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E-cigarette openness, curiosity, harm perceptions and advertising exposure among U.S. middle and high school students

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Abstract

Understanding factors associated with youth e-cigarette openness and curiosity are important for assessing probability of future use. We examined how e-cigarette harm perceptions and advertising exposure are associated with openness and curiosity among tobacco naive youth. Findings from the 2015 National Youth Tobacco Survey (NYTS) were analyzed. The 2015 NYTS is a nationally representative survey of 17,711 U.S. middle and high school students. We calculated weighted prevalence estimates of never users of tobacco products (cigarettes, cigars/cigarillos/little cigars, waterpipe/hookah, smokeless tobacco, bidis, pipes, dissolvables, e-cigarettes) who were open to or curious about e-cigarette use, by demographics. Weighted regression models examined how e-cigarette harm perceptions and advertising exposure were associated with openness using e-cigarettes and curiosity about trying e-cigarettes. Among respondents who never used tobacco products, 23.8% were open to using e-cigarettes and 25.4% were curious. Respondents that perceived e-cigarettes cause a lot of harm had lower odds of both openness (OR = 0.10, 95% CI = 0.07, 0.15) and curiosity about e-cigarettes (OR = 0.10, 95% CI = 0.07, 0.13) compared to those with lower harm perception. Respondents who reported high exposure to e-cigarette advertising in stores had greater odds of being open to e-cigarette use (OR = 1.22, 95% CI = 1.03, 1.44) and highly curious (OR = 1.25, 95% CI = 1.01, 1.53) compared to those not highly exposed. These findings demonstrate that youth exposed to e-cigarette advertising are open and curious to e-cigarette use. These findings could help public health practitioners better understand the interplay of advertising exposure and harm perceptions with curiosity and openness to e-cigarette use in a rapidly changing marketplace.

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Disclaimer

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Keywords

Tobacco; Electronic cigarettes

1. Introduction

Electronic cigarettes (e-cigarettes) are battery-powered devices capable of delivering nicotine and varying compositions of flavorings, propylene glycol, glycerin, and other constituents to the user in the form of an aerosol. Since becoming available in the U.S., e-cigarette use has proliferated: e-cigarette sales grew from \$274.6 million in 2012 to \$636.2 million in 2013, an increase of 132.5% (Giovenco et al., 2015). Nielsen estimates that e-cigarette sales were near \$850 million in 2015 (Vonder, 2015). The e-cigarette market continues to evolve as new types, models, flavors and nicotine strengths become available (Cobb et al., 2015). By January 2014, it was estimated that > 460 brands of e-cigarettes were available online (Cobb et al., 2015). In 2016, FDA estimated that there were 4000 to 8000 product formulations for e-liquids and 640 to 800 for electronic nicotine delivery systems (US Food and Drug Administration, 2016).

E-cigarettes are now the most commonly used tobacco product among middle school and high school students (Singh et al., 2016a). During 2011–2015, current use of e-cigarettes increased from 0.6% to 5.3% among middle school students and from 1.5% to 16.0% among high school students (Arrazola et al., 2015). Youth use of products containing nicotine, including e-cigarettes, is unsafe (U.S. Department, 2016). Nicotine is known to impact adolescent brain function and development (England et al., 2015; Goriounova and Mansvelder, 2012), cause addiction, and could lead to sustained tobacco product use (*The Health Consequences of Smoking: Nicotine Addiction. A Report of the Surgeon General*, 1988). Data from cross-sectional and longitudinal studies suggest that e-cigarette use is strongly associated with other tobacco use, especially the use of combustible products (including cigarettes, cigars, and hookahs) (Miech et al., 2017; U.S. Department, 2016; Wills et al., 2017). Further, recent cross-sectional studies found that e-cigarette use among youth was associated with cigarette smoking intentions (Bunnell et al., 2015a), and higher odds of ever, current, and established cigarette smoking (Dutra and Glantz, 2014).

Due to the rapidly changing marketplace, it is important to understand factors that may lead to youth e-cigarette use. Cognitive constructs in youth including susceptibility, curiosity and openness have been examined as predictors of e-cigarette use. Curiosity, which is considered to develop after someone experiences unpleasant feelings of uncertainty and is motivated to reduce these unpleasant feelings through exploratory behavior (Litman and Jimerson, 2004), has been associated with future cigarette use (Nodora et al., 2014; Pierce et al., 2005) and has been cited as a reason for e-cigarette experimentation (Kong et al., 2015) and initiation (Pepper et al., 2014). In 2014, approximately one quarter (25.8%) of youth who never used e-cigarettes reported curiosity about e-cigarettes (Margolis et al., 2016). Openness, similar to susceptibility (Mays et al., 2016), indicates the lack of a firm commitment not to use tobacco products (Coleman et al., 2015). Openness captures interest in trying e-cigarettes and is considered part of the progression to regular tobacco use (Mowery et al., 2004). While

curiosity has been studied in youth, openness has not been extensively studied in youth. In young adults (ages 18–29), 25.5% of reported openness to using e-cigarettes (Mays et al., 2016).

