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Speaking up about lighting up in public: Examining psychosocial correlates of smoking and vaping assertive communication intentions among U.S. adults

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Abstract

Against a backdrop of increasing smoke-free policies, electronic cigarette use, and discussion about public health risks posed by smoking and vaping, this study examines psychosocial predictors of intentions to ask others not to use e-cigarettes (vape) and smoke – i.e., assertive communication intentions. A national sample of U.S. adults (n=474) reported assertive communication intentions for public venues. Psychosocial correlates included perceived risks of exposure to secondhand smoke (SHSe) and secondhand vapor (SHVe), SHSe and SHVe attitudes, subjective norms, and perceived self-efficacy. Separate linear regression models were conducted for smoking and vaping assertive communication intention outcomes. Perceived risks and self-efficacy were associated with greater vaping and smoking assertive communication intentions; subjective norms were only significant for vaping assertive communication intentions. Although a majority of respondents indicated they were unlikely to intervene to voice objections about SHSe and SHVe in public venues, this study suggests that incidental or intentional messages and policies that influence perceptions of risk, norms, and efficacy could affect willingness to voice objections about others' vaping and smoking in public.

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Keywords

Smoking; Tobacco; Electronic cigarettes; Electronic Nicotine Delivery Systems; Health Communication; Assertive Communication

Health behaviors, such as smoking, drinking, vaccination, and condom use, not only have the potential to affect the person performing the behavior, but also can spill over and have effects on others. Such cases often involve weighing the rights of the individual enacting the behavior against the rights of others in society who may also be affected. Assertive communication – intervening by communicating directly about an issue, event, or behavior with the goal of self-expression or exerting social influence – is particularly relevant in cases where behaviors extend beyond the individual and potentially pose health risks to others. In this study, we focus on two tobacco control-related behaviors that extend beyond the individual – smoking and vaping in public. We examine the relationship between assertive communication intentions (ACI) and key psychosocial correlates to gain insight into elements of health campaigns and the information environment more broadly that may affect willingness to voice objections to others' smoking and vaping in public.

Tobacco use is a leading preventable cause of disease and death. In the U.S. an estimated 480,000 die from smoking-related related illnesses each year, with over 41,000 deaths attributable to secondhand smoke exposure (SHSe) (U.S. Department of Health and Human Services (USDHHS), 2014). Tobacco control strategies include interventions at multiple levels from individual-level behavioral modification to institutional-level policy changes that affect the built and social environment. Communication efforts characterized as both mediated (health campaigns, ads, news stories, etc.) and interpersonal (counseling, peer conversations about quitting, and so on) play a role in tobacco control and changing smoking behavior (Dunlop, Cotter, & Perez, 2014; Jeong, Tan, Brennan, Gibson, & Hornik, 2015). Assertive interpersonal communication can work in tandem with institutional-level interventions and serve public health goals by encouraging compliance with existing smoke-free policies (Vardavas et al., 2011). Asking others not to smoke or use e-cigarettes also communicates norms about behavior in the absence of clearly stated laws and policies or confusion about existing policies.

Putting the focus on not only smokers' risks to themselves, but also on risks to vulnerable others who are exposed to secondhand smoke has been influential in garnering support for policies and laws that restrict smoking in public (Nathanson, 1999). These policies have proliferated over the past several decades (Hyland, Barnoya, & Corral, 2012) and are increasingly accepted in the U.S., though there are regional differences in implementation (Tynan et al., 2015) and level of support has been shown to vary by demographics and smoking status (Thomson, Wilson, Collins, & Edwards, 2015). Systematic reviews indicate that smoke-free policies, especially those that are comprehensive and ban all public smoking without exception, decrease smoking behavior, SHSe, and adverse health outcomes (Hoffman & Tan, 2015). Although somewhat more controversial (because of the potential to stigmatize smokers) (Bell, Salmon, Bowers, Bell, & McCullough, 2010), implementing smoke-free policies is also seen as a way to denormalize the behavior and encourage

smoking cessation (Bayer & Bachynski, 2013). After laws have been put into effect, the public has tended to see smoking as less socially acceptable and been more supportive of smoke-free policies (Brown, Moodie, & Hastings, 2009).

Electronic cigarettes.

Traditional and electronic cigarette use (vaping) differ in how established they are as consumer products and in the level of certainty surrounding the risks they pose to their users and the public more generally. Electronic cigarettes or e-cigarettes, which are also called Electronic Nicotine Delivery Systems (ENDS) when they contain nicotine, are battery-operated devices that are designed to deliver nicotine, flavor, and other chemicals. E-cigarettes aerosolize nicotine, along with other chemicals and flavors. The aerosol, commonly called vapor, is then inhaled by a user. Unlike smoking where there is a large body of evidence making a strong case for negative health effects (USDHHS, 2014), there is still scientific uncertainty surrounding the long-term effects of using e-cigarettes and the risks posed to public health (Pisinger & Døssing, 2014). Media coverage has portrayed e-cigarettes as a safer and more socially acceptable competitor product to traditional cigarettes, and a way to help people quit smoking (Grana & Ling, 2014). Common reasons that smokers cite for using e-cigarettes are to help them cut back on and quit smoking (Coleman et al., 2016), as well as to avoid smoking bans and be less bothersome to others (Richardson, Pearson, Xiao, Stalgaitis, & Vallone, 2014). However, e-cigarettes may encourage dual use and there is some evidence that the products tempt young people to take up tobacco products they would not have otherwise used (Wills, Knight, Williams, Pagano, & Sargent, 2015).

A number of smoke-free policies in the U.S. currently include not only traditional cigarettes, but also e-cigarettes (American Nonsmokers' Rights Foundation (ANRF), 2016). However, research indicates e-cigarette users have not encountered much resistance to their vaping behavior in smoke-free venues and do not consider it harmful to bystanders (Shi, Cummins, & Zhu, 2016). Although there is a positive association between perceptions of risks posed by vaping and public support for restricting electronic cigarette (e-cigarette) use in public venues (Mello, Bigman, Sanders-Jackson, & Tan, 2016), little attention has been given to factors that are associated with assertive communication for vaping.

Assertive communication about smoking and vaping.

Like urging someone to quit smoking (van den Putte, Yzer, & Brunsting, 2005), a person asking others not to smoke or use e-cigarettes around them is attempting direct social influence. In both cases, the person communicating seeks to influence behavior through direct interpersonal verbal intervention (i.e., assertive communication). Past research has examined correlates of asking others not to smoke in a general context (e.g., Brownson, Davis, Wilkerson, & Jackson-Thompson, 1994; Elder et al., 1992), and also focused on more specific locations, such as workplaces (Sivri, Lazuras, Rodafinos, & Eiser, 2013), homes (Spangler, Csákányi, Rogers, & Katona, 2014) and colleges (Brann & Sutton, 2009; Choo & Kim, 2011). However, to our knowledge, no published studies examine psychosocial correlates of intentions to ask others not to smoke or vape in the kinds of public venues that

are increasingly smoke-free (e.g., bars, restaurants, and parks), nor have any studies directly compared communication intentions surrounding vaping and smoking.

