HHS Public Access

Author manuscript

Nicotine Tob Res. Author manuscript; available in PMC 2015 September 15.

Published in final edited form as:

Nicotine Tob Res. 2013 September ; 15(9): 1623–1627. doi:10.1093/ntr/ntt013.

Awareness and Ever Use of Electronic Cigarettes Among U.S. Adults, 2010–2011

Brian A. King, PhD, MPH[1,2], **Suhana Alam, MPH**[1,3], **Gabbi Promoff, MA**[1], **Rene Arrazola, MPH**[1], and **Shanta R. Dube, PhD, MPH**[1]

[1]Office on Smoking and Health, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, Atlanta, GA

[2]Epidemic Intelligence Service, Division of Applied Sciences, Scientific Education and Professional Development Program Office, Centers for Disease Control and Prevention, Atlanta, GA

[3]Oak Ridge Institute for Science and Education, Oak Ridge, TN

Abstract

Introduction—Electronic cigarettes, or e-cigarettes, were introduced into the U.S. market in recent years. However, little is known about the health impact of the product or the extent of its use. This study assessed the prevalence and correlates of awareness and ever use of e-cigarettes among U.S. adults during 2010–2011.

Methods—Data were obtained from the *HealthStyles* survey, a national consumer-based survey of U.S. adults aged ≥18 years old. In 2010, data collection for the *HealthStyles* survey was both mail-based (n = 4,184) and web-based (n = 2,505), and in 2011, web-based (n = 4,050) only. Estimates of awareness and ever use of e-cigarettes were calculated overall and by sex, age, race/ethnicity, educational attainment, household income, region, and smoking status.

Results—In 2010, overall awareness of e-cigarettes was 38.5% (mail survey) and 40.9% (web survey); in 2011, awareness was 57.9% (web survey). Ever use of e-cigarettes among all respondents was 2.1% in the 2010 mail survey, 3.3% in the 2010 web survey, and 6.2% in the 2011 web survey. Ever use of e-cigarettes was significantly higher among current smokers compared with both former and never-smokers, irrespective of survey method or year. During 2010–2011, ever use increased among both sexes, those aged 45–54 years, non-Hispanic Whites, those living in the South, and current and former smokers.

Conclusions—Awareness and ever use of e-cigarettes increased among U.S. adults from 2010 to 2011. In 2011, approximately 1 in 5 current smokers reported having ever used e-cigarettes. Continued surveillance of e-cigarettes is needed for public health planning.

Corresponding Author: Brian A. King, Ph.D., M.P.H., Office on Smoking and Health, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, 4770 Buford Highway, MS K-50, Atlanta, GA 30341, USA. Telephone: 770.488.5107; Fax: 770.488.5848; baking@cdc.gov.

DECLARATION OF INTEREST

None declared.

INTRODUCTION

Electronic cigarettes, or e-cigarettes, are battery powered devices that provide inhaled doses of nicotine and other additives to the user (Food and Drug Administration [FDA], 2009). Depending on the brand, e-cigarette cartridges typically contain nicotine, humectants to produce the vapor (e.g., propylene glycol or glycerol), and flavorings (e.g., tobacco, mint, fruit, chocolate) (Etter, Bullen, Flouris, Laugesen, & Eissenberg, 2011). Since becoming available in the United States, e-cigarettes have been promoted as being more cost-effective, amenable to use in smoking-restricted environments, and socially acceptable than traditional cigarettes (Cobb, Byron, Abrams, & Shields, 2010; Henningfield & Zaatari, 2010). E-cigarettes have also been marketed as smoking cessation aids (FDA, 2010a, 2010b, 2010c, 2010d, 2010e). However, there is currently no conclusive scientific evidence that e-cigarettes promote long-term cessation (Etter et al., 2011), and e-cigarettes are not included as a recommended smoking cessation method by the U.S. Public Health Service (PHS, 2008).

The Family Smoking Prevention and Tobacco Control Act of 2009 gave the U.S. FDA the authority to regulate tobacco products, including the ability to propose certain requirements and restrictions on manufacturing, marketing, and distribution (Government Printing Office [GPO], 2009). The Act defines a tobacco product, in part, as any product made or derived from tobacco that is not a drug, device, or combination product under the Act. In 2010, the U.S. Court of Appeals held that e-cigarettes and other products made or derived from tobacco can be regulated as tobacco products under the Act unless they are marketed for therapeutic purposes, in which case they are regulated as drugs and/or devices (D.C. Circuit, U.S. Court of Appeals, 2010). Currently, e-cigarettes that are marketed for therapeutic purposes are regulated by the FDA Center for Drug Evaluation and Research (FDA, 2012). The FDA Center for Tobacco Products currently regulates cigarettes, cigarette tobacco, