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Reasons to use e-cigarettes among adults and youth in the Population Assessment of Tobacco and Health (PATH) study

Nicole E. Nicksic^{a,b,*}, L. Morgan Snell^b, and Andrew J. Barnes^{a,b}

^aCenter for the Study of Tobacco Products, Department of Psychology, Virginia Commonwealth University, Richmond, VA, United States

^bDepartment of Health Behavior and Policy, Virginia Commonwealth University, Richmond, VA, United States

Abstract

Background: While e-cigarette use is increasing, reasons to use e-cigarettes are poorly summarized in the literature. The objective of this study was to organize reasons to use e-cigarette items into factors and determine associations between these factors and e-cigarette user characteristics.

Methods: Data were drawn from youth (12–17) and adults (18+) in Wave 1 (2013–2014) of the Population Assessment of Tobacco and Health (PATH) study. Exploratory factor analysis was conducted on 13 reasons to use survey items from experimental and established adult e-cigarette users and past 30 day youth e-cigarette users to determine two factors – “alternative to cigarettes” and “larger social environment”. Weighted linear regression models tested the associations between e-cigarette user group and sociodemographics and reasons to use factors among youth and adults.

Results: Adult current established e-cigarette users were associated with both alternative to cigarettes ($\beta = 0.128$, $p < .001$) and larger social environment ($\beta = 0.063$, $p < .001$) factors, while former established e-cigarette users were associated with alternative to cigarettes ($\beta = 0.064$, $p < .001$). Several adult socio-demographic characteristics were associated with one but not the other factor, or both but in opposite directions. Youth that used e-cigarettes earlier today were also associated with both reasons to use factors ($\beta = 0.127$ – 0.130 , $p < .01$, each); however, youth using any other day in the past 30 days was not associated with either factor.

Conclusions: Reasons to use are associated with patterns of e-cigarette use among youth and adults. These factors could support a comprehensive approach to addressing rising e-cigarette use among youth and adults and target certain user populations.

Keywords

Tobacco; E-cigarettes; Reasons to use; Tobacco use; Factor analysis; Youth; Adults

*Corresponding author at: Department of Health Behavior and Policy, Virginia Commonwealth University, 830 E Main St Suite 923, Richmond, VA, 23219, United States., nenicksic@vcu.edu (N.E. Nicksic).

1. Introduction

The popularity of electronic cigarettes (e-cigarettes) has risen sharply in recent years (Jamal et al., 2016). In 2015, 7.9 million adults were past 30-day e-cigarette users (Jamal et al., 2016), and e-cigarettes were the most popular tobacco product among middle and high school students (Singh, Arrazola, Corey, & Al, 2016). E-cigarettes frequently contain nicotine, which is addictive, and harmful toxicants, including formaldehyde (Logue et al., 2017). Further, associations between e-cigarette use and future cigarette use among youth are well established (England, Bunnell, Pechacek, Tong, & McAfee, 2015; Friedman, 2015; Leventhal et al., 2015; National Academies of Sciences Engineering and Medicine, 2018; Primack, Soneji, Stoolmiller, Fine, & Sargent, 2015). U.S. policymakers have taken steps to prevent e-cigarette initiation, including restricting sales to minors; however, effective tobacco control requires a comprehensive understanding of the reasons youth and adults find e-cigarettes desirable.

Early studies on the reasons that youth and adults use e-cigarettes relied heavily on focus groups (Choi, Fabian, Mottey, Corbett, & Forster, 2012; Pepper & Brewer, 2014; Pokhrel, Herzog, Muranaka, Regmi, & Fagan, 2015), while later studies examined whether reasons to use e-cigarettes are associated with patterns of use (Adkison et al., 2013; Bold, Kong, Cavallo, Camenga, & Krishnan-Sarin, 2016; Kong, Morean, Cavallo, Camenga, & Krishnan-Sarin, 2015; Pepper, Ribisl, Emery, & Brewer, 2014; Tan, Lee, & Bigman, 2016). Common reasons to use e-cigarettes cited by youth and adults were curiosity, peer influences, and ability to use anywhere (Bold et al., 2016; Choi et al., 2012; Kong et al., 2015). Adults also cited more goal-directed reasons, such using them to quit or reduce cigarette smoking and being less harmful than cigarettes (Adkison et al., 2013; Bold et al., 2016; Pepper et al., 2014). Additional youth-specific reasons were that e-cigarettes were “cool”, had appealing flavors, were easy to hide, were cheaper, and did not smell like cigarettes (Bold et al., 2016; Choi et al., 2012; Kong et al., 2015). Previous research assigned these reasons to general categories, such as “general interest” and “social norms”, to organize related items. For example, “social norms” is commonly assigned as the larger category that cites friends/peers/family using e-cigarettes and e-cigarettes can be used anywhere (Bold et al., 2016; Kong et al., 2015; Tan et al., 2016).