Using a national sample of U.S. adults, this study examines psychosocial correlates of intending to ask someone not to vape or smoke in public venues. Prior research on correlates of assertive communication in a tobacco context has drawn on the Attitudes-Social Influence-Self-Efficacy model (e.g., Aspropoulos, Lazuras, Rodafinos & Eiser, 2010; Willemsen & de Vries, 1996) and the Theory of Planned Behavior (e.g., Brann & Sutton, 2009). Consequently, studies have examined determinants such as perceived risks of secondhand smoke, and various measures of attitude, normative influences, and perceptions of efficacy as underlying factors in assertive communication. There is some evidence that each of these factors may contribute to assertive communication for smoking, and therefore may extend to assertive communication for vaping. Moreover, these factors are relevant to the ongoing debate surrounding comparative health risks and social acceptance of vaping versus smoking. We investigate the role of perceptions of health risks of exposure to secondhand vapor (SHVe) and smoke (SHSe) and attitudes toward SHVe/SHSe as correlates of assertive communication intentions for vaping and smoking in this study. In addition, we examine two other correlates that have been associated with assertive communication in previous studies and that are rooted in contemporary health behavior theories – perceived subjective norms and self-efficacy regarding assertive communication.

Perceived health risks of exposure.

A key theme in discussions surrounding tobacco products and the legitimacy of tobacco control efforts is that of the health risks posed. Perceived SHSe risk is associated with support for smoke-free policies (Borland et al., 2006), and with household rules about smoking (Cheng, Glantz, & Lightwood, 2011; Quick, Bates, & Romina, 2009). Perceived SHVe risk is also associated with support for restrictions on vaping in public venues (Mello et al., 2016). Although some European studies that focused on the workplace context did not find perceived SHSe harm to be a factor in assertive communication among coworkers (Aspropoulos, Lazuras, Rodafinos & Eiser, 2010; Lazuras, Zlatev, Rodafinos & Eiser, 2012; Sivri et al., 2013), others have found beliefs about SHSe harm contribute to models of workplace assertive communication intentions (Willemsen & de Vries, 1996). Moreover, studies in Missouri and California found perceived harmfulness of SHSe to be associated with greater willingness to ask someone not to smoke, and to be an antecedent of assertive communicative behavior in a more general context (Brownson, Davis, Wilkerson, & Jackson-Thompson, 1994; Elder et al., 1992). Similarly, an Australian study found those who reported concern about SHSe to be more likely to say they would ask someone not to smoke (Germain, Wakefield, & Durkin, 2007). Based on the idea that greater perceived personal harm provides a protection motivation rationale for assertive communication about others' behavior and moves the behavior beyond personal risk for the smoker or vaper into territory perceived as a public health risk and risk to the bystander (Nathanson, 1999), we hypothesized that, if there is an association: *H1a/H1b Greater perceived personal risk from SHSe/SHVe will be associated with increased SHSe/SHVe ACI in public venues.*

Attitude toward exposure.

A person is more likely to intervene to reduce a behavior that they evaluate negatively than one they are indifferent or positive towards. Along those lines, studies have examined attitudes toward exposure to secondhand smoke, such as being annoyed by SHSe. Negative attitude toward SHSe was found to be associated with being more willing to voice objections to SHSe in work settings (Sivri et al., 2013). Based on these prior findings and in line with the logic in expectancy value theories, we hypothesized that those who have a more positive attitude toward SHSe and SHVe would generally be less likely to voice opposition to smoking and vaping. Consequently, if there is an association: *H2a/H2b More positive attitudes toward SHSe/SHVe will be associated with decreased SHSe/SHVe intentions in public venues.*

Perceived normative support for assertive communication.

Perceived social risks of speaking up might also help to explain whether someone would act assertively or not. Theoretically, perceived climate of opinion (Noelle-Neumann, 1974), including perceived norms surrounding the communication behavior, could affect willingness to ask someone not to smoke or vape in public. People look to others to provide clues about whether or not to perform a behavior (Cialdini & Goldstein, 2004) and rely on behavioral modeling from similar others in considering their own actions (Bandura, 2011). Qualitative research suggests that people consider social norms in weighing whether to ask someone not to smoke (Poland, Stockton, Ashley, & Pederson, 1999). In addition, smokers who lived in a country with more comprehensive smoke-free policies were more likely to recall being told their smoking was bothersome when compared with smokers from a country with less comprehensive legislation (Thrasher, Boado, Sebríe, & Bianco, 2009).

The belief that assertive communicative behavior is common has been found to be associated with intentions to ask others not to smoke in workplace settings (Willemssen & de Vries, 1996). Normative perceptions were also associated with increased assertiveness behavior regarding SHSe among college students in Korea (Choo & Kim, 2011). However, in a U.S. study among college students (Brann & Sutton, 2009), beliefs about whether others would approve of assertive communication if the smoking was bothering someone had a non-significant positive relationship with assertive communication intentions. The Theory of Planned Behavior (TPB) considers both descriptive norms, such as whether people think others are communicating assertively, and injunctive norms that reflect whether people think important others would be supportive of assertive communication (Ajzen, 2006). Based on theories, such as TPB, that posit perceived normative support inclines people toward engaging in a behavior, we hypothesized that, if there is an association: *H3a/H3b Greater perceived normative support for assertive communication will be associated with increased SHSe/SHVe ACI in public venues.*

Self-efficacy toward assertive communication.

Even if a person believes that there are risks from SHSe/SHVe, and that it is socially acceptable to voice objections, he or she may not intend to act unless they believe they have

the ability to carry out the behavior. From a theoretical standpoint, a number of behavior theories and frameworks include efficacy or perceived behavioral control as a core explanatory factor, including Social Cognitive Theory (Bandura, 2004), the Attitudes-Social Influence-Efficacy model (Willemsen & de Vries, 1996), Risk Perception Attitude framework (Rimal & Real, 2003), and the Reasoned Action Approach/TPB (Fishbein & Ajzen, 2011). In the context of communication surrounding asking someone not to smoke, self-efficacy helped explain intentions to voice objections in the workplace (Sivri et al., 2013); however, there have been mixed findings for self-efficacy as a factor in explaining college students' assertive communication intentions (Brann & Sutton, 2009; Choo & Kim, 2011). Based on theory suggesting that self-efficacy is a factor in volitional behavior, we hypothesized that, if there is an association: *H4a/H4b Greater self-efficacy will be associated with increased SHSe/SHVe ACI in public venues.*

In thinking about smoking and vaping-related interventions or predicting trends as the information environment changes surrounding risks, attitudes, and norms, analyzing which components explain intentions most or contribute uniquely to intended behavior would help in understanding what might shift communication patterns. Differences have previously been observed for tobacco control policy support based on demographics and product use (Thomson et al., 2015). Political ideology can sometimes play a role as well (Cohen et al., 2000; Unger, Barker, Baezconde-Garban, Soto & Sussman, 2017). We, therefore, included covariates, such as race/ethnicity, age, gender, education, income, political ideology, identification with political party, health status, and smoking and vaping status. After accounting for covariates: *(RQ1a/RQ1b) Do perceived personal risk, SHSe/SHVe attitudes, perceived subjective norms, and self-efficacy independently contribute as predictors for SHSe/SHVe ACI in public venues?*

Comparing SHSe and SHVe correlates and assertive communication intentions.

Marketing materials have made claims that e-cigarettes do not produce secondhand smoke and are only water vapor (Grana & Ling, 2014), which could lead to different mental models (i.e., lay schema) for the two products (Morgan, Fischhoff, Bostrom, & Atman, 2002). On the other hand, there has been coverage of risks and lack of regulation of e-cigarettes (Yates et al., 2015). Given the dynamic communication environment and the fact that understanding of e-cigarettes is being shaped by its positioning in relation to understanding of traditional cigarettes, we sought to examine whether respondents draw a distinction between the two behaviors.

Although a substantial and growing minority view vaping and smoking as comparably harmful, the public has generally perceived smoking as more harmful than vaping (Majeed et al., 2016; Pepper, Emery, Ribisl, Rini, & Brewer, 2015). Overall, the literature suggests that, on average, there will be less perceived personal risk and less of a negative attitude toward SHVe. Smoke-free policies and health campaigns have also historically focused on smoking. Therefore, one might also expect it to be more normative to ask someone not to smoke. To the extent that the behavior may have been modeled more and there have been

more opportunities to engage in the behavior in the past, people may also be more confident in their ability to ask others not to smoke. We therefore expected that, on average: *(H5a-d) Perceived personal risk, perceived subjective norms, and self-efficacy will be higher for smoking than vaping, and attitude will be more negative.* If potential explanatory factors associated with ACI differ for smoking and vaping, communication intentions should also differ, suggesting: *(H6) Overall, there will be lower ACI for SHVe than for SHSe.* Hypotheses are summarized in Figure 1.

Methods

Data for this study were collected during December 2013 as part of a survey module measuring public attitudes and knowledge about SHV within the Annenberg National Health Communication Survey (ANHCS). The ANHCS was a rolling cross-sectional survey among adults aged 18 years and older that surveyed the public from 2005 to 2013. ANHCS participants were U.S. adults who were members of GfK's KnowledgePanel (previously Knowledge Networks). The panel is designed to be a nationally representative online research panel. GfK uses probability-based random-digit dial (RDD) and address-based sampling of U.S. households to recruit its KnowledgePanel (see www.knowledgenetworks.com/fact-sheets/KnowledgePanel.pdf). GfK provides hardware and Internet service necessary for participating in online surveys to recruited households that lack them.

The December e-cigarette survey module (N=510) included items measuring public knowledge, risk perceptions, and policy opinions associated with SHVe and SHSe. Prior to answering the questions, respondents were shown a description of e-cigarettes that included other terms used at that time for vaping products: "New types of cigarettes are now available called electronic cigarettes (also known as e-cigarettes, e-cigs, or personal vaporizers). These products are battery-operated and deliver nicotine through a vapor that is inhaled by the user. Most e-cigarettes look like regular cigarettes, cigars, or pipes. Some resemble everyday items such as pens and USB memory sticks. They can be bought online or in convenience stores as reusable kits with refillable cartridges, or they can be bought as one-time, disposable products. Some electronic cigarette brands include Smoking Everywhere, NJOY, Gamucci, Blu, or Vuse." Subsequent survey items referred to the term "electronic cigarettes" for the sake of brevity. Only participants who reported they had heard of e-cigarettes were included in the analyses (N = 474).

Measures

Assertive communication intentions (ACI).—The dependent variables were adapted from the CDC's 2009–2010 National Adult Tobacco Survey (NATS) (Office on Smoking and Health Centers for Disease Control and Prevention (CDC OSH, 2011). The SHSe ACI measure comprised three items: "How likely would you be to ask other people not to smoke around you if you couldn't move away from their smoke [indoors in restaurants/ in bars, casinos, clubs/ at parks]?" A set of parallel items tapped SHVe assertive communication intentions and asked about others people's vaping and being unable to move away from their vapor. Response options for both sets of items ranged from 1="very likely" to 5="very

unlikely”, but were subsequently reverse coded so that lower numbers were indicative of being less likely and higher numbers reflected greater likelihood. The two sets of three items were each averaged to create separate ACI scales for SHSe (Cronbach’s $\alpha = .90$) and SHVe (Cronbach’s $\alpha = .94$) in public venues.

Perceived health risks of exposure.—Perceived personal risk for SHSe and SHVe were adapted from prior measures from the CDC NATS, which asked about perceived harms of secondhand cigarette smoke (CDC OSH, 2011). The two items for SHSe were: “Do you think that breathing smoke from other people’s cigarettes is...?” (1=“not at all harmful to my health” to 7=“very harmful to my health”) and “If you were regularly exposed to secondhand smoke, how concerned would you be about the impact on your health of breathing smoke from other people’s cigarettes? Would you be...?” (1=“not at all concerned” to 7=“very concerned”). A parallel set of two items that measured perceived SHVe risk asked about breathing vapor from other people’s electronic cigarettes rather than smoke from cigarettes. Each set was averaged to create separate risk scales for smoking (Spearman’s $\rho = .78, p < .0001$) and vaping (Spearman’s $\rho = .87, p < .0001$).

Attitude toward exposure.—The SHSe attitude measure —“My breathing smoke from other people’s cigarettes would be...” — followed the format used in the Theory of Planned Behavior (Ajzen, 2006) and consisted of three semantic differential items that included cognitive (1=“foolish” to 7= “wise”) experiential (1=“unenjoyable” to 7=“enjoyable”) and summative (1= “bad” to 7=“good”) dimensions of attitude toward SHSe. Three parallel items measured SHVe attitudes and asked about vapor from other people’s electronic cigarettes instead of smoke. Separate scales for SHSe (Cronbach’s $\alpha = 0.94$) and SHVe (Cronbach’s $\alpha = 0.96$) attitude were created by averaging each set of three items. Lower scale scores reflect more negative attitudes.

Perceived normative support for assertive communication.—The subjective norms measure (Ajzen, 2006) for SHSe comprised an injunctive and a descriptive norm item: “Most people important to me approve of me asking others not to smoke around me” and “Most people important to me have asked others not to smoke around them.” Response options ranged from 1=“strongly disagree” to 5=“strongly agree.” A similar set of items were asked for SHVe norms; they focused on vaping rather than smoking. Each pair was averaged to create separate subjective norm scales for smoking (Spearman’s $\rho = .67, p < .0001$) and vaping (Spearman’s $\rho = .70, p < .0001$).

Self-efficacy toward assertive communication.—Efficacy for SHSe assertive communication was measured using two perceived behavioral control items (Ajzen, 2006): “I am confident that I can ask others not to smoke around me” and “If I really wanted to, I could ask others not to smoke around me.” Response options ranged from 1=“strongly disagree” to 5=“strongly agree.” A parallel item set asked about vaping. The measures for each set were averaged to create separate perceived behavioral control scales for smoking (Spearman’s $\rho = .72, p < .0001$) and vaping (Spearman’s $\rho = .77, p < .0001$).

Covariates.—We included demographic variables: age, gender, race/ethnicity, household income, education, self-reported health status, political ideology, and political party

identification. We also included product use variables. Respondents were classified as nonsmokers, former smokers, or current smokers using standard measures of lifetime cigarette use and current use of cigarettes. A separate measure addressed e-cigarette use. Respondents who said they had ever tried e-cigarettes or had used them in the past 30 days were classified as ever having tried e-cigarettes; the remainder were categorized as never having tried e-cigarettes.

Analysis

The focus of this analysis was on examining relationships between psychosocial correlates and ACI. We used un-weighted data. First, we performed descriptive analyses of the measures (summarized in Table 1). Then, to address hypotheses related to associations between predictor and outcome variables (H1-H4), we analyzed bivariate associations using regression and Spearman's correlations. Next, we performed multiple linear regression analyses to assess the correlates of ACI for smoking and vaping using the psychosocial, demographic, and product use status variables discussed above (RQ1). We examined both partial and full models. Model 1 for both SHSe and SHVe models examined the contribution of the psychosocial variables as a block. In Model 2, we independently examined the contribution of the covariates as a block (i.e., the product use status and demographic variables that had been identified based on the prior literature). In Model 3, the full model, we examined the combined explained variance of the psychosocial factors and covariates. Unadjusted bivariate coefficients for each variable, as well as Models 1, 2, and 3 are summarized in Tables 2 and 3. The amount of missing data across all variables was minimal; therefore, listwise deletion was utilized for handling missing values in regression analyses. To address hypotheses related to comparing e-cigarette and traditional cigarette variables (H5-H6), we conducted paired t-tests (summarized in Table 4).