Potential drivers of openness include advertising and harm perceptions. Youth and young adults have lower harm perceptions of e-cigarettes compared to combusted cigarettes, which could be driving their high levels of curiosity and openness to using e-cigarettes (Margolis et al., 2016). Although studies have not examined harm perceptions and openness, studies have found that youth and young adults who believe e-cigarettes are less harmful than combusted cigarettes are more likely to be curious about e-cigarettes (Margolis et al., 2016) and to experiment with them (Choi and Forster, 2014).

Another key factor that influences patterns of tobacco product use is advertising. Experimental and population-based studies have found that exposure to e-cigarette advertising is associated with greater curiosity to try e-cigarettes (Villanti et al., 2016), openness to e-cigarette use (Mantey et al., 2016), and use of e-cigarettes (Mantey et al., 2016). Advertising can promote initiation and continued use of cigarettes (Evans et al., 1995; Lovato et al., 2011). Tobacco product advertising is related to tobacco product initiation among youth (U.S., 2012). Although cigarette advertising has been prohibited from U.S. television since 1971 (Eckard, 1991), e-cigarette advertising is currently allowed on television without restriction (US Food and Drug Administration, 2016). Youth are often exposed to e-cigarette advertising, as nearly 70% of middle and high school students were exposed to e-cigarette advertisements from at least one source in 2014 (Singh et al., 2016b). This exposure may lead to curiosity and openness to try e-cigarettes. Duke et al. (Duke et al., 2014) found that youth exposure to television e-cigarette advertisements as measured by target rating points (TRPs) increased from < 100 quarterly TRPs in 2011 to 347 TRPs during April–June 2013, reflecting a 256% increase from 2011 to 2013.

A previous study found that harm perceptions and advertising exposure are associated with curiosity about e-cigarettes in middle and high school students that had never used combustible tobacco products with comparable findings for never tobacco user (Margolis et al., 2016). However, this study (Margolis et al., 2016) did not examine openness as a potential unique predictor of tobacco use among tobacco naïve youth. Tobacco naïve youth are an important population to study as recent debate has posited that e-cigarettes are increasing tobacco use among youth (Dutra and Glantz, 2014) and several recent longitudinal studies in the US including one conducted by Miech et al. with a national sample of 12th grade students (Miech et al., 2017) and one by Wills et al. with high school students in Hawaii (Wills et al., 2017) have examined e-cigarette use by youth and subsequent cigarette smoking. While the role of e-cigarettes in the progression of other tobacco use is unclear more data would be useful to better understand constructs like openness to trying e-cigarettes among students that have never used any tobacco product. Understanding the prevalence of openness among youth and the factors that influence youth never tobacco users to be open to e-cigarettes is important to prevent tobacco use. Therefore, this study used data from the National Youth Tobacco Study (NYTS) and is the first to provide an estimate of openness among youth in a nationally representative sample of youth and to examine how e-cigarette harm perceptions and advertising exposure are associated

with e-cigarette openness among youth who reported never having used any tobacco products in 2015. Due to the rapidly changing e-cigarette marketplace and youth uptake of e-cigarettes, we also present data on e-cigarette curiosity in 2015 as a continuation of the 2014 analysis of youth that had never used combustible products (Margolis et al., 2016).

2. Methods

2.1. Sample

NYTS is a cross-sectional, school-based, self-administered, pencil-and-paper questionnaire administered to U.S. middle and high school students. A three-stage cluster sampling procedure was used to generate a nationally representative sample of U.S. public and private school students in grades 6–12. This report uses data from 2015 NYTS. The sample included 17,711 respondents; the response rate was 63.4% (Singh et al., 2016a). The Centers for Disease Control and Prevention Human Research Protection Office and the Office of Management and Budget approved the NYTS protocol.

2.2. Measures

2.2.1. Tobacco use—Ever use of a tobacco product was measured using items assessing whether respondents had ever tried cigarette smoking, even one or two puffs; had ever tried smoking bidis, pipe tobacco, cigars, cigarillos, or little cigars, even one or two puffs; had ever used chewing tobacco, snuff, or dip, even just a small amount; and had ever used an e-cigarette or hookah/waterpipe, even once or twice. Youth were classified as “never users of tobacco” if they responded *no* to all of these items ($n = 10,419$).

Additional items also measured more detailed e-cigarette behaviors and responses to these items suggested some inconsistencies in participants’ e-cigarette use. Therefore, participants who had inconsistencies in their responses about e-cigarette use were considered missing from the sample of never users ($n = 115$). Inclusion of these respondents did not change our findings.

2.2.2. Openness—The two items that measured openness to e-cigarettes were: *Do you think you will try an electronic cigarette or e-cigarette soon?* and *If one of your best friends were to offer you an electronic cigarette or e-cigarette, would you use it?* Response options for both items were *Definitely yes*, *Probably yes*, *Probably not* and *Definitely not*. Based on prior research (Coleman et al., 2015; Mays et al., 2016), those who answered definitely not to both items were considered “not open to using e-cigarettes” and those who indicated anything other than *Definitely not* to one or both items were categorized as “open to using e-cigarettes.”

2.2.3. Curiosity—E-cigarette curiosity was measured with one item that asked, *Have you ever been curious about using an electronic cigarette, or e-cigarette, even once or twice*, and included the options *Definitely yes*, *Probably yes*, *Probably not*, and *Definitely not*. Following previous research on tobacco curiosity (Margolis et al., 2016; Portnoy et al., 2014), those who responded *Definitely yes* and *Probably yes* were classified as “highly

curious.” Those who responded *Probably not* were classified as “somewhat curious” and those who responded *Definitely no* were classified as “not curious.”

2.2.4. Harm perception and exposure to advertising—One item measured harm perception: *How much do you think people harm themselves when they use e-cigarettes some days but not every day?* Response options included *No harm, Little harm, Some harm,* and *A lot of harm.*

Four items measured exposure to e-cigarette advertising, including *When you (are using the Internet/read newspapers or magazines/go to a convenience store, supermarket, or gas station/watch TV), how often do you see ads or promotions for electronic cigarettes or e-cigarettes?* Response options for all items were: *I (do not use the Internet, do not read newspapers or magazines/never go to a convenience store, supermarket, or gas station, do not watch TV), Never, Rarely, Sometimes, Most of the time, and Always.* As categorized in previous research (Margolis et al., 2016), response options were dichotomized so that respondents who selected *Never, Rarely, or Sometimes* were classified as “not high exposure” and respondents who selected *Most of the Time, or Always* were classified as “high exposure” (Nodora et al., 2014; Singh et al., 2016b). Respondents who did not use the source were coded as missing consistent with previous research (Margolis et al., 2016), including 646 (6%) who did not use the Internet, 4764 (46%) who did not read newspapers/magazines, 726 (7%) who did not visit retail stores, and 823 (8%) who did not watch television.

2.2.5. Demographics—Characteristics assessed included sex (male, female), school type (middle school: 6th through 8th grade; high school: 9th through 12th grade), age (< 13–14, 15–16, 17 years and older), and race/ethnicity (Non-Hispanic White, Non-Hispanic Black, Hispanic, Non-Hispanic Asian, and Non-Hispanic Multiple and other races).

2.3. Statistical analysis

Stata SE 14 (StataCorp LP) with SVY procedures was used to account for the complex sampling design and to generate nationally representative estimates. Data were weighted to account for the complex survey design and to adjust for nonresponse. Weighted prevalence estimates and 95% confidence intervals were calculated for never users of tobacco who were curious or open to e-cigarettes. We used chi-square tests to assess bivariate associations between curiosity and openness to e-cigarettes with harm perceptions and advertising exposure. Spearman correlation assessed the correlation between curiosity and openness.

We used a weighted logistic regression model to examine the association between e-cigarette openness and the primary independent variables of harm perception and advertising exposure, adjusting for demographic variables. We used a weighted multinomial logistic regression model to examine the association between e-cigarette curiosity and the primary independent variables of harm perception and exposure to e-cigarette advertisements, adjusting for demographic variables. In the multinomial model, respondents who were “not curious” served as the reference group. We estimated odds ratios for respondents who were “highly curious” about e-cigarettes versus “not curious” as well as those “somewhat curious” versus “not curious.” Analyses were also performed using a logistic regression

model comparing “curious” respondents to those “not curious” about e-cigarettes. Results between the two models were comparable; thus, to facilitate comparability with similar previously published studies, we present the multinomial regression results only.

In all analyses, p values < 0.05 were considered statistically significant.

3. Results

3.1. E-cigarette openness and curiosity

In total, 55.6% of middle school students and 44.2% of high school students indicated that they have never used any tobacco product, including cigarettes, cigars, smokeless products, bidis, pipes, dissolvable products, and e-cigarettes. Among respondents who had never used any tobacco products, 23.8% of respondents were open to using e-cigarettes (Table 1). Among respondents who never used any tobacco products, 13.1% were highly curious about e-cigarettes, 12.3% were somewhat curious, and 74.6% were not curious (Table 2). A greater proportion of female respondents (14.9%; 95% CI: 13.0, 16.9) than male respondents (11.3%; 95% CI: 9.9, 12.8) were highly curious about e-cigarettes.

E-cigarette harm perceptions were associated with openness to e-cigarette use and curiosity. Among respondents who reported e-cigarettes have no harm, 41.7% (95% CI: 37.1, 46.5) were open to e-cigarette use and 26.2% (95% CI: 23.3, 29.4) were highly curious. In comparison, among respondents who reported that e-cigarettes have a lot of harm 8.6% (95% CI: 7.4, 10.0) were open to e-cigarette use and 4.4% (95% CI: 3.6, 5.4) were highly curious about e-cigarettes. Unadjusted analysis indicates that high exposure to advertising or promotions on the internet, newspapers or magazines, stores, or television was not associated with openness to e-cigarette use (Table 1) or e-cigarette curiosity (Table 2). In our sample of youth never tobacco users, there was a strong, positive correlation between our outcomes of openness to e-cigarette use and curiosity ($r = 0.69$).

3.2. Correlates of e-cigarette openness

The results from the multivariable logistic regression model examining factors associated with openness to e-cigarette use among never tobacco users are presented in Table 4. Similar to the results for curiosity, male respondents had lower odds of openness compared to female respondents (OR = 0.77, 95% CI = 0.66, 0.91). Hispanic respondents had higher odds of being open to e-cigarette use compared to non-Hispanic whites (OR = 1.46, 95% CI = 1.20, 1.77). Higher levels of e-cigarette harm perceptions were associated with lower odds of openness to e-cigarette use (*Some Harm*: OR = 0.34, 95% CI = 0.25, 0.46; *A Lot of Harm*: OR = 0.10, 95% CI = 0.07, 0.15). High exposure to e-cigarette advertising in stores was associated with higher odds of being open to e-cigarette use (OR = 1.22, 95% CI = 1.03, 1.44) compared to those who were not highly exposed.

3.3. Correlates of e-cigarette curiosity

The results of the multinomial logistic regression examining factors associated with e-cigarette curiosity among never tobacco users are presented in Table 3. Male respondents had lower odds of being *highly* curious about e-cigarettes compared to female respondents

(OR = 0.56, 95% CI = 0.45, 0.70). Respondents who were non-Hispanic Black, Hispanic, and with Multiple and other race/ethnicity had greater odds of being *highly* curious about e-cigarettes compared to Non-Hispanic White respondents (Non-Hispanic Black: OR = 1.45, 95% CI = 1.14, 1.85; Hispanic: OR = 1.75; 95% CI = 1.34, 2.27; Multiple and other: OR = 1.48; 95% CI = 1.01, 2.16). High school students had greater odds of being *highly* curious compared to middle school students (OR = 1.69, 95% CI = 1.13, 2.55). Respondents who reported e-cigarettes have *Little Harm*, *Some Harm* or *A lot of Harm* had lower odds of being *highly* curious about e-cigarettes compared to respondents reporting e-cigarettes have *No Harm* (Little Harm: OR = 0.75, 95% CI = 0.58, 0.98; Some Harm: OR = 0.23, 95% CI = 0.17, 0.32; A lot of Harm: OR = 0.10, 95% CI = 0.07, 0.13). Respondents who reported high exposure to e-cigarette advertising and promotions in stores had greater odds of being *highly* curious compared to those not highly exposed (OR = 1.25, 95% CI = 1.01, 1.53).

In examining factors associated with being *somewhat* curious compared to *not* curious about e-cigarettes, Hispanic respondents had greater odds of being *somewhat* curious about e-cigarettes compared to non-Hispanic white respondents (OR = 1.42, 95% CI = 1.16, 1.73) (Table 3). Respondents who reported e-cigarettes have *Some Harm* or *A lot of Harm* had lower odds of being *somewhat* curious about e-cigarettes compared to respondents reporting e-cigarettes have *No Harm* (*Some Harm*: OR = 0.57, 95% CI = 0.40, 0.82; *A lot of Harm*: OR = 0.20, 95% CI = 0.13, 0.31).

4. Discussion

About a quarter of youth who have not used any tobacco products were both open to using e-cigarettes and curious about them. Female respondents were more likely to report being open to e-cigarettes and highly curious. This high level of interest in e-cigarettes among youth is particularly concerning as nicotine is harmful to adolescent brain development (England et al., 2015; U.S. Department, 2016) and previous research has established that nearly all regular tobacco product use begins during youth and young adulthood (U.S. Department, 2016).

E-cigarettes are a relatively new tobacco product in the US (U.S. Department, 2016) that has generated much debate and have not been fully studied (Henningfield and Zaatari, 2010). Research is just beginning to understand the potential role(s) that e-cigarettes play in predicting future tobacco use among key demographic groups. Recent longitudinal studies have shown a positive association between e-cigarette use by youth and subsequent cigarette smoking (Miech et al., 2017; Wills et al., 2017). Further, recent e-cigarette use was also shown to predict changes in perceptions of cigarette smoking harm (Miech et al., 2017). It is important to explore factors that influence youth interest in tobacco use.

Our data revealed that respondents who reported no or low harm perceptions of e-cigarettes compared to those with higher harm perceptions were more likely to be both open to using e-cigarettes and highly curious. Also, those who reported high exposure to e-cigarette advertising in stores were more likely to be open to using e-cigarettes and highly curious compared to those who reported less exposure to e-cigarette advertising. Understanding the interplay between advertising exposure, harm perceptions, curiosity, and openness to

product usage is important, as openness is considered part of the progression to established smoking (Mowery et al., 2004), and curiosity has been cited as a reason for tobacco use (Kong et al., 2015; Pepper et al., 2014) and associated with future use (Nodora et al., 2014; Pierce et al., 2005). Pierce et al. note that advertising theory posits curiosity may successfully promote product trial when the behavior is seen as having low risk (Pierce et al., 2005). Research has also found that harm perceptions toward e-cigarettes are related to experimentation (Choi and Forster, 2014) and curiosity (Margolis et al., 2016). Recent studies also have found that youth who use e-cigarettes are more likely to intend to smoke cigarettes and more likely to have ever smoked or currently smoke cigarettes compared to those who do not (Bunnell et al., 2015b; Dutra and Glantz, 2014).

Although some of the observed associations are small in magnitude; they are practically meaningful because any observed relationship can help to confirm findings from prior studies in this area. In addition, observed associations between harm perceptions and openness can to inform whether public education campaigns where messaging aimed at modifying perceptions and cognitive factors in a variety of ways is considered to prevent tobacco use in youth.

This study further illuminates the influence of advertising exposure on openness about e-cigarette use. E-cigarette advertising has not been restricted in the same way as conventional tobacco product advertising (US Food and Drug Administration, 2016) and demonstrates an extensive reach (Singh et al., 2016c). This study found that openness to e-cigarettes and curiosity were related to advertising exposure in stores. Previous research (Margolis et al., 2016) found similar results and revealed exposure to point of sale e-cigarette advertising was associated with e-cigarette curiosity. This study adds to the existing evidence base of the influence of e-cigarette point of sale advertising on both openness and curiosity. Outcomes related to cigarette point of sale advertising have been widely studied and show that youth exposed to point of sale tobacco promotion have higher odds of being susceptible to future cigarette smoking and of having tried cigarette smoking, compared with those less frequently exposed (Robertson et al., 2016). Future research could examine outcomes related to e-cigarette point of sale advertising exposure. Research to further understand the impact of e-cigarette advertisements and promotions could also be informative for future tobacco interventions.

5. Limitations

There are some limitations to this study. First, the data are cross-sectional in nature; therefore, causal relationships about the variables in this study cannot be assessed. This study also only included some of the factors that may be related to e-cigarette use. In addition to curiosity, youth report that they experiment with e-cigarettes due to appealing flavors, and peer influences (Kong et al., 2015). Studies using a longitudinal design could corroborate and extend our findings to consider not just curiosity and openness, but also future use and additional factors related to e-cigarette use. Also, only students from public and private schools in the U.S. are included in these data. As a result, the findings might not be generalizable to all youth, including those who are being home-schooled, have dropped out of school, or are in detention centers. However, in 2014, 97.5% of U.S. youths aged 10–

13 years and 95.4% of those aged 14–17 years were enrolled in a traditional school (Kong et al., 2015; United States Census Bureau, n.d.). Finally, all data were self-reported; therefore, the findings are subject to response, recall, and social desirability bias (United States Census Bureau, n.d.).