Conversely, reasons to use cigarettes are well-defined (Lewis-Esquerre, Rodrigue, & Kahler, 2005; Rash & Copeland, 2008; US Department of Health and Human Services, 2014). Latent themes developed from social-learning theory, including “expectancy” and “coping”, help explain why individuals smoke cigarettes (US Department of Health and Human Services, 2014). These larger concepts (e.g. expectancies about the rewards that will occur from using tobacco) were developed from factor analyses into validated questionnaires, including the Smoking Consequences Questionnaire (Lewis-Esquerre et al., 2005; Rash & Copeland, 2008). Thus, cigarette research has provided a framework of theory and evidence on reasons to use cigarettes, which have been targeted by effective tobacco interventions (US Department of Health and Human Services, 2014).

The purpose of this study is to determine the underlying themes of reasons to use e-cigarettes and to examine the associations between these reasons and user characteristics,

including examining youth and adults separately. This study contributes to the literature on reasons to use e-cigarettes by employing exploratory factor analysis (EFA) that assumes no latent a priori structure among thirteen reasons to use to identify constructs that best describe the observed patterns motivating use. This factor structure refines our understanding on how reasons to use e-cigarettes share commonality among youth and adults and uses nationally representative data to tailor tobacco prevention and control programs.

2. Methods

Data are from 13,651 youth (12–17 years) and 32,320 adults (18 years and older) in the US surveyed in Wave 1 (September 2013–December 2014) of the PATH Study, a nationally representative, longitudinal cohort. Parents/Guardians ($n = 13,588$) completed a Parent Interview focusing on their child's health and tobacco use. Over 150,000 mailing addresses were used to sample tobacco users and nonusers, where an in-person household screener determined participant selection. Up to two adults and two youth were selected from each household. The adult survey oversampled tobacco users, Blacks, and young adults aged 18–24. To adjust for oversampling and nonresponse, weighted data are combined with a probability sample to be representative of the civilian, non-institutionalized US population. The weighted response rates for the household screener was 54.0%, 74.0% for adult interviews, and 78.4% for youth interviews. Detailed information on the study design and methods of the PATH study are described elsewhere (Hyland et al., 2017).

2.1. Measures

2.1.1. Reasons to use e-cigarettes—Using EFA for adults and youth, two factors, “alternatives to cigarettes” and “larger social environment”, were created for further analysis as separate outcomes. The EFA used the tetrachoric and Rho commands in Stata, principal axis factoring, and a Promax rotation on two different subsamples: 3396 (representing a US population (N) of 14,011,757) adults and 405 ($N = 747,156$) youth who completed all thirteen dichotomous (no/yes) variables on reasons to use e-cigarettes (Table 1). Among adults, the two factors (eigenvalues: 4.15 and 1.13) comprised 41% of the variance. Among youth, the two factors (eigenvalues: 4.29 and 1.19) explained 42% of the variance. The eigenvalues for subsequent factors were under one and explained under 7% of the variance among adults and under 9% for youth. The Kaiser Meyer Olkin (KMO) measure indicates the adequacy of how suited items are for factor analysis (Kaiser, 1974). The KMO measures were 0.85 for adults and 0.79 for youth, indicating acceptable commonality among items (Kaiser, 1974). Table 1 presents the rotated factor loadings of items, where factor loadings above 0.3 (Kline, 1994) on the specified factor are bolded, for adults and youth.

Items that loaded highly onto the “alternative to cigarettes” factor for youth and adults included using in places where cigarettes prohibited, less harmful to me and others, help quit smoking, no smell, and more acceptable. The “larger social environment” factor included people in the media use e-cigarettes, people who are important use them, enjoy socializing while using, and appealing advertising. As constructed, higher values of the factors map onto higher tendencies to report using e-cigarettes because they are alternatives to cigarettes of for the larger social environment.

Minimal differences existed between factors when comparing adults and youth. Only two variables (affordable and flavors) loaded on different factors between adults and youth. For youth, feels like smoking did not load on either factor. Reliability analyses examined the internal consistency of each factor using Cronbach's alphas. The alphas were considered acceptable (Loewenthal, 2001) at 0.65 for "alternative to cigarettes" and 0.62 for "larger social environment" among adults. Among youth, the alphas were also acceptable at 0.71 for "alternative to cigarettes" and 0.62 for "larger social environment." Only two items (feels like smoking and more acceptable) on the "alternative to cigarettes" factor among adults had a factor loading below 0.4. When removing these two items for a more conservative factor loading cutoff of 0.4, sensitivity analyses indicated that e-cigarette user groups remained statistically significant, yet the Cronbach's alpha decreased to 0.61. Variables that loaded highly on the "alternative to cigarettes" factor were supported by previous research (Adkison et al., 2013; Bold et al., 2016; Pepper et al., 2014); however, the "larger social environment" was not previously identified. An average summary score was determined for both factors separately for adults and youth, where each reason to use variable that loaded onto the factor was summed and divided by the total variables on the factor. A score ranging from 0 to 1 was created for both factors for every participant.