Results

Findings were generally supportive of the hypotheses; however, there were a few notable differences between smoking and vaping ACI, which we report below. Sample covariates and psychosocial correlates are summarized in Table 1 (see Table 1).

Psychosocial correlates and covariates of ACI.

Hypotheses H1-H4 expected that greater perceived personal risk, normative support, and self-efficacy would be associated with increased ACI intentions in public venues; conversely more positive attitudes toward secondhand smoke and vapor exposure would be associated with decreased ACI. Table 2 and Table 3 show the unadjusted relationship between each of these predictors and SHSe and SHVe ACI, respectively. Perceived personal risk was associated with increased ACI for both SHSe and SHVe, as was perceived normative support and self-efficacy. In contrast, more positive attitudes were associated with lower SHSe and SHVe ACI. Therefore, H1-H4 were supported.

For SHSe ACI (RQ1a), the psychosocial correlates had more explained variance as a block than the demographic and product use variables (Table 2). The psychosocial variables had a combined adjusted R^2 of .31 as a block (Model 1), while the covariates had a R^2 of .09

(Model 2). When both blocks were entered into the same model, the adjusted R^2 was .33 (Model 3). For the full model with the covariates and psychosocial correlates, being Black, perceiving greater personal risk, and more behavioral control were significantly associated with greater SHSe ACI (Model 3). Conversely, being a current smoker was associated with lower ACI. Although both attitude toward SHSe and perceived assertive communication norms were significantly associated in unadjusted analyses, neither showed a significant relationship with SHSe ACI in the full model.

For the SHVe ACI outcome (RQ1b), the psychosocial correlates again explained more of the variance than the demographic variables (Table 3). The psychosocial variables had a combined adjusted R^2 of .36 as a block (Model 1), while the covariates had an adjusted R^2 of .11 (Model 2). The full model had an adjusted R^2 of .36 (Model 3). Among the covariates, only being a current smoker was statistically associated with the outcome. On average, current smokers had lower SHVe ACI. For the psychosocial correlates, as was the case for the SHSe outcome, perceived personal risk and behavioral control were associated with greater SHVe ACI. For the SHVe outcome, however, more perceived normative support for asking others not to vape was also associated with ACI (Model 3). Having ever used e-cigarettes was not significantly related to SHVe ACI in the full model.

Differences in psychosocial correlates.

H5 posited that compared with SHVe responses, SHSe items would reflect greater perceived risk, more unfavorable attitudes, more perceived normative support of assertive communication and greater self-efficacy for assertive communication. H6 anticipated greater ACI for SHSe than SHVe in public venues. Paired t-tests confirmed those expectations (see Table 4). Positive mean differences (i.e., vaping subtracted from smoking variables) showed greater perceived risk, norms, perceived behavioral control and assertive communication intentions for smoking variables. Negative mean differences for attitude indicated a more negative attitude toward secondhand smoke exposure than secondhand vapor exposure. Therefore, H5 and H6 were supported.

The difference in willingness to speak up based on the type of tobacco-related product is underscored by examining variation in the percentages of people in the study who indicated they would be unlikely (i.e., had a 3 or below on both SHSe/SHVe communication intentions scales) to intervene (54.6), would intervene only to ask someone not to smoke (27.8%), would intervene only to ask someone not to vape (1.1%), or would intervene in both cases (16.2%).

Discussion

Assertive communication can play a role in behavior change, particularly when behaviors have externalities that can affect others, as is the case with health behaviors such as smoking and vaping. This study examined factors associated with assertive communication intentions (ACI) and if there are differences in whether people intend to ask others not to smoke versus not to vape around them in public venues. We examined the relationship between ACI and key psychosocial correlates to gain insight into elements of health campaigns and the information environment more broadly that may affect willingness to voice objections to

others' smoking and vaping in public. To our knowledge, this is the first study with a national U.S. sample that tests correlates of ACI for both smoking and vaping in the context of public venues (i.e., bars, casinos, clubs, restaurants, and parks), which are increasingly being included in smoke-free policies.

Our findings suggest that to the extent that debates about risks and social acceptability surrounding smoking and vaping in public discourse and policy implementation shape people's risk perceptions, perceptions of communicative norms, and perceptions about their ability to voice objections, those messages may indeed be consequential for assertive communication. We found that perceived personal risk posed by exposure to secondhand smoke (SHSe) and secondhand vapor (SHVe) were major factors consistently associated with ACI in both a smoking and a vaping context, respectively. This finding builds on prior studies that had examined perceived SHSe risk and its positive relationship to SHSe assertive communication, and extends empirical findings to public venues and to vaping. We also found that self-efficacy was a predictor of ACI for both SHSe and SHVe, thus lending support to theoretical frameworks, such as the Theory of Planned Behavior, that envision perceived behavioral control as an underlying component in assertive communication.

Perceived normative support for assertive communication – specifically thinking important others would approve and had voiced objections – helped to explain SHVe ACI, but not SHSe ACI. Previous research suggested mixed findings regarding whether perceived norms would be significantly associated with assertive communication. Normative considerations may be particularly important when there is uncertainty surrounding a health behavior or the societal mores surrounding a behavior are in flux (Kim, Kim, & Niederdeppe, 2015; Noelle-Neumann, 1974). Compared with smoking, vaping is a relatively novel behavior and there is more scientific uncertainty about risks that SHVe may pose to the public. The relative novelty and uncertainty of vaping, along with marketing that has focused on social acceptability of e-cigarettes, may help to explain the fact that subjective norms factored into assertive communication intentions for vaping, but not for smoking. If so, normative factors could become less influential as vaping and communication about it proliferates, and/or if scientific certainty increases over time.

There were also demographic and product use differences in intending to communicate assertively. Compared with non-Hispanic Whites, non-Hispanic Black respondents reported greater smoking ACI. This finding is in keeping with prior surveys that examined smoke-free policy support (Thomson et al., 2015) and assertive communication in a smoking context (Brownson et al., 1994; Elder et al., 1992). Prior studies did not examine vaping ACI. We observed no statistically significant racial or ethnic differences for vaping ACI in this study after including psychosocial correlates. In line with past findings (Elder et al., 1992; Thomson et al., 2015), compared with nonsmokers, current smokers in this study were less likely to say they intended to ask others not to smoke. Overall, however, the majority of participants indicated they would not ask others not to smoke. Surveys from earlier eras when fewer smoke-free policies existed similarly documented a gap in assertive communication about SHSe between smokers and nonsmokers, and also found a substantial proportion of nonsmokers did not speak up about SHSe (Brownson et al., 1994; Davis, Boyd, & Schoenborn, 1990; Elder et al., 1992).

Participants in this study were more willing to communicate assertively about smoking than vaping. The findings align with the fact that, on average, participants reported more risk for smoking than vaping, and perceived more normative support and efficacy for assertive communication for asking someone not to smoke. Yet, a substantial proportion said they would not communicate assertively in either context. Although current smokers were less likely to say they would ask others not to vape and not to smoke when compared with nonsmokers, vaping status did not have as robust of a relationship. Vaping status was not significantly related to SHSe ACI. Perhaps more surprising, although having tried e-cigarettes was associated with lower SHVe ACI in bivariate associations, vaping status was not significantly related to SHVe assertive communicative intentions after controlling for psychosocial correlates. This suggests a distal or indirect connection between having tried e-cigarettes and being less likely to speak up about others' not vaping in public. The findings point to perceived SHVe risk and communicative norms and self-efficacy as more proximal.