Despite these limitations, our study contributes to the literature by demonstrating that point of sale advertising and harm perceptions are associated with e-cigarette openness and curiosity among youth; these factors are often considered part of the progression from never use to established tobacco use (Mowery et al., 2004). Interest in e-cigarettes presents a substantial public health concern, as youth use of nicotine is unsafe, and e-cigarettes are the most widely used tobacco product among youth (U.S. Department, 2016). Findings from this study can help inform comprehensive tobacco control strategies, including the development of effective health communication campaigns to reduce youth tobacco use and initiation.

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Table 1

Bivariate associations between demographic, harm perceptions, and advertising correlates and openness to e-cigarette use among never users of tobacco products - NYTS 2015^{a,b}.

	Overall n (weighted %)	Not open to e-cigarette use weighted % (95% CI)	Open to e-cigarette use weighted % (95% CI)
Overall	10,419	76.2 (74.5, 77.8)	23.8 (22.2, 25.5)
Sex			
Female	5387	75.4 (72.9, 77.7)	24.6 (22.3, 27.1)
Male	4986	77.1 (75.3, 78.7)	23.0 (21.3, 24.7)
Age			
< 13–14 years	6523	77.7 (75.8, 79.4)	22.4 (20.1, 24.2)
15–16 years	2516	73.0 (70.3, 75.5)	27.0 (24.5, 29.7)
17–18+ years	1363	75.5 (71.3, 79.3)	24.5 (20.7, 28.7)
Race/ethnicity			
Non-Hispanic white	5012	77.7 (74.9, 80.2)	22.4 (19.8, 25.1)
Non-Hispanic black	1322	77.1 (73.7, 80.2)	22.9 (19.8, 26.3)
Hispanic	2611	71.8 (69.8, 73.7)	28.2 (26.3, 30.2)
Asian	483	76.0 (70.3, 80.9)	24.0 (19.1, 29.7)
Multiple and other	561	73.8 (69.3, 77.8)	26.2 (22.2, 30.7)
School type			
Middle school (6–8th grade)	6023	78.0 (76.1, 79.8)	22.0 (20.2, 23.9)
High school (9–12th grade)	4373	73.8 (71.3, 76.2)	26.2 (23.8, 28.7)
E-cigarette harm perceptions			
No harm	804	25.3 (53.5, 63.0)	41.7 (37.1, 46.5)
Little harm	2658	59.8 (56.4, 63.0)	40.2 (37.0, 43.6)
Some harm	3606	78.4 (76.6, 80.2)	21.6 (19.8, 23.4)
A lot of harm	3191	91.4 (90, 92.6)	8.6 (7.4, 10.0)
E-cigarette ad exposure: internet			
Not high exposure	8883	76.0 (74.2, 77.7)	24.0 (22.3, 25.8)
High exposure	1046	75.7 (72.7, 78.5)	24.3 (21.5, 27.3)
E-cigarette ad exposure:			
Newspapers or magazines			
Not high exposure	6425	75.1 (73.2, 76.9)	24.9 (23.2, 26.8)
High exposure	736	75.1 (71.9, 78.1)	24.9 (22, 28.2)
E-cigarette ad exposure: stores			
Not high exposure	6922	76.2 (74.0, 78.3)	23.8 (21.7, 26.0)
High exposure	2937	75.0 (73.4, 76.5)	25.1 (23.5, 26.6)
E-cigarette ad exposure: television			
Not high exposure	8546	75.7 (74.0, 77.4)	24.3 (22.6, 26.0)
High exposure	1262	77.4 (74.1, 80.5)	22.6 (19.5, 25.9)

CI = Confidence Interval.

^a Never users of any tobacco product are respondents who reported never having used or tried cigarettes, cigars, cigarillos, little cigars, or e-cigarettes.

^b Respondents were asked the following two items to assess openness about electronic cigarettes: “Do you think you will try an electronic cigarette or e-cigarette soon?” and “if one of your best friends were to offer you an electronic cigarette or e-cigarette, would you use it?” response options for both items were “definitely yes,” “probably yes,” “probably not,” and “definitely not.” respondents who answered “definitely not” to both items were considered “not open to using e-cigarettes” and those who indicated anything other than “definitely not” to one or both items were categorized as “open to using e-cigarettes.”

Table 2

Bivariate associations between demographic, harm perceptions, and advertising correlates and e-cigarette curiosity among never users of tobacco products - NYTS 2015^a.

