat (26.5%), dizziness or lightheadedness (25.6%), headache or migraine (22.8%), shortness of breath (18.8%), change in or loss of taste (11.5%), and other (9.9%; most commonly nausea, tight chest, congestion). Current cigarette smokers (27.6% of e-cigarette users) were more likely than nonsmokers to report at least one symptom (62.6% vs 56.0%, chi-square=7.5, p=.07) and more likely to report symptoms of cough (45.5% vs. 36.1%, chi-square=14.9, p<.0001), shortness of breath (21.1% vs. 15.7%, chi-square=7.9, p=.005), and change in or loss of taste (13.8% vs. 8.5%; chi-square=11.0, p=.001). **CONCLUSIONS:** This research adds to the growing literature on symptoms experienced by e-cigarette users. Most e-cigarette users reported at least one symptom related to use, most commonly cough, dry or irritated mouth or throat, and dizziness or lightheadedness. Findings can help to prioritize research requiring additional study, such as further examining short term health effects that could be used on warnings or in public education campaigns. Additional research is needed to identify the extent of symptoms and their impact on use.

FUNDING: Federal

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## POS4-113

### THE POWER OF DESIGN: EXPLORING THE SALIENT DESIGN FEATURES OF CIGARETTE PACK DESIGN

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**SIGNIFICANCE:** Despite the progress of the Family Smoking Prevention and Tobacco Control Act, the current regulation of the visual design of cigarette packs is limited. Consumer behavior research has demonstrated that product packaging is one of the most influential point-of-sale elements. Unfortunately, the tobacco



control literature on the visual design of cigarette packs in the U.S. is limited. This study sought to fill this gap by determining which design elements (e.g., type, logo, color) were the most salient among adult smokers. **METHODS:** A qualitative research method was used, and data was collected using focus groups (6 groups, 33 adult smokers) in March 2017. Participants were selected from the NORC AmeriSpeak Panel. Focus group were diverse; two groups had lesbian, gay, and bisexual participants; two groups had less than four years of college education; one group had LGB and straight participants; and, one group had a general population. Focus groups were selected for regional, gender, and racial/ethnic diversity. Data was analyzed using a ground theory approach. **RESULTS:** We identified three themes: (1) Participants in this study identified color as the most salient design feature. (2) Color was often supported and linked with other design elements such as logos/images, typography, and the pack itself (e.g., soft pack). (3) The combined brand experience of multiple elements working together. When discussing design elements, participants often shared that the visual design of a pack reflected information about the cigarettes within and was related to consumer behaviors (e.g., purchase). **CONCLUSIONS:** This study has revealed that particular design features are salient to smokers. The data indicated that pack design influences consumers' attitudes toward the product within the pack and consumption behaviors. As such, this study draws attention to the importance of regulating the visual design of cigarette packs and suggests where specific visual elements such as color may be particularly amenable to regulation.

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## POS4-114

### YOUNG ADULT PEER CROWD AFFILIATION, E-CIGARETTE USE, AND DUAL USE OF CIGARETTES AND E-CIGARETTES

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**SIGNIFICANCE:** Young adults often identify themselves with reputation-based peer crowds such as "Hip Hop," "Goth," and "Jocks" that are distinguishable in terms of lifestyle norms, including substance use behavior. Tobacco industry is known to segment young adults for targeted marketing based on social types. Little is known about e-cigarette use and dual use of e-cigarette and cigarette across different young adult peer crowds. This study examined the association between young adult peer crowd affiliation and lifetime e-cigarette use, current e-cigarette only use, and current dual use. Findings may help targeted communications as the health consequences of e-cigarette and dual use become clear. **METHODS:** Cross-sectional data were obtained from 429 young adults (*M* age = 20.8; *SD* = 1.9; 66% women). Self-reported peer crowd affiliation was classified into 6 categories: Academics (e.g., "Scholar," "Nerd"), Alternatives (e.g., "Hipster," "Artist"), Athletes (e.g., "Jock," "Gym-rat"), Deviants (e.g., "Stoner," "Goth"), Geeks (e.g., "Video Gamer," "Geek"), Populans (e.g., "Partier," "Preppy") and Regulars (e.g., "Normal," "Regular"). Logistic and multinomial logistic regression models were run to test the associations between peer crowd affiliation and lifetime e-cigarette use and current e-cig-only use and dual use of cigarette and e-cigarette use, adjusting for age, gender, family/household income, ethnicity, and cigarette smoking status (where appropriate). **RESULTS:** Affiliation with Populans, relative to Regulars, was associated with higher likelihood of lifetime or ever e-cig use [OR = 3.2 (95% CI: 1.1-8.7)]. Relative to Regulars, affiliation with Athletes was associated with current e-cigarette-only use [OR = 3.4 (95% CI: 1.3-9.0)] and affiliation with Deviants was associated with current dual use [OR = 2.9 (95% CI: 1.1-7.3)]. **CONCLUSIONS:** Findings imply that young adult social types differ in their pattern of e-cigarette and dual use. Research is needed to understand e-cigarette use motives of different social types so that negative impact of e-cigarette use may be controlled and positive application may be encouraged through effective communication.

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## POS4-115

### DO TOBACCO BRAND WEBSITES TAILOR CONTENT TO VULNERABLE POPULATIONS?

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**SIGNIFICANCE:** Several studies have reported that tobacco companies tailor their marketing to appeal to specific audiences. However, research is limited on whether tobacco brand websites vary their marketing based on audience demographics. **METHODS:** We examined 12 tobacco brand websites representing four tobacco product categories: cigarettes (Marlboro, Camel, Newport, Pall Mall) cigar/cigarillos (Black & Mild, Swisher), smokeless tobacco (Copenhagen, Grizzly), and e-cigarettes (Njoy, Blu, V2, Vuse). Participants (*n*=32) were adult smokers sorted into equal-size demographic groups defined by age, gender and ethnicity. Participants coded two to three websites each month for themes, interactive activities (e.g. online games) and links to external social media sites (e.g. Facebook) during a one-year period (*n*=874 website visits). Responses were analyzed by demographic group. **RESULTS:** Compared to other groups, African-American participants and men were most likely to report themes related to harm reduction, while White participants and men were most likely to report themes related to a party lifestyle. Women were more likely than men to report social themes. Compared to other ethnic groups, African American participants were more likely to report interactive activities and links to five major social media sites. Participants aged 36 and over were more likely to report interactive activities, while participants aged 21-35 were more likely to report external links to social media. Men were more likely than women to report interactive activities. **CONCLUSIONS:** Brand websites provide tobacco companies with a dynamic and inexpensive marketing medium allowing companies to collect demographic information that can be used to tailor marketing efforts to individual consumers. Future research should explore if and how tobacco brand websites tailor advertising to different demographic groups and if certain characteristics appeal to different demographics. Furthermore, websites direct visitors to external social media sites, providing additional opportunities for dissemination of positive messages about tobacco products, often without health warnings or age restrictions.

FUNDING: Federal

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## POS4-116

### PREGNANCY AND BIRTH OUTCOMES OF WOMEN WITH TOBACCO AND OTHER SUBSTANCE USE PROBLEMS

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**SIGNIFICANCE:** Women who smoke tobacco during pregnancy and have other substance use problems are a highly vulnerable population with poor birth outcomes. Babies born to women who smoke have higher risks of preterm delivery, low birthweight and various adverse outcomes including physical, mental and behavioural difficulties during infancy and childhood. Smoking cessation in this group is uncommon, with limited effective interventions available. **METHODS:** A retrospective chart review of 75 women referred to a substance use in pregnancy antenatal service in NSW, Australia provided case-comparison baseline data for a study incorporating smoking cessation care into routine prenatal treatment. Smoking status, substance use, antenatal attendance, fetal complications and birth/neonatal outcomes were assessed over a 12-month period. **RESULTS:** 92% (69/75) of women (mean age 29y±6 years) smoked daily during pregnancy (median 10 cigarettes/day, IQR5-15); 36% (27/75) reported reducing nicotine intake and 11% (8/75) reporting cessation before term. Substances, other than tobacco, most commonly used during pregnancy were cannabis (39/75; 52%) and amphetamines (19/75; 25%). 28% (21/75) were receiving opioid agonist treatment. Of 77 babies birthed, mean gestational age was 37.7±2.4 weeks and birthweight was 2867±681 grams. The primary fetal complication during pregnancy was fetal growth restriction (12/77; 16%), 27% (21/77) were delivered preterm (<37weeks) and 29% (22/77) were low birthweight (<2500 grams), 42% (33/77) were admitted to special care nurseries; median stay was 6 days (IQR 4-13). 56% (43/77) of babies were breast-fed at discharge. Median clinic attendance was 2 appointments per woman (IQR1-3). **CONCLUSIONS:** Almost all women in the specialist service reported smoking