If the observed associations are indicative of an underlying causal relationship, these findings suggest that health communicators should consider messages that address harm from secondhand smoke and vapor when testing potential health interventions, particularly if they are hoping to influence assertive communication. Interventions that increase communicative self-efficacy, and (for vaping) perceptions of supportive norms for assertive communication, could also make people more willing to speak up. Both individual-level interventions and policy changes may send messages that shift beliefs about SHSe and SHVe harm, as well as affect beliefs about communicative norms and efficacy.

Because this is a cross-sectional study, we are not able to determine whether the factors that are associated with ACI play a causal role in intentions to voice objections to smoking and vaping. Future experimental or longitudinal studies could help to tease out directionality and causality. Future studies should also consider measuring attitudes toward the assertiveness behavior itself, in addition to SHSe and SHVe attitudes. This study does not directly address behavioral outcomes. It relies on self-reported behavioral intentions. It therefore has limitations associated with self-reported data and is not able to speak to observed communication behavior. However, meta-analytic research has found that changes in intentions predict subsequent changes in behavior (Webb & Sheeran, 2006). For smoking specifically, low rates of self-reported assertive communication on surveys also emerged with subsequent experimental and field studies (Gibson, 1994), suggesting validity between self-reported behavior and actual behavior for this topic.

This study captures ACI during a particular point in time in late 2013. It represents an important snapshot at a pivotal point when perceptions of e-cigarettes and ENDS products were being formed and fills a gap in the literature. However, given the evolving debate surrounding tobacco products and changing regulatory landscape in the U.S., beliefs surrounding e-cigarettes and communication may have evolved since 2013 and could be poised for additional shifts as the deeming rule that brings e-cigarettes under FDA jurisdiction is implemented. For example, Food and Drug Administration regulations that bring e-cigarettes under the umbrella of regulated tobacco products could contribute to future shifts in perceptions about the safety of e-cigarettes, which could in turn affect assertive communication.

Studies that have used approaches that deduce policy effects by comparing outcomes across countries or geographic regions that have implemented different policies (i.e., comparative approaches) find evidence that the national policy environment surrounding e-cigarettes is related to risk perceptions surrounding vaping (Yong et al., 2016). Other comparative research links comprehensive smoke-free legislation to smokers being more likely to recall people having told them their smoking was bothersome (Thrasher et al., 2009). In light of research that suggests differences across countries and states in assertive communication behavior and overall support for restrictions, there is reason to expect variations in assertive communication within the U.S. based on location and the existence of smoke-free policies. This study does not address effects of regional or policy differences on psychosocial correlates or ACI, nor does it test how assertive communication might in turn influence policy compliance. These research questions should be explored in future research powered to test such effects.

Despite these limitations, this study provides insight into the relationships between ACI and key variables that have been identified in the literature as theoretically relevant. Furthermore, to our knowledge, there has not been published work examining this particular set of relationships surrounding ACI for both smoking and vaping in a national sample. Overall, the findings highlight the important role that risk communication in the public sphere is likely to play in interpersonal discussion surrounding use of e-cigarettes going forward. Perceived personal risk was consistently associated with intentions to speak up about both smoking and e-cigarettes and also accounted for substantial portions of the variance in models.

There is emerging evidence that a considerable portion of the population is increasingly seeing risks from cigarette smoking and vaping as comparable (Majeed et al., 2016). This may stem in part from media coverage, which has presented a mixed picture of the potential risks and benefits associated with the products and focused on regulatory policies for e-cigarettes (Yates et al., 2015). Experimental exposure to (Tan, Lee, Nagler & Bigman, 2017), as well as recalling more exposure to (Tan, Bigman, Mello, & Sanders-Jackson, 2015) negative information about e-cigarettes is associated with perceiving greater health risks from SHVe. As scientific evidence accumulates and policies are implemented, it will be important to assess effects of regulatory and information environments on the public's beliefs and behaviors with regard to tobacco and tobacco-related products. That includes monitoring and research on assertive communication about smoking and vaping and its role in promoting policy compliance and public health goals that seek to create a culture of health

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References

- Ajzen I (2006). Constructing a Theory of Planned Behavior Questionnaire. Retrieved from <https://people.umass.edu/ajzen/pdf/tpb.measurement.pdf>:
- American Nonsmokers' Rights Foundation (ANRF). (2016). Overview list—How many smokefree laws? Retrieved from <http://www.no-smoke.org/pdf/mediaordlist.pdf>
- Aspropoulos E, Lazuras L, Rodafinos A, & Eiser JR (2010). Can you please put it out? Predicting non-smokers' assertiveness intentions at work. *Tobacco control*, 19, 148–152. doi:10.1136/tc.2009.031161 [PubMed: 20378590]
- Bandura A (2004). Health promotion by social cognitive means. *Health Education & Behavior*, 31, 143–164. doi:10.1177/1090198104263660 [PubMed: 15090118]
- Bandura A (2011). The social and policy impact of social cognitive theory In Melvin MM & Donaldson SI (Eds.), *Social psychology and evaluation* (pp. 33–70). New York, NY: Guilford Press.
- Bayer R, & Bachynski KE (2013). Banning smoking in parks and on beaches: Science, policy, and the politics of denormalization. *Health Affairs*, 32, 1291–1298. doi:10.1377/hlthaff.2012.1022 [PubMed: 23836746]
- Bell K, Salmon A, Bowers M, Bell J, & McCullough L (2010). Smoking, stigma and tobacco 'denormalization': Further reflections on the use of stigma as a public health tool. A commentary on Social Science & Medicine's Stigma, Prejudice, Discrimination and Health Special Issue. *Social Science & Medicine*, 70, 795–799. doi: 10.1016/j.socscimed.2009.09.060 [PubMed: 20044187]
- Borland R, Yong H-H, Siahpush M, Hyland A, Campbell S, Hastings G, . . . Fong GT (2006). Support for and reported compliance with smoke-free restaurants and bars by smokers in four countries: Findings from the International Tobacco Control (ITC) Four Country Survey. *Tobacco Control*, 15(suppl 3), iii34–iii41. doi:10.1136/tc.2004.008748 [PubMed: 16754945]
- Brann M, & Sutton ML (2009). The theory of planned behavior and college students' willingness to talk about smoking-related behaviors. *Communication Research Reports*, 26, 198–207. doi: 10.1080/08824090903074399
- Brown A, Moodie C, & Hastings G (2009). A longitudinal study of policy effect (smoke-free legislation) on smoking norms: ITC Scotland/United Kingdom. *Nicotine & Tobacco Research*, 11, 924–932. doi:10.1093/ntr/ntp087 [PubMed: 19541947]
- Brownson RC, Davis JR, Wilkerson JC, & Jackson-Thompson J (1994). Predictors of individual action to reduce exposure to environmental tobacco smoke. *Tobacco Control*, 3, 216–221. doi: 10.1136/tc.3.3.216
- Cheng K-W, Glantz SA, & Lightwood JM (2011). Association between smokefree laws and voluntary smokefree-home rules. *American Journal of Preventive Medicine*, 41, 566–572. doi: 10.1016/j.amepre.2011.08.014 [PubMed: 22099232]
- Choo J, & Kim EK (2011). Application of the ASE Model to the assertive behavior of non-smoking college students under secondhand smoke exposure. *Journal of Korean Academy of Community Health Nursing*, 22, 1–10. doi: 10.12799/jkachn.2011.22.1.1
- Cialdini RB, & Goldstein NJ (2004). Social influence: Compliance and conformity. *Annual Review of Psychology*, 55, 591–621. doi:10.1146/annurev.psych.55.090902.142015
- Cohen JE, Milio N, Rozier RG, Ferrence R, Ashley MJ, & Goldstein AO (2000). Political ideology and tobacco control. *Tobacco Control*, 9, 263–267. doi: 10.1136/tc.9.3.263 [PubMed: 10982561]
- Coleman BN, Johnson SE, Tessman GK, Tworek C, Alexander J, Dickinson DM, . . . Green KM (2016). "It's not smoke. It's not tar. It's not 4000 chemicals. Case closed": Exploring attitudes, beliefs, and perceived social norms of e-cigarette use among adult users. *Drug and Alcohol Dependence*, 159, 80–85. doi:10.1016/j.drugalcdep.2015.11.028 [PubMed: 26708706]
- Davis RM, Boyd GM, & Schoenborn CA (1990). "Common courtesy" and the elimination of passive smoking: Results of the 1987 National Health Interview Survey. *JAMA*, 263, 2208–2210. doi: 10.1001/jama.1990.03440160070040 [PubMed: 2319686]
- Dunlop SM, Cotter T, & Perez D (2014). When your smoking is not just about you: Antismoking advertising, interpersonal pressure, and quitting outcomes. *Journal of Health Communication*, 19, 41–56. doi:10.1080/10810730.2013.798375 [PubMed: 23967804]

- Elder J, Rosbrook B, Choi W, Johnson M, Bal D, & Pierce JP (1992). Public objections to environmental tobacco smoke. *Preventive Medicine*, 21, 701–709. doi: 10.1016/0091-7435(92)90077-U [PubMed: 1438116]
- Fishbein M, & Ajzen I (2010). *Predicting and changing behavior: The reasoned action approach*. New York, NY: Psychology Press, Taylor & Francis Group.
- Germain D, Wakefield M, & Durkin S (2007). Non-smokers' responses when smokers light up: A population-based study. *Preventive Medicine*, 45, 21–25. doi:10.1016/j.ypmed.2007.03.012 [PubMed: 17509677]
- Gibson B (1994). Psychological aspects of smoker-nonsmoker interaction: Implications for public policy. *American Psychologist*, 49, 1081–1083. doi:10.1037/0003-066X.49.12.1081
- Grana RA, & Ling PM (2014). "Smoking revolution": A content analysis of electronic cigarette retail websites. *American Journal of Preventive Medicine*, 46, 395–403. doi:10.1016/j.amepre.2013.12.010 [PubMed: 24650842]
- Hoffman SJ, & Tan C (2015). Overview of systematic reviews on the health-related effects of government tobacco control policies. *BMC Public Health*, 15, 744. doi:10.1186/s12889-015-2041-6 [PubMed: 26242915]
- Hyland A, Barnoya J, & Corral JE (2012). Smoke-free air policies: Past, present and future. *Tobacco Control*, 21, 154–161. doi:10.1136/tobaccocontrol-2011-050389 [PubMed: 22345239]
- Jeong M, Tan AS, Brennan E, Gibson L, & Hornik RC (2015). Talking about quitting: Interpersonal communication as a mediator of campaign effects on smokers' quit behaviors. *Journal of Health Communication*, 20, 1196–1205. doi:10.1080/10810730.2015.1018620 [PubMed: 26147367]
- Kim HK, Kim S, & Niederdeppe J (2015). Scientific uncertainty as a moderator of the relationship between descriptive norm and intentions to engage in cancer risk-reducing behaviors. *Journal of Health Communication*, 20, 387–395. doi:10.1080/10810730.2014.977465 [PubMed: 25730742]
- Lazuras L, Zlatev M, Rodafinos A, & Eiser JR (2012). Smokers' compliance with smoke-free policies, and non-smokers' assertiveness for smoke-free air in the workplace: A study from the Balkans. *International Journal of Public Health*, 57, 769–775. doi:10.1007/s00038-012-0338-0 [PubMed: 22314541]
- Majeed BA, Weaver SR, Gregory KR, Whitney CF, Slovic P, Pechacek TF, & Eriksen MP (2016). Changing perceptions of harm of e-cigarettes among US adults, 2012–2015. *American Journal of Preventive Medicine*, 53, 331–338. doi:10.1016/j.amepre.2016.08.039
- Mello S, Bigman CA, Sanders-Jackson A, & Tan ASL (2016). Perceived harm of secondhand electronic cigarette vapors and policy support to restrict public vaping: Results from a national survey of US adults. *Nicotine & Tobacco Research*, 18, 686–693. doi:10.1093/ntr/ntv232 [PubMed: 26470722]
- Morgan MG, Fischhoff B, Bostrom A, & Atman CJ (2002). *Risk communication: A mental models approach*. New York: Cambridge University Press.
- Nathanson CA (1999). Social movements as catalysts for policy change: The case of smoking and guns. *Journal of Health Politics, Policy and Law*, 24, 421–488. doi: 10.1215/03616878-24-3-421
- Noelle-Neumann E (1974). The spiral of silence A theory of public opinion. *Journal of Communication*, 24, 43–51. doi:10.1111/j.1460-2466.1974.tb00367.x
- Office on Smoking and Health Centers for Disease Control and Prevention. (2011). *The National Adult Tobacco Survey, 2009–2010*. Retrived from http://www.cdc.gov/tobacco/data_statistics/surveys/nats/pdfs/2009-2010-questionnaire.pdf
- Pepper JK, Emery SL, Ribisl KM, Rini CM, & Brewer NT (2015). How risky is it to use e-cigarettes? Smokers' beliefs about their health risks from using novel and traditional tobacco products. *Journal of Behavioral Medicine*, 38, 318–326. doi:10.1007/s10865-014-9605-2 [PubMed: 25348584]
- Pisinger C, & Døssing M (2014). A systematic review of health effects of electronic cigarettes. *Preventive Medicine*, 69, 248–260. doi: 10.1016/j.ypmed.2014.10.009 [PubMed: 25456810]
- Poland BD, Stockton L, Ashley MJ, & Pederson L (1999). Interactions between smokers and non-smokers in public places: A qualitative study. *Canadian Journal of Public Health*, 90, 330–333. Retrived from: <http://www.jstor.org/stable/41993047>. [PubMed: 10570578]

- Quick BL, Bates BR, & Romina S (2009). Examining antecedents of clean indoor air policy support: Implications for campaigns promoting clean indoor air. *Health Communication*, 24, 50–59. doi: 10.1080/10410230802606992 [PubMed: 19204858]
- Richardson A, Pearson J, Xiao H, Stalgaitis C, & Vallone D (2014). Prevalence, harm perceptions, and reasons for using noncombustible tobacco products among current and former smokers. *American Journal of Public Health*, 104, 1437–1444. doi:10.2105/AJPH.2013.301804 [PubMed: 24922154]
- Rimal RN, & Real K (2003). Perceived risk and efficacy beliefs as motivators of change: Use of the risk perception attitude (RPA) framework to understand health behaviors. *Human Communication Research*, 29, 370–399. doi:10.1093/hcr/29.3.370
- Shi Y, Cummins SE, & Zhu S-H (2016). Use of electronic cigarettes in smoke-free environments. *Tobacco control*, 26, e19–e22. doi: 10.1136/tobaccocontrol-2016-053118 [PubMed: 27609779]
- Sivri C, Lazuras L, Rodafinos A, & Eiser JR (2013). Smoke-free policies and non-smokers' reactions to SHS exposure in small and medium enterprises. *International Journal of Occupational Medicine and Environmental Health*, 26, 940–948. doi:10.2478/s13382-013-0166-3 [PubMed: 24464571]
- Spangler J, Csákányi Z, Rogers T, & Katona G (2014). Parental ease in asking others not to smoke and respiratory symptoms and illness among children. *International Journal of Environmental Research and Public Health*, 11, 1747–1755. doi:10.3390/ijerph110201747 [PubMed: 24503972]
- Tan ASL, Bigman CA, Mello S, & Sanders-Jackson A (2015). Is exposure to e-cigarette communication associated with perceived harms of e-cigarette secondhand vapour? Results from a national survey of US adults. *BMJ Open*, 5, e007134. doi:10.1136/bmjopen-2014-007134
- Tan AS, Lee CJ, Nagler RH, & Bigman CA (2017). To vape or not to vape? Effects of exposure to conflicting news headlines on beliefs about harms and benefits of electronic cigarette use: Results from a randomized controlled experiment. *Preventive Medicine*, 105, 97–103. doi:10.1016/j.ypmed.2017.08.024 [PubMed: 28882742]
- Thomson G, Wilson N, Collins D, & Edwards R (2015). Attitudes to smoke-free outdoor regulations in the USA and Canada: A review of 89 surveys. *Tobacco Control*, 25, 506–516. doi:10.1136/tobaccocontrol-2015-052426 [PubMed: 26371112]
- Thrasher JF, Boado M, Sebríé EM, & Bianco E (2009). Smoke-free policies and the social acceptability of smoking in Uruguay and Mexico: Findings from the International Tobacco Control Policy Evaluation Project. *Nicotine & Tobacco Research*, 11, 591–599. doi:10.1093/ntr/ntp039 [PubMed: 19380383]
- Tynan MA, Holmes CB, Promoff G, Hallett C, Hopkins M, & Frick B (2015). State and local comprehensive smoke-free laws for worksites, restaurants, and bars — United States, 2015. *MMWR*, 65, 623–626. doi:10.15585/mmwr.mm6524a4
- Unger JB, Barker D, Baezconde-Garbanati L, Soto DW and Sussman S (2017). Support for electronic cigarette regulations among California voters. *Tobacco Control*, 26, 334–337. doi: 10.1136/tobaccocontrol-2016-052918 [PubMed: 27207853]
- U.S. Department of Health and Human Services. (2014). The health consequences of smoking: 50 years of progress. A report of the Surgeon General. Atlanta, GA: U.S Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health.
- van den Putte B, Yzer MC, & Brunsting S (2005). Social influences on smoking cessation: A comparison of the effect of six social influence variables. *Preventive Medicine*, 41, 186–193. doi: 10.1016/j.ypmed.2004.09.040 [PubMed: 15917010]
- Vardavas IC, Dimitrakaki C, Schoretsaniti S, Patelarou E, Filippidis TF, Connolly NG, & Tountas Y (2011). The role of the non-smoker in enforcing smoke-free laws. *Journal of Public Health Policy*, 32, 46–59. doi:10.1057/jphp.2010.45 [PubMed: 21150943]
- Webb TL, & Sheeran P (2006). Does changing behavioral intentions engender behavior change? A meta-analysis of the experimental evidence. *Psychological Bulletin*, 132, 249–268. doi: 10.1037/0033-2909.132.2.249 [PubMed: 16536643]
- Willemsen MC, & de Vries H (1996). Saying “no” to environmental tobacco smoke: Determinants of assertiveness among nonsmoking employees. *Preventive Medicine*, 25, 575–582. doi:10.1006/pmed.1996.0092 [PubMed: 8888326]

- Wills TA, Knight R, Williams RJ, Pagano I, & Sargent JD (2015). Risk factors for exclusive e-cigarette use and dual e-cigarette use and tobacco use in adolescents. *Pediatrics*, 135, e43–e51. doi: 10.1542/peds.2014-0760 [PubMed: 25511118]
- Yates K, Friedman K, Slater MD, Berman M, Paskett ED, & Ferketich AK (2015). A content analysis of electronic cigarette portrayal in newspapers. *Tobacco Regulatory Science*, 1, 94–102. doi: 10.18001/TRS.1.1.9 [PubMed: 26229974]
- Yong H-H, Borland R, Balmford J, Hitchman SC, Cummings KM, Driezen P, & Thompson ME (2016). Prevalence and correlates of the belief that electronic cigarettes are a lot less harmful than conventional cigarettes under the different regulatory environments of Australia and the United Kingdom. *Nicotine & Tobacco Research*, 19, 258–263. doi:10.1093/ntr/ntw137 [PubMed: 27190403]

Figure 1.
Hypothesized Relationships between Secondhand Smoke and Vapor Exposure (SHSe/SHVe)
Assertive Communication Intentions and Psychosocial Correlates

Table 1:

Sample Demographic and Product Use Covariates, Psychosocial Correlates, and Assertive Communication Intention Measures

	Mean (SD)	%
<i>Demographic covariates</i>		
Age	48.91 (16.03)	
Female		52.74
Race/ethnicity		
Non-Hispanic White		74.26
Non-Hispanic Black		8.44
Hispanic		11.39
Other		5.91
Education		
Bachelors or higher		35.23
Some College		32.91
High School		25.11
Below High School		6.75
Household income		
<\$25,000		17.09
\$25,000 to \$49,999		21.31
\$50,000		61.60
Political Ideology (1–7, extremely liberal to extremely conservative)	4.15 (1.53)	
Party Identification (1–7, strong Republican to strong Democrat)	4.22 (2.13)	
Health Status (1–6, very poor to excellent)	4.25 (0.94)	
<i>Product use covariates</i>		
Smoking status		
Nonsmoker		55.70
Former smoker		29.96
Current smoker		14.35
Tried e-cigarettes		11.60
<i>Psychosocial correlate scales</i>		
SHSe Intentions (1–5, lower = less likelihood)	3.07 (1.17)	
SHSe Risk (1–7, lower = less perceived risk)	5.76 (1.54)	
SHSe Attitude (1–7, lower = a more negative attitude)	1.68 (1.13)	
SHSe Norms (1–5, lower = less normative support)	3.42 (0.92)	
SHSe Efficacy (1–5, lower = less perceived behavioral control)	3.64 (0.92)	
SHVe Intentions (1–5, lower = less likelihood)	2.39 (1.07)	
SHVe Risk (1–7, lower = less perceived risk)	3.80 (1.89)	
SHVe Attitude (1–7, lower = a more negative attitude)	2.65 (1.42)	
SHVe Norms (1–5, lower = less normative support)	2.97 (0.86)	
SHVe Efficacy (1–5, lower = less perceived behavioral control)	3.36 (0.91)	

Note. Ns range from 467–474. SHSe refers to secondhand smoke exposure-related variables. SHVe refers to secondhand vapor exposure-related variables.