	Overall n	Not curious ^b weighted % (95% CI)	Somewhat curious ^b weighted % (95% CI)	Highly curious ^b weighted % (95% CI)
Overall	10,419	74.6 (72.7, 76.4)	12.3 (11.3, 13.3)	13.1 (11.8, 14.5)
Sex				
Female	5387	73.0 (70.6, 75.3)	12.1 (10.8, 13.5)	14.9 (13.0, 16.9)
Male	4986	76.2 (73.8, 78.4)	12.5 (11.2, 13.9)	11.3 (9.9, 12.8)
Age				
< 13–14 years	6523	76.4 (74.0, 78.5)	11.5 (10.4, 12.8)	12.1 (10.8, 13.5)
15–16 years	2516	70.3 (67.6, 72.8)	13.9 (12.3, 15.6)	15.8 (13.5, 18.4)
17–18+ years	1363	74.5 (70.9, 77.8)	12.6 (10.4, 15.3)	12.9 (10.7, 15.5)
Race/ethnicity				
Non-Hispanic white	5012	76.1 (73.2, 78.8)	12.2 (10.9, 13.6)	11.7 (9.9, 13.8)
Non-Hispanic black	1322	75.1 (71.7, 78.2)	9.6 (7.6, 12.0)	15.3 (12.9, 17.9)
Hispanic	2611	69.3 (66.9, 71.5)	14.4 (12.8, 16.1)	16.3 (14.5, 18.3)
Asian	483	79.5 (74.3, 83.8)	11.0 (8.3, 14.5)	9.5 (6.8, 13.1)
Multiple and other	561	70.8 (65.9, 75.3)	14.2 (10.5, 18.9)	15.0 (11.7, 19.0)
School type				
Middle school (6–8th grade)	6023	77.0 (74.6, 79.2)	11.6 (10.4, 12.9)	11.4 (10.1, 12.8)
High school (9–12th grade)	4373	71.5 (68.9, 73.9)	13.1 (11.8, 14.6)	15.3 (13.4, 17.5)
E-cigarette harm perceptions				
No harm	804	59.2 (54.7, 63.7)	14.5 (11.2, 18.6)	26.2 (23.3, 29.4)
Little harm	2658	57.6 (54.5, 60.5)	18.7 (17.1, 20.5)	23.7 (21.2, 26.4)
Some harm	3606	76.6 (74.4, 78.6)	13.1 (11.5, 14.8)	10.4 (9.0, 11.9)
A lot of harm	3191	89.9 (88.4, 91.2)	5.6 (4.8, 6.7)	4.4 (3.6, 5.4)
E-cigarette ad exposure: internet				
Not high exposure	8883	74.1 (72.0, 76.0)	12.5 (11.5, 13.6)	13.4 (12.1, 14.9)
High exposure	1046	74.8 (70.9, 78.3)	12.1 (10.1, 14.4)	13.2 (10.4, 16.5)
E-cigarette ad exposure: newspapers or magazines				
Not high exposure	6425	73.3 (71.2, 75.3)	12.9 (11.8, 14.0)	13.8 (12.4, 15.4)
High exposure	736	73.5 (68.6, 78.0)	13.7 (10.8, 17.3)	12.7 (9.9, 16.1)
E-cigarette ad exposure: stores				
Not high exposure	6922	74.7 (72.5, 76.7)	12.5 (11.4, 13.6)	12.8 (11.4, 14.4)
High exposure	2937	72.8 (70.0, 75.5)	12.5 (10.9, 14.2)	14.7 (12.9, 16.7)
E-cigarette ad exposure: television				
Not high exposure	8546	74.0 (72.0, 75.9)	12.6 (11.7, 13.6)	13.4 (12.0, 14.9)
High exposure	1262	74.9 (71.2, 78.2)	12.0 (9.5, 15.2)	13.1 (10.4, 16.3)

CI = Confidence Interval.

^aNever users of any tobacco product are respondents who reported never having used or tried cigarettes, cigars, cigarillos, little cigars, or e-cigarettes.

^b Respondents were asked the following item to assess curiosity about e-cigarettes: “Have you ever been curious about using an electronic cigarette or e-cigarette, even once or twice?” response options were “definitely yes,” “probably yes,” “probably not,” and “definitely not.” “definitely yes” and “probably yes” were combined to form the category “highly curious.” respondents who selected “probably not” were categorized as “somewhat curious” and respondents who selected “definitely not” were categorized as “not curious.”

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Table 3

Multivariate multinomial logistic regression: factors associated with e-cigarette curiosity among never users of tobacco products - NYTS 2015^a.