during their pregnancy, with approximately 10% quitting before term. Fetal complications including low birthweight and preterm delivery were common. Our team aims to significantly improve smoking cessation and birth outcomes in this priority group by assessing the acceptability and feasibility of a combination treatment comprising contingency management, psychosocial and pharmacological treatments.

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## POS4-117

### A SYSTEMATIC REVIEW OF NICOTINE EXPOSURES VIA INGESTION OF E-CIGARETTE LIQUIDS IN CHILDREN UNDER SIX

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We conducted a systematic review to analyze factors in ingestion of e-cigarette liquids among children under six. We found one literature review related to e-cigarette exposures in young children (Jo et al., 2017). This review analyzed the effects of various e-cigarette exposures. This review was brief and did not discuss factors leading to exposure. Our literature review focused on factors that led to unintentional exposures. In this review, we used Medline, Web of Science, Google Scholar, SRNT annual meeting abstracts, and reference sections of identified publications. Our review was limited to studies in the U.S. conducted in 2010 or later. We found 17 relevant publications. Four articles reviewed were case studies. One case study involving a six-year-old Canadian child was included due to its relevance to our aim. Two articles reviewed were cross-sectional studies. One reviewed e-cigarette exposures and one analyzed parental beliefs and behaviors. Two articles reviewed were experimental studies analyzing nicotine content and packaging. Five articles reviewed were retrospective analyses of data from various poison control centers. We reviewed six articles for toxicity and fatality information for children under six. We reviewed factors leading to nicotine ingestion and reducing exposures. Three or less articles recommended supporting the promotion of safe product storage, licenses for vape stores, parent education on e-liquid, and health warnings about toxicity to children on packaging. Four or more articles recommended making packaging less attractive to children, regulating nicotine levels and creating a maximum allowed concentration, and educating health care providers and the public on the dangers of e-liquids. Our literature review indicated that the dosage for fatality was approximately 1 mg/kg. Limitations included lack of funding for this review, which limited articles and data available; lack of available research following the implementation of the Child Poisoning Prevention Act of 2015; and lack of information available on e-cigarette purchases over the past ten years or so. There was no funding used to complete this systematic literature review.

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## POS4-118

### AN ASSESSMENT OF ORAL HEALTH STATUS, TOBACCO USE, AND CANCER AWARENESS AMONG TEA PLANTATION WORKERS (IRULA TRIBES), NILGIRI HILLS, TAMILNADU, INDIA

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**BACKGROUND:** Tea is an important agro-industry of India, which contributes immensely to the country's economy. Tea garden population constitutes approximately 1/12th of tea growing state's population. Poor socio-economic conditions, ignorance due to illiteracy, over-crowded and unhygienic living conditions in the residential colonies make tea garden population vulnerable to various communicable diseases and malnutrition. Hence this study was contemplated with an aim to assess the oral health status, tobacco use and cancer awareness among tea plantation workers, Nilgiri Hills, Tamil Nadu, India. **METHODOLOGY:** A cross-sectional descriptive study was conducted to assess the tobacco use and cancer awareness among tea plantation workers, Nilgiri Hills. Data was collected using a pretested Questionnaire, which included Demographic data, tobacco habits, its frequency and form. The data collected was analysed using SPSS version 15. **RESULTS:** Results showed that among 900 study population, showed 57% had no formal

education, 34.5% had not visited dentist before. 64.5% had indigenous brushing habits. 52% of oral mucosal lesions and 6% malignant oral tumors were observed. A very high prevalence of periodontal disease, tobacco chewing, deep rooted beliefs and customs regarding dentition and dental treatment was observed in this community. Prevalence of oral mucosal lesions in the study population was due to tobacco usage and lack of awareness regarding the deleterious effects of the products used. **CONCLUSION:** The dangers from smoking and chewing tobacco are well documented within the literature but the public's lack of knowledge of the risks is a concern. Health professionals are encouraged to ensure that the public is made aware of these risks, especially those within high-risk groups.

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## POS4-119

### TRENDS IN CIGARETTE SMOKING QUIT RATES AND PREVALENCE IN THE UNITED STATES BY RACE/ETHNICITY: 2002 TO 2015

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**INTRODUCTION:** In the United States (US), racial/ethnic groups differ in smoking behaviors. Relatively little is known about whether trends in smoking and quit rates differ by race/ethnicity. The current study examined trends in quit rates and smoking prevalence over 13 years among US adults by race/ethnicity. **METHODS:** Data were drawn from the 2002-2015 National Survey on Drug Use and Health (NSDUH) public use data files. Linear time trends of quit rates (i.e., ratio of ever smokers to former smokers) and smoking prevalence (overall, daily, non-daily) were assessed for persons age 18 and older by racial/ethnic group (Non-Hispanic [NH] White, NH Black, Hispanic, NH Other) using logistic regression models. **RESULTS:** From 2002 to 2015, the quit rate decreased significantly among NH Black respondents while quit rates significantly increased for NH White, Hispanic, and NH Other respondents. The year by race/ethnicity interaction was significant. In 2002, the quit rates for NH Black (0.33), Hispanic (0.37), and NH Other (0.38) respondents were lower than for NH White respondents (0.46). In 2015, NH Black respondents had the lowest quit rate (0.31), followed by NH Other respondents (0.38) and then by Hispanic respondents (0.45). NH White respondents continued to report the highest quit rate (0.51) in 2015. From 2002 to 2015, the overall, daily, and nondaily smoking prevalences decreased for all racial/ethnic groups. The prevalence of daily smoking was significantly higher among NH White respondents relative to the other racial/ethnic groups and the prevalence of non-daily smoking was also higher among NH White respondents compared with Hispanic and NH Other respondents. **CONCLUSIONS:** Cigarette smoking quit rates decreased significantly from 2002 to 2015 among NH Black adults in contrast to increases in quit rates for other racial/ethnic groups. While cigarette use prevalence declined among all racial/ethnic groups, daily and non-daily smoking was highest among NH White adults. Increased public health and clinical efforts may be needed for racial/ethnic groups who have shown the least amount of progress in smoking prevalences and quit rates over time.

FUNDING: Federal

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## POS4-120

### INTERSECTION OF E-CIGARETTE USE AND GENDER ON TRANSITIONS IN CIGARETTE SMOKING STATUS: FINDINGS ACROSS WAVE 1 AND WAVE 2 OF THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY

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**BACKGROUND:** It has been proposed that e-cigarettes may be beneficial to smoking cessation of traditional cigarettes. While cigarette smoking rates have decreased in the United States population, some findings indicate that women may have a harder time quitting than men. With the considerable increase in e-cigarette use in recent years, it remains unknown whether e-cigarette use and gender are associated with transitions in cigarette smoking status. **METHODS:** Using data



from wave 1 and wave 2 of the Population Assessment of Tobacco and Health (PATH; wave 1: 2013-2014, wave 2: 2014-2015) Study, we evaluated relationships among wave 1 e-cigarette use status (current daily, current non-daily, never) and gender, and their association with transitions in cigarette smoking status between wave 1 and wave 2 (quitters vs. continued smokers; relapse smokers vs. former smokers). Relationships between wave 1 e-cigarette use status and gender were assessed as odds ratios. RESULTS: Current daily e-cigarette use at wave 1, compared to never e-cigarette use, was associated with increased odds of transitioning to quitting cigarette smoking from wave 1 to wave 2 (OR=2.26). Current daily and non-daily e-cigarette use at wave 1, compared to never e-cigarette use, was associated with increased odds of relapse cigarette smoking from wave 1 to wave 2 (OR=2.88 and 2.76, respectively). Women were more likely to relapse to cigarette smoking from wave 1 to wave 2 (OR=1.80) compared to men. A significant wave 1 e-cigarette use status by gender interaction demonstrated that men who were current daily e-cigarette users had increased odds of relapse to cigarette smoking from wave 1 to wave 2 (OR=2.66). This relationship was not significant for women. CONCLUSION: Results suggest that e-cigarette use is associated with quitting smoking cigarettes but also relapsing back to cigarette smoking. Further, while women were more likely to relapse back to cigarette smoking overall, men who were daily e-cigarette users were most likely to relapse back to cigarette use. These findings highlight that while e-cigarette use may contribute to quit behavior, it is also associated with increased odds of relapse.

FUNDING: Federal

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## POS4-131

### LINGUISTIC VALIDATION OF THE PERCEIVED RISK INSTRUMENT (PRI) INTO FRENCH, GERMAN, ITALIAN, JAPANESE, POLISH, AND RUSSIAN

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BACKGROUND: The Perceived Risk Instrument (PRI) was developed in American English to measure and compare the perceived risks associated with the use of tobacco or nicotine-containing products. It includes two scales: Perceived Health Risk (18 items) and Perceived Addiction Risk (7 items, including one on cessation). In addition, two items related to Perceived Harm to Others are included and interpreted as single items. The measure enables the evaluation of perceived risk to the respondent (PRI-P) and the risk to users in general (PRI-G). The objective of this research was to assess the applicability of the PRI to other countries and cultures, such as France, Germany, Italy, Japan, Poland and Russia. METHODS: The linguistic validation process of the PRI consisted of five steps: conceptual analysis, translation (forward and back-translation into English), testing through cognitive interviews, external review, and proof-reading. Translation difficulties together with solutions were categorized as cultural, idiomatic, semantic or syntactic. RESULTS: The linguistic validation did not indicate culture-related difficulties, but identified semantic, idiomatic and syntactic concerns. Japanese was the language which raised most of the concerns, i.e., 17 difficulties, mainly semantic (7), syntactic (5) and idiomatic (5). French, Italian, Polish and Russian were mostly concerned with idiomatic and German with semantic difficulties. CONCLUSIONS: The linguistic validation process led to translations of the PRI, adequately capturing the concepts of the original American English and being reliably applicable to the target countries of France, Germany, Italy, Japan, Poland and Russia. The PRI is now available for use in tobacco product-related cross-cultural research. This provides opportunities for international initiatives on risk perception research. Furthermore, this research lays the groundwork for the development of questionnaire validation guidelines for the tobacco industry. The PRI is distributed by Mapi Research Trust, handling access, use and further translations.

FUNDING: Tobacco Industry

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## POS4-132

### TRENDS IN US SMOKERS' PERCEPTIONS OF THE RELATIVE RISKS OF NON-COMBUSTIBLE TOBACCO PRODUCTS VERSUS CIGARETTES

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Tobacco and nicotine products vary in risk, with combustible cigarettes being the most harmful types. Smokers can benefit from switching to less harmful alternatives, which requires knowledge of relative product risk. However, publicly shared information often emphasizes absolute risks, rather than relative risks. To understand smokers' perceptions of product risk, we assessed perceptions of various non-combustible products, relative to cigarette smoking, among 31,269 US adult smokers in a series of cross-sectional online surveys between 2009 and 2017. Smokers aware of a product rated that product's risk relative to cigarettes on a 7-point scale, from "a lot more risky," through "same as cigarettes," to "a lot less risky." Products included snus, other smokeless tobacco, and tobacco-heating products; vapor products – cigalikes, tanks, and other vapor products – were added in 2015. Logistic regression was used to analyze linear trends among the proportion of smokers who considered each product to be at least as risky as smoking (i.e., having either the same risk as smoking, or more risk). Analyses also compared risk perceptions of different vapor products. Generally, smokers' perceptions that non-combustible products are at least as risky as cigarettes increased significantly over time. This was true for tobacco-heating products (61% to 66%), cigalikes (39% to 44%), and tanks (43% to 48%); there was no change for other vapor products (45% to 47%) or snus (73% to 73%). Perceived relative risk of other smokeless tobacco declined significantly over time (83% to 80%). Among vapor products, tanks were the most likely – and cigalikes the least likely – to be rated at least as risky as cigarettes. Majorities, or near majorities, of smokers perceived each of the non-combustible products to be at least as risky as cigarettes. Except for smokeless tobacco, which large majorities deemed at least as risky as smoking, this misperception increased over time. Smokers' misunderstanding of the risks of non-combustible tobacco products may be abetted by messages that fail to put information in a relative-risk context, likely impeding harm reduction among smokers.