2.1.2. E-cigarette user groups—Adult e-cigarette users were defined as current experimental, former established, or current established. Adults who had ever used an e-cigarette were asked 'Have you ever used e-cigarettes fairly regularly?' (yes/no). Current experimental users had not used e-cigarettes fairly regularly, yet used them some days or every day. Former established users had used e-cigarettes fairly regularly, yet currently did not use. Current established users used e-cigarettes fairly regularly and used some days or every day. Reasons to use e-cigarettes were only asked to past 30-day e-cigarette users among youth, and youth users were not defined in the same groups as adult users. Three youth e-cigarette user groups were defined as e-cigarette use at least once in the past 30 days (but not in the past 7 days), past 7 days (but not today), or earlier today.

2.1.3. Covariates—Adult covariates included past 30-day cigarette use, sex, age (18–24, 25–34, 35–44, 45–54, 55–64, 65+), race/ethnicity (White, Black, Hispanic, and Other), education (High School/GED or below, Some college, Bachelor's or advanced), and annual household income (< \$10,000, \$10,000–\$24,999, \$25,000–\$49,999, \$50,000–\$99,999, \$100,000+). Youth covariates included youth-reported past 30-day cigarette use, sex, age (12–14 or 15–17), race/ethnicity, and parent owning an e-cigarette and parent-reported parent education.

2.2. Statistical analyses

Weighted proportions determined national estimated prevalence of e-cigarette user groups and sociodemographic characteristics. Weighted linear regression tested associations between the continuous average summary scores for the "alternative to cigarettes" and "larger social environment" reasons to use e-cigarettes factors and e-cigarette user groups among adults and youth, while adjusting for covariates. Among adults, weighted linear regression associations were also stratified by e-cigarette user groups. Analyses were performed using Stata 12.0.

3. Results

3.1. Adults

Among adult e-cigarette users, the majority were current experimental users (51.4%), had smoked cigarettes in the past 30 days (81.7%), and were non-Hispanic White (71.2%). More e-cigarette users were between the ages of 25 and 34 (26.9%) and fewer users were over the age of 65 (4.7%). Most adult users earned a high school diploma/GED or less (47.4%) and had an annual income of \$10,000–\$24,999 (25.6%).

3.1.1. Use e-cigarettes as an alternative to cigarettes—Compared to current experimental e-cigarette users, former established ($\beta = 0.064, p < .001$) and current established ($\beta = 0.128, p < .001$) users were more likely to have had higher scores on the “alternative to cigarettes” factor (Table 2). Being female ($\beta = 0.020, p = .01$) and Black ($\beta = 0.036, p = .01$) were associated with higher levels of “alternative to cigarettes”. Compared to 18–24-year-olds, all older age groups had higher “alternative to cigarettes” scores ($\beta = 0.045$ – $0.076, p < .01$, each).

Among current experimental e-cigarette users, all older age groups in comparison to 18–24-year-olds were associated with higher levels of “alternative to cigarettes” ($\beta = 0.031$ – $0.104, p < .05$, each; Table 3). Female ($\beta = 0.027, p = .02$), 35–44 years old ($\beta = 0.045, p = .02$), 45–54 years old ($\beta = 0.044, p < .01$), and Black ($\beta = 0.045, p < .01$) current established e-cigarette users were also associated with higher levels of “alternative to cigarettes”.

3.1.2. Use e-cigarettes for larger social environment reasons—Being a current established user was associated with scoring higher on the “larger social environment” factor ($\beta = 0.063, p < .001$; Table 2). Being Black ($\beta = 0.117, p < .001$) or Hispanic ($\beta = 0.093, p < .001$) were associated with higher levels of “larger social environment”. However, having some college education ($\beta = -0.047, p < .001$), being 35–44 years old ($\beta = -0.045, p = .001$) and 45–54 years old ($\beta = -0.045, p < .01$), and earning an income ($\beta = -0.034$ – $0.098, p < .05$, each) were associated with lower levels of “larger social environment”.