	Somewhat curious ^b adjusted odds ratio (95% CI)	Highly curious ^b adjusted odds ratio (95% CI)
Sex		
Female	Referent	Referent
Male	0.87 (0.70, 1.07)	0.56 (0.45, 0.70)
Age		
< 13–14 years	Referent	Referent
15–16 years	1.34 (0.84, 2.14)	0.96 (0.68, 1.35)
17–18+ years	1.16 (0.78, 1.74)	0.73 (0.47, 1.14)
Race/ethnicity		
Non-Hispanic white	Referent	Referent
Non-Hispanic black	0.82 (0.60, 1.13)	1.45 (1.14, 1.85)
Hispanic	1.42 (1.16, 1.73)	1.75 (1.34, 2.27)
Asian	0.79 (0.52, 1.20)	0.98 (0.63, 1.54)
Non-Hispanic multiple and other	1.15 (0.78, 1.70)	1.48 (1.01, 2.16)
School type		
Middle school (6–8th grade)	Referent	Referent
High school (9–12th grade)	0.93 (0.59, 1.46)	1.69 (1.13, 2.55)
E-cigarette harm perceptions		
No harm	Referent	Referent
Little harm	1.12 (0.76, 1.64)	0.75 (0.58, 0.98)
Some harm	0.57 (0.40, 0.82)	0.23 (0.17, 0.32)
A lot of harm	0.20 (0.13, 0.31)	0.10 (0.07, 0.13)
E-cigarette ad exposure: internet		
Not high exposure	Referent	Referent
High exposure	0.89 (0.59, 1.33)	0.92 (0.63, 1.33)
E-cigarette ad exposure: newspapers or magazines		
Not high exposure	Referent	Referent
High exposure	1.32 (0.77, 2.27)	1.14 (0.78, 1.65)
E-cigarette ad exposure: stores		
Not high exposure	Referent	Referent
High exposure	1.09 (0.90, 1.31)	1.25 (1.01, 1.53)
E-cigarette ad exposure: television		
Not high exposure	Referent	Referent
High exposure	0.98 (0.68, 1.42)	0.87 (0.65, 1.16)

CI = Confidence Interval.

^aNever users of any tobacco product are respondents who reported never having used or tried cigarettes, cigars, cigarillos, little cigars, or e-cigarettes.

^bRespondents were asked the following item to assess curiosity about electronic cigarettes: "Have you ever been curious about using an electronic cigarette?" response options were "definitely yes," "probably yes," "probably not," and "definitely not." "definitely yes" and "probably yes" were

combined to form the category “highly curious.” respondents who selected “probably not” were categorized as “somewhat curious” and respondents who selected “definitely not” were categorized as “not curious.” in the multinomial logistic regression model presented, “definitely not” and those that were “not curious” served as the reference category for both levels of curiosity (“highly” and “somewhat”). The adjusted odds ratios presented for each covariate include adjustment for all of the other variables presented in the table.

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Table 4

Multivariate logistic regression: factors associated with e-cigarette openness among never users of any tobacco product - NYTS 2015^a.

Open to e-cigarettes ^b adjusted odds ratio (95% CI)	
Sex	
Female	Referent
Male	0.77 (0.66, 0.91)
Age	
< 13–14 years	Referent
15–16 years	1.1 (0.79, 1.53)
17–18+ years	1.04 (0.72, 1.51)
Race/ethnicity	
Non-Hispanic white	Referent
Non-Hispanic black	1.0 (0.79, 1.27)
Hispanic	1.46 (1.20, 1.77)
Asian	1.24 (0.84, 1.82)
Multiple and other	1.28 (0.89, 1.83)
School type	
Middle school (6–8th grade)	Referent
High school (9–12th grade)	1.14 (0.82, 1.58)
E-cigarette harm perceptions	
No harm	Referent
Little harm	0.84 (0.63, 1.13)
Some harm	0.34 (0.25, 0.46)
A lot of harm	0.10 (0.07, 0.15)
E-cigarette ad exposure: internet	
Not high exposure	Referent
High exposure	1.1 (0.82, 1.44)
E-cigarette ad exposure: newspapers or magazines	
Not high exposure	Referent
High exposure	1.23 (0.90, 1.68)
E-cigarette ad exposure: stores	
Not high exposure	Referent
High exposure	1.22 (1.03, 1.44)
E-cigarette ad exposure: television	
Not high exposure	Referent
High exposure	0.78 (0.57, 1.07)

CI = Confidence Interval.

^aNever users of any tobacco product are respondents who reported never having used or tried cigarettes, cigars, cigarillos, little cigars, or e-cigarettes.

^bThe adjusted odds ratio compares never users of any tobacco product who are open to e-cigarette use compared to never users who are not open to e-cigarette use. The adjusted odds ratios presented for each covariate include adjustment for all of the other variables presented in the table.