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Table 2:

Demographic, Product Use, and Psychosocial Correlates of Secondhand Smoke Assertive Communication Intentions

	Unadjusted Bivariate				Model 1			Model 2			Model 3		
	B	CI			B	CI		B	CI		B	CI	
<i>Psychosocial Correlates</i>													
SHSe Risk	0.35***	0.29	0.41	0.31***	0.23	0.38		0.29***	0.21	0.37			
SHSe Attitude	-0.30***	-0.39	-0.21	0.05	-0.05	0.15		0.07	-0.04	0.17			
SHSe Norms	0.50***	0.39	0.60	0.14*	0.02	0.26		0.11#	-0.01	0.24			
SHSe Efficacy	0.49***	0.38	0.59	0.34***	0.23	0.46		0.36***	0.24	0.47			
<i>Demographic variables</i>													
Age	0.00	-0.01	0.01				0.00	0.00	0.01	0.01	0.00	0.00	0.01
Female	0.20#	-0.01	0.41				0.11	-0.10	0.32	0.00	-0.18	0.19	
Race/ethnicity													
Non-Hispanic White	-0.20	-0.44	0.05				-	-	-	-	-	-	-
Non-Hispanic Black	0.39*	0.01	0.77				0.46*	0.06	0.85	0.53*	0.19	0.87	
Hispanic	0.16	-0.17	0.50				0.14	-0.21	0.49	0.13	-0.17	0.43	
Other	-0.17	-0.62	0.28				-0.01	-0.46	0.44	-0.13	-0.52	0.26	
Education													
Bachelors or higher	0.07	-0.15	0.29				-	-	-	-	-	-	-
Some College	0.09	-0.14	0.31				0.13	-0.13	0.38	0.10	-0.12	0.32	
High School	-0.14	-0.39	0.10				-0.02	-0.32	0.28	0.00	-0.26	0.25	
< High School	-0.13	-0.56	0.29				0.01	-0.46	0.47	-0.02	-0.42	0.38	
Household income													
<\$25,000	0.02	-0.27	0.30				-	-	-	-	-	-	-
\$25,000 to \$49,999	-0.20	-0.46	0.06				-0.22	-0.57	0.12	-0.24	-0.54	0.06	
\$50,000	0.13	-0.08	0.35				-0.12	-0.43	0.20	-0.11	-0.38	0.15	
Political ideology	0.01	-0.06	0.08				-0.02	-0.11	0.07	-0.01	-0.09	0.06	
Party Identification	-0.01	-0.06	0.04				-0.04	-0.10	0.03	-0.04	-0.09	0.01	
Health Status	0.03	-0.08	0.15				0.03	-0.09	0.14	0.04	-0.06	0.14	

	Unadjusted Bivariate			Model 1			Model 2			Model 3		
	B	CI		B	CI		B	CI		B	CI	
<i>Product use variables</i>												
Smoking status												
Nonsmoker	0.48***	0.27	0.69				.	.	.	.	.	.
Former smoker	-0.01***	-0.24	0.22				-0.19	-0.44	0.05	-0.18	-0.39	0.04
Current smoker	-0.94***	-1.23	-0.65				-0.99***	-1.35	-0.64	-0.49***	-0.83	-0.16
Tried e-cigarettes	-0.69***	-1.01	-0.36				-0.19	-0.56	0.18	-0.06	-0.38	0.26
Adjusted R ²				0.31			0.09			0.33		

Note.

p < .10

* p < .05

** p < .01

*** p < .001

Ns range from 462–473. Model 1 includes psychosocial correlates. Model 2 includes demographic variables Model 3 is the full model with both psychosocial correlates and demographic/product use covariates. SHSe refers to secondhand smoke exposure.

Table 3:
Demographic, Product Use, and Psychosocial Correlates of Secondhand Vapor Assertive Communication Intentions

	Unadjusted Bivariate				Model 1				Model 2				Model 3			
	B	CI	B	CI	B	CI	B	CI	B	CI	B	CI	B	CI	B	CI
<i>Psychosocial Correlates</i>																
SHVe Risk	0.32***	0.28	0.36	0.24***	0.18	0.29			0.21***	0.15	0.27					
SHVe Attitude	-0.33***	-0.40	-0.27	-0.07*	-0.14	0.00			-0.06#	-0.14	0.01					
SHVe Norms	0.52***	0.42	0.62	0.19***	0.08	0.30			0.19***	0.08	0.31					
SHVe Efficacy	0.34***	0.24	0.44	0.11*	0.02	0.21			0.10*	0.00	0.20					
<i>Demographic variables</i>																
Age	0.01*	0.00	0.01				0.01**	0.00	0.02	0.01#	0.00	0.01				
Female	0.16	-0.04	0.35				0.01	-0.18	0.20	-0.04	-0.21	0.12				
Race/ethnicity																
Non-Hispanic White	-0.15	-0.37	0.07				-	-	-	-	-	-				
Non-Hispanic Black	0.39*	0.04	0.73				0.37*	0.13	0.72	0.26#	-0.04	0.57				
Hispanic	0.13	-0.18	0.43				0.06	0.25	0.37	0.12	-0.15	0.39				
Other	-0.26	-0.67	0.15				-0.13	-0.54	-0.28	-0.08	-0.42	0.27				
Education																
Bachelors or higher	0.02	-0.18	0.22				-	-	-	-	-	-				
Some College	0.02	-0.19	0.22				0.11	-0.12	0.35	0.06	-0.13	0.26				
High School	-0.07	-0.30	0.15				0.07	-0.20	0.34	0.10	-0.13	0.33				
< High School	0.09	-0.30	0.47				0.33	-0.09	0.75	0.19	-0.17	0.54				
Household income																
<\$25,000	-0.16	-0.42	0.10				-	-	-	-	-	-				
\$25,000 to \$49,999	0.00	-0.24	0.24				0.11	-0.21	0.42	-0.09	-0.36	0.18				
\$50,000	0.10	-0.10	0.30				0.08	-0.20	0.37	-0.08	-0.32	0.16				
Political ideology	0.02	-0.04	0.08				0.01	-0.07	0.09	-0.01	-0.08	0.06				
Party Identification	0.02	-0.02	0.07				0.01	-0.04	0.07	-0.01	-0.06	0.04				
Health Status	0.02	-0.08	0.12				0.03	-0.07	0.13	0.07	-0.02	0.16				

	Unadjusted Bivariate			Model 1			Model 2			Model 3		
	B	CI		B	CI		B	CI		B	CI	
<i>Product use variables</i>												
Smoking status												
Nonsmoker	0.52***	0.33	0.71									
Former smoker	-0.19#	-0.40	0.02				-0.40***	-0.62	-0.17	-0.16	-0.35	0.04
Current smoker	-0.72***	-0.99	-0.45				-0.79***	-1.12	-0.47	-0.40**	-0.68	-0.12
Tried e-cigarettes	-0.85***	-1.14	-0.56				-0.42*	-0.75	-0.08	-0.09	-0.38	0.20
Adjusted R ²				0.36			0.11			0.36		

Note.

p<.10

* p<.05

** p<.01

*** p<.001

Ns range from .462–.474. Model 1 includes psychosocial correlates. Model 2 includes demographic variables. Model 3 is the full model with both psychosocial correlates and demographic/product use covariates. SHVe refers to secondhand vapor exposure.

Table 4:

Paired T-tests: Differences between Psychosocial Correlates for Secondhand Smoke and Vapor

	Mean Difference	SE	t	CI
Risk	1.96	0.08	24.92	1.80 2.11
Attitude	-0.97	0.06	-16.52	-1.09 -0.86
Norms	0.46	0.04	10.91	0.38 0.54
Efficacy	0.29	0.04	7.00	0.21 0.37
Intentions	0.68	0.05	14.77	0.59 0.78

Note. All are significantly different at the $p < .0001$ level. Ns range from 470–474. Positive mean differences (i.e., vaping subtracted from smoking variables) indicate greater perceived risk, subjective norms, efficacy (perceived behavioral control), and assertive communication intentions for smoking variables. Negative mean differences for attitude indicates a more negative attitude toward secondhand smoke exposure than secondhand vapor exposure.