For current experimental e-cigarette users, being Black ($\beta = 0.097, p < .001$) and Hispanic ($\beta = 0.100, p < .001$) were associated with higher levels of “larger social environment”, while past 30 day cigarette use ($\beta = -0.060, p = .02$), some college ($\beta = -0.065, p < .001$), and all higher income levels ($\beta = -0.043$ – $0.098, p < .05$, each) were associated with lower levels (Table 3). Being 25–34 years olds ($\beta = -0.090, p = .01$), 35–44 years old ($\beta = -0.178, p < .001$), and completing some college ($\beta = -0.104, p = .001$) were associated with lower levels of “larger social environment”, while being Black ($\beta = 0.110, p = .04$) was associated with higher levels among former established e-cigarette users. Among current established e-cigarette users, Black ($\beta = 0.145, p < .001$), Hispanic ($\beta = 0.085, p < .01$), and Other race/ethnicities ($\beta = 0.080, p = .02$) had higher levels of “larger social environment”. Additionally, higher levels of income (\$25,000+) were associated with lower levels of “larger social environment” in current established e-cigarette users ($\beta = -0.081$ – $0.115, p < .01$, each).

3.2. Youth

The majority of youth e-cigarette users had used an e-cigarette at least once in the past 30 days, but not in the past 7 days (51.9%) and were male (62.0%), 15–17 years (83.7%), and non-Hispanic White (66.6%). Less than a third of youth (28.8%) reported that their parents owned an e-cigarette. The plurality of parents reported a high school education/GED or less (37.9%). Youth who had reported using an e-cigarette earlier today in comparison to youth who had used e-cigarettes any day in the past 30 days had higher levels of “alternative to cigarettes” ($\beta = 0.130$, $p = .001$) and “larger social environment” ($\beta = 0.127$, $p < .01$) reasons to use e-cigarettes. Youth with parents having a Bachelor’s or advanced degree were associated with lower levels of “alternative to cigarettes” ($\beta = -0.084$, $p = .02$) (Table 4).

4. Discussion

This study provided insight into the reasons youth and adults use e-cigarettes that is congruent with previous research, while also expanding the literature by describing a two-factor structure (“alternative to cigarettes” and “larger social environment”) that organizes reasons to use items based on underlying commonality among response patterns. Like previous studies, youth and adults in this study were both highly influenced by sub-categories such as general interest, peer influences, social norms, desirable attributes, and goal-directed reasons (Adkison et al., 2013; Bold et al., 2016; Choi et al., 2012; Kong et al., 2015; Pepper et al., 2014; Tan et al., 2016). However, the reasons to use in the current study were organized into a higher-order pattern of shared variation beyond prior sub-categories. For example, this study found that sub-categories, including peer influences and social norms, were strongly related to one another through EFA, and are part of a larger, latent organizing factor that we called the “larger social environment”. This factor also included media, advertising, and socializing influences, a category of responses that speaks to ways in which youth and adults look for cues to use and integrate information from many sources to make decisions about tobacco use. The larger category of “alternative to cigarettes” encompasses not just goal-directed use (e.g., to quit cigarette smoking), but also perceptions about where the product could be used, how acceptable use is, and how use might affect health. This finding helps identify two primary factors motivating e-cigarette use that differ across experimental and established e-cigarette users but are largely consistent across youth and adult users, features particularly helpful for providing health officials and other policymakers with a foundation for customizing public health messages for e-cigarette user groups, while facing limited resources.

Current established e-cigarette use was significantly related with both reasons to use e-cigarettes factors, indicating that this group could be influenced to use e-cigarettes by messages about benefits based on both factors. However, former established users were more likely to cite alternative to cigarettes as a reason to use, indicating that this group was likely attracted to e-cigarettes as an alternative product to smoking. Although this group did not currently use e-cigarettes, the majority used cigarettes in the past 30 days. This finding could indicate that e-cigarettes may not lead to successful long-term cigarette cessation, as suggested elsewhere (Kalkhoran, Grana, Neilands, & Ling, 2015; Pepper & Brewer, 2014).

Follow-up is necessary to determine patterns of e-cigarette use and their relation to cigarette cessation.

Consistent with previous studies, e-cigarette users in this study were more likely to be younger, White males with lower education and income (Kasza et al., 2017; Pepper et al., 2014; Pepper & Brewer, 2014; Schoenborn & Gindi, 2015). However, further differences in reasons to use emerged among sociodemographic characteristics. Among all user groups, female and older users were associated with the “alternative to cigarettes” factor, but not with the “larger social environment”. Being Black was associated with both factors, while being Hispanic was only associated with the “larger social environment” factor. Those with some college education and higher income were less likely to use e-cigarettes for larger social environment reasons. Hence, racial/ethnic groups and those with lower education and income could be targeted to advance public health, depending on the policy goals (e.g., harm reduction versus reduction in all tobacco products). Additionally, females and older e-cigarette users may be influenced to use e-cigarettes to replace cigarettes. These findings are useful in understanding how policy might be tailored to specific populations to be most effective.