FUNDING: Tobacco Industry

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## POS4-133

### PREDICTION OF DISEASE SPECIFIC DEATH RATES BY USING FORECASTS OF THEIR KEY PREDICTIVE ECOLOGICAL INDICATORS

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Philip Morris International developed a Population Health Impact Model (PHIM) to estimate the reduction in the smoking attributable mortality related to the introduction of Reduced Risk Products (RRPs). We expanded the PHIM to incorporate ecological models and allow predictive disease modeling using ecological risk factors (e.g. GDP, inflation, employment, population tobacco consumption). The data covers 73 variables in 47 countries, for the period of 2000-2014. We developed disease-specific mortality rate models for 4 major smoking diseases: cerebrovascular and cardiac diseases, chronic obstructive pulmonary disease (COPD) and lung cancer according to the Institute for Health Metrics and Evaluation. Each disease has been modeled by and across sex annually between 2007-2014 and all models include GDP and at least one smoking variable by default. The models for 2014 were used to forecast disease-specific mortality rates for the years 2015, 2020, 2025, 2030 and 2035. For GDP, inflation and smoking prevalence - alternative forecasts were available from external databases and compared with the forecasted results from our models. The GDP forecasts were in a good agreement, while inflation was identified as a highly unreliable for long-term forecasting. The male smoking prevalence forecast matched relatively well, while for females there were large discrepancies, even for 2010, with discrepancies increasing over the forecasted years 2015-2025. Mortality patterns for the cerebrovascular, cardiac disease and COPD specific death rates in general show downward trends during the period between 2007-2014 as well as for the forecasted period 2015-2035. Lung cancer mortality shows a downward trend for males across all periods and for females the downward trend was observed only from 2007-2014, while during





the forecasted period there is a clear increase in lung cancer, consistent with the literature. The results are based on summary statistics across 45-47 countries, although within a single country there may be differences in the trends. We are working to expand the forecasting models to include factors such as obesity and tobacco control policies to improve the predictions.

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## POS4-134

### PROBABILISTIC ANALYSIS OF THE EFFECTS OF A MODIFIED RISK TOBACCO PRODUCT ON POPULATION HEALTH

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**BACKGROUND:** The US FDA can authorize the marketing of a new Modified Risk Tobacco Product (MRTP) only if the evidence submitted in the application shows the product is expected to benefit the health of the population as a whole, considering non-users as well as users of tobacco products. The FDA encourages the use of statistical models to project population health effects, and various models are being developed for this purpose. "Cohort models" follow a single cohort through the death of each member, while full ("cross-sectional") population models follow a population of mixed ages including births as well as deaths. Both types either calculate expected counts of members of each product use category, or use summary statistics from Monte Carlo simulation of tobacco use histories of many individuals. For all model types, a key challenge is accounting for large uncertainties in input parameters, such as transition rates to and from the new product, and the Excess Risk Ratio (ERR, also called Excess Relative Risk) for product users on a scale from 0 for never-users to 1 for cigarette smokers. **METHODS:** In principle, these uncertainties can be incorporated simultaneously by simply (1) replacing fixed inputs with probability distributions and (2) calculating the resulting output distributions. However, both (1) and (2) are challenging, due to limited data and high computational requirements respectively. A useful tool for prioritizing probabilistic analysis is the tornado chart, showing the sensitivity of any output as each input is varied one-at-a-time between low and high cases. Methods for calculating output distributions are described, including probability trees, Monte Carlo simulation, and hybrid methods incorporating both. **RESULTS:** An illustrative analysis suggests that key uncertainties include ERR and reduction in cigarettes per day (CPD) by dual users, as well as transition rates between MRTP-only use and dual use or cigarette-only smoking. **CONCLUSIONS:** The impacts of ERR and CPD reduction uncertainty appear underappreciated in some recent population health impact analyses, suggesting that tornado charts would be helpful to prioritize probabilistic analysis.

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