When we stratified the analyses by e-cigarette user group, further differences emerged. Female current established e-cigarette users were more likely to endorse alternative to cigarettes reasons compared to males. However, males and females appear equally likely to be motivated by social aspects of e-cigarette use. Age was also associated with variation in factor associations across user groups. Among current experimental users, past 30-day cigarette use was associated with the “larger social environment”. This indicates that current dual users of both products may be influenced by social aspects rather than using e-cigarettes as an alternative to cigarettes. Following dual users over time is necessary to determine how reasons to use influence their tobacco use. Additionally, older current experimental users were associated with higher scores on the “alternative to cigarettes” factor. This user group may seek alternatives to cigarettes, yet further study is warranted to determine whether experimentation leads to established use. Current and former established users tended to see e-cigarettes as a cigarette alternative as age increased, while the larger social environment was less influential. Black participants in all user groups reported the larger social environment as their reason to use, while established Black users reported alternative to cigarettes. Current experimental and established Hispanic adult users were more likely than Whites to report larger social environment reasons to use. This suggests that current use among racial/ethnic groups might be influenced by different motivations and necessitates further investigation. Our findings support previous research on e-cigarette use that illuminated associations between specific reasons to use and initiation or discontinuation of use over time (Pepper et al., 2014), and extend those conclusions to demonstrate that 1) specific, individual reasons to use are likely correlated with other reasons to use and can be organized in larger factors and 2) variation in which factor is associated with e-cigarette use is heterogeneous across user groups and demographic characteristics.

Like adult current established e-cigarette users, youth who had used e-cigarettes that same day were associated with both reasons to use factors, although using within the past 7 days

was not associated with either factor. Youth whose parents had attained a high school diploma or less were more likely to cite either factor as a reason to use e-cigarettes, indicating that they may be more motivated to use these products because they are alternatives to cigarettes or for larger social environment reasons compared to youth whose parents are more educated. Consistent with previous research, almost half of these youth had also used cigarettes within the past 30 days (45%), and White, older males whose parents had lower educational attainment were more likely to be past-30 day e-cigarette users (Kasza et al., 2017; Leventhal et al., 2015; Pepper et al., 2013; Primack et al., 2015; Singh et al., 2016). However, no other sociodemographic characteristics than parent education were significantly associated with reasons to use among youth. One probable explanation is the lack of more specific questions in PATH about curiosity and use among friends/peers/family that appear to be highly associated with e-cigarette use in previous literature (Bold et al., 2016; Kong et al., 2015; Pepper et al., 2014). Despite exclusion of these variables, using these reasons to use factors can aid prevention efforts of long-term tobacco use, as well as interventions to target frequent and daily youth users.

The purpose of this study was to define underlying reasons to use factors and to analyze associations between these factors and e-cigarette use among adults and youth. One validation of the factors identified is that they are associated with these user groups in line with a priori expectations of use based on the extant literature. For example, among adults, current established e-cigarette users report using them as an alternative to cigarettes (since most adult e-cigarette users are established users) as well as in social situations, which contributes to continued use (Pepper et al., 2014). Just as reasons to use conventional cigarettes vary among adults and youth, we expected to observe differences in reasons to use e-cigarettes across these groups. Thus, two items loading on different factors between youth and adults is not surprising. For example, affordability may be seen as an “alternative to cigarettes” for adults as they are more likely to have income and are able to legally purchase e-cigarette products. However, youth may consider affordability as part of a social aspect, as in “larger social environment” because they may be accessing these products through friends (either through borrowing friends’ devices or giving money to friends to purchase; Pepper, Coats, Nonnemaker, & Loomis, 2018) to use them in social situations to improve social image (Kong et al., 2015). The finding that the same reasons to use item may be contributing to different factors across these two groups suggests e-cigarette policies targeting prices may influence youth and adult behaviors differently. Further, we identified these new factors and suggested policy options, yet caution should be taken. Certain items, such as help quit smoking and use where cigarettes are prohibited, belonging to the underlying reason to use factor of “alternative to cigarettes” raises as many questions as it answers. This finding, along with the heterogeneity in e-cigarette devices on the market today, highlights fundamental challenges for tobacco product regulators. Given many e-cigarette users report they use them as an alternative to smoking cigarettes, our results suggest policymakers should regulate e-cigarette products to ensure they deliver enough nicotine to the user to compete with cigarettes. However, e-cigarettes also need to be regulated in a way to avoid continued dual use of e-cigarettes and cigarettes, as well as curtail initiation among youth.

4.1. Limitations

There were some limitations in the current study that should be considered. The reasons to use questions were self-reported, and those questions available in the survey did not encompass all potential reasons to use e-cigarettes reported in the literature, particularly for youth participants. Participants were only given ‘yes’ or ‘no’ response options, rather than rating the importance of each reason. User groups were limited by which participants received these questions. For youth, only past 30-day users were asked about reasons to use, which limited our sample size and any potential knowledge on youth who have ever tried or used e-cigarettes beyond the previous 30 days. Although the factors were similar in the adult and youth samples, minor differences were observed between samples. Continued research is necessary to support this variation. As this study was cross-sectional in nature, no causal conclusions can be inferred. Furthermore, why adults and youth use e-cigarettes may evolve over time, both individually and as a population, and differences between user groups and sociodemographic groups may converge or diverge as more evidence about the relative harms of e-cigarettes compared to cigarettes emerge, the social acceptability of these products changes, or as the products themselves change.

4.2. Conclusions

While e-cigarette use rises, understanding the underlying reasons why youth and adults use e-cigarettes is important for policy efforts. This study found two overarching factors, “alternative to cigarettes” and “larger social environment”, which combine sub-categories to explain main motivators of e-cigarette use. Adult current established e-cigarette users and youth who had used e-cigarettes earlier today were associated with both of these factors, indicating a need to include reasons to use in interventions targeting frequent e-cigarette users. Further, several adult sociodemographic characteristics, including sex, age, race/ethnicity, education, and income, were associated with one factor but not the other or both but in opposite directions. Policymakers could use this information to create a foundation for tobacco prevention and control efforts to develop programming specific to e-cigarette user groups. Future research should incorporate longitudinal data from users on their environment and possible influences, and examine how these factors are associated with variation in use over time.

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HIGHLIGHTS

- Two overarching reasons to use e-cigarettes factors were identified.
- Reasons to use highly motivate adults and youth who use e-cigarettes frequently.
- Low income and minority adults were associated with “larger social environment”.
- These factors could support policy efforts to target various user groups.

Table 1 Reasons to use e-cigarette variables and their rotated factor loadings for adults and youth e-cigarette users in Wave 1 of the PATH study (2013–2014).

	Adults		Youth	
	Alternative to cigarettes	Larger social environment	Alternative to cigarettes	Larger social environment
They are/were affordable	0.402	0.207	0.292	0.489
People in the media or other public figures use/used them	-0.165	0.796	0.027	0.730
It can be used in places where smoking cigarettes is/was not allowed	0.445	0.150	0.597	0.059
They might be less harmful to me than cigarettes	0.784	-0.075	0.763	-0.032
They might be less harmful to people around me than cigarettes	0.838	-0.006	0.707	0.186
It comes in flavors I like/liked	0.191	0.483	0.429	0.239
Using them help people to quit smoking	0.599	-0.120	0.645	0.054
They don't smell	0.631	-0.081	0.776	-0.208
Using it feels like smoking a regular cigarette	0.347	0.070	0.291	0.085
They are more acceptable to non-tobacco users	0.399	0.350	0.588	-0.026
People who are important to me use/used them	-0.027	0.638	-0.029	0.560
Liked socializing while using an e-cigarette	0.065	0.625	0.063	0.559
The advertising appeals/appealed to me	-0.007	0.711	-0.131	0.742

Higher factors loadings (above 0.3) are bolded on the selected factor.

Weighted proportions and associations of reasons to use e-cigarette variables and adult e-cigarette user groups in Wave 1 of the PATH Study (2013–2014).

Table 2

	% (95% CI)		Alternative to cigarettes		Larger social environment	
	β	(SE)	β	(SE)	β	(SE)
<i>E-cigarette user group</i>						
Current experimental	51.4 (49.5–53.4)	Ref	Ref	Ref	Ref	Ref
Former established	9.1 (8.2–10.1)	0.064 (0.013)	< 0.001	-0.014 (0.015)	0.36	
Current established	39.5 (37.6–41.4)	0.128 (0.008)	< 0.001	0.063 (0.010)	< 0.001	
Past 30 day cigarette use	81.7 (80.2–83.1)	0.011 (0.012)	0.37	-0.007 (0.013)	0.61	
Female	45.8 (43.9–47.7)	0.020 (0.008)	0.01	0.016 (0.010)	0.10	
<i>Age</i>						
18–24	21.9 (20.6–23.4)	Ref	Ref	Ref	Ref	Ref
25–34	26.9 (25.3–28.5)	0.045 (0.011)	< 0.001	-0.005 (0.011)	0.65	
35–44	18.6 (17.2–20.1)	0.045 (0.013)	0.001	-0.045 (0.013)	0.001	
45–54	15.8 (14.5–17.2)	0.046 (0.012)	< 0.001	-0.045 (0.015)	< 0.01	
55–64	12.1 (11.0–13.3)	0.054 (0.016)	0.001	-0.013 (0.022)	0.55	
65+	4.7 (3.9–5.7)	0.076 (0.021)	< 0.001	-0.037 (0.030)	0.22	
<i>Race/ethnicity</i>						
White	71.2 (69.5–72.9)	Ref	Ref	Ref	Ref	Ref
Black	9.6 (8.5–10.8)	0.036 (0.014)	0.01	0.117 (0.019)	< 0.001	
Hispanic	12.1 (10.9–13.5)	-0.008 (0.014)	0.56	0.093 (0.014)	< 0.001	
Other	7.1 (6.2–8.1)	-0.023 (0.016)	0.17	0.013 (0.020)	0.52	
<i>Education</i>						
High school/GED or below	47.4 (45.2–49.5)	Ref	Ref	Ref	Ref	Ref
Some college	40.0 (38.2–41.9)	0.0002 (0.009)	0.97	-0.047 (0.011)	< 0.001	
Bachelor's or advanced	12.6 (11.4–13.9)	-0.005 (0.012)	0.69	-0.034 (0.019)	0.07	
<i>Income</i>						
< \$10,000	19.4 (17.9–21.1)	Ref	Ref	Ref	Ref	Ref
\$10,000–\$24,999	25.6 (24.0–27.2)	0.005 (0.012)	0.70	-0.034 (0.014)	0.02	
\$25,000–\$49,999	25.1 (23.7–26.7)	0.002 (0.014)	0.88	-0.081 (0.017)	< 0.001	
\$50,000–\$99,999	20.0 (18.3–21.8)	-0.008 (0.014)	0.58	-0.098 (0.017)	< 0.001	

	<u>Alternative to cigarettes</u>	<u>Larger social environment</u>
% (95% CI)	β (SE)	β (SE)
\$100,000+	9.9 (8.9–11.1)	–0.020 (0.018)
	<i>p</i> -Value	<i>p</i> -Value
	0.26	–0.097 (0.019)
		< 0.001

Bolded *p*-values indicate statistical significance at 0.05.

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Table 3

Weighted associations of reasons to use e-cigarette factors and sociodemographic variables by adult e-cigarette user groups in Wave 1 of the PATH Study (2013–2014).

	Current experimental EC user			Former established EC user			Current established EC user					
	Alternative to cigarettes		Larger social environment	Alternative to cigarettes		Larger social environment	Alternative to cigarettes		Larger social environment			
	β (SE)	p-Value	β (SE)	p-Value	β (SE)	p-Value	β (SE)	p-Value				
Past 30 day cigarette use	0.025 (0.022)	0.25	-0.060 (0.024)	0.02	-0.035 (0.032)	0.28	-0.058 (0.043)	0.18	0.004 (0.016)	0.78	0.035 (0.018)	0.06
Female	0.018 (0.013)	0.15	0.024 (0.013)	0.07	0.003 (0.025)	0.89	-0.004 (0.030)	0.89	0.027 (0.012)	0.02	0.013 (0.015)	0.39
Age												
25–34	0.058 (0.015)	< 0.001	0.009 (0.016)	0.60	0.028 (0.033)	0.40	-0.090 (0.034)	0.01	0.033 (0.018)	0.07	0.003 (0.019)	0.90
35–44	0.046 (0.020)	0.02	-0.021 (0.019)	0.27	0.032 (0.039)	0.42	-0.178 (0.041)	< 0.001	0.045 (0.019)	0.02	-0.041 (0.025)	0.11
45–54	0.044 (0.018)	0.02	-0.030 (0.021)	0.16	0.068 (0.052)	0.20	-0.046 (0.051)	0.37	0.044 (0.016)	< 0.01	-0.044 (0.023)	0.06
55–64	0.092 (0.025)	< 0.001	0.044 (0.031)	0.17	0.013 (0.053)	0.81	-0.050 (0.048)	0.30	0.010 (0.023)	0.67	-0.063 (0.032)	0.06
65+	0.088 (0.028)	< 0.01	0.003 (0.038)	0.93	0.079 (0.066)	0.23	-0.054 (0.117)	0.64	0.059 (0.032)	0.07	-0.064 (0.041)	0.12
Race/ethnicity												
Black	0.039 (0.021)	0.07	0.097 (0.025)	< 0.001	0.002 (0.049)	0.97	0.110 (0.054)	0.04	0.045 (0.017)	< 0.01	0.145 (0.028)	< 0.001
Hispanic	-0.013 (0.019)	0.51	0.100 (0.018)	< 0.001	-0.025 (0.047)	0.60	0.003 (0.052)	0.95	0.004 (0.016)	0.80	0.085 (0.027)	< 0.01
Other	-0.017 (0.023)	0.46	-0.038 (0.027)	0.16	-0.040 (0.045)	0.37	-0.020 (0.045)	0.66	-0.031 (0.025)	0.23	0.080 (0.035)	0.02
Education												
Some college	-0.002 (0.013)	0.91	-0.056 (0.014)	< 0.001	-0.022 (0.030)	0.46	-0.104 (0.030)	0.001	0.005 (0.013)	0.72	-0.030 (0.016)	0.06
Bachelor's or advanced	-0.014 (0.020)	0.47	-0.037 (0.025)	0.14	-0.011 (0.034)	0.75	-0.018 (0.044)	0.68	0.008 (0.018)	0.67	-0.033 (0.025)	0.19
Income												
\$10,000–24,999	-0.004 (0.017)	0.80	-0.041 (0.018)	0.02	-0.009 (0.039)	0.83	-0.003 (0.044)	0.94	0.021 (0.018)	0.24	-0.038 (0.027)	0.16
\$25,000–49,999	-0.003 (0.019)	0.87	-0.092 (0.022)	< 0.001	0.014 (0.041)	0.72	-0.024 (0.051)	0.64	0.007 (0.018)	0.70	-0.081 (0.026)	< 0.01
\$50,000–99,999	-0.014 (0.021)	0.52	-0.092 (0.024)	< 0.001	0.051 (0.041)	0.22	-0.024 (0.056)	0.67	-0.011 (0.021)	0.62	-0.115 (0.029)	< 0.001
\$100,000+	-0.030 (0.028)	0.27	-0.098 (0.027)	< 0.001	-0.001 (0.052)	0.99	-0.075 (0.060)	0.21	-0.011 (0.026)	0.68	-0.098 (0.031)	< 0.01

Bolded *p*-values indicate statistical significance at 0.05.

Weighted proportions and associations of reasons to use e-cigarette variables and youth e-cigarette user groups in Wave 1 of the PATH Study (2013–2014).

Table 4

<i>E</i> -cigarette user group	% (95% CI)		Alternative to cigarettes		Larger social environment	
	β (SE)	p-Value	β (SE)	p-Value	β (SE)	p-Value
Past 30 day	51.9 (46.7–57.2)	Ref	Ref	Ref	Ref	Ref
Past 7 day	33.5 (28.8–38.4)	0.056 (0.030)	0.07	0.009 (0.037)	0.009 (0.037)	0.81
Earlier today	14.6 (11.2–18.7)	0.130 (0.037)	0.001	0.127 (0.045)	0.127 (0.045)	< 0.01
Past 30 day cigarette use	45.2 (40.2–50.3)	0.039 (0.033)	0.25	0.004 (0.032)	0.004 (0.032)	0.89
Female	38.0 (33.9–42.3)	–0.042 (0.034)	0.22	0.002 (0.035)	0.002 (0.035)	0.97
15–17 years old	83.7 (79.8–86.9)	0.028 (0.041)	0.50	–0.042 (0.043)	–0.042 (0.043)	0.33
Race/ethnicity						
White	66.6 (61.8–71.2)	Ref	Ref	Ref	Ref	Ref
Black	8.1 (5.7–11.4)	0.032 (0.051)	0.53	0.082 (0.065)	0.082 (0.065)	0.21
Hispanic	17.5 (14.0–21.7)	–0.012 (0.039)	0.76	–0.015 (0.039)	–0.015 (0.039)	0.69
Other	7.8 (5.4–10.8)	–0.044 (0.056)	0.44	0.024 (0.059)	0.024 (0.059)	0.68
Parent own EC	28.8 (23.9–34.2)	0.018 (0.034)	0.61	0.070 (0.036)	0.070 (0.036)	0.05
Parent education						
High school/GED or below	37.9 (31.5–44.7)	Ref	Ref	Ref	Ref	Ref
Some college	35.0 (29.4–41.0)	0.006 (0.027)	0.82	–0.040 (0.035)	–0.040 (0.035)	0.26
Bachelor's or advanced	27.1 (21.6–33.5)	–0.084 (0.035)	0.02	–0.066 (0.036)	–0.066 (0.036)	0.07

Bolded *p*-values indicate statistical significance at 0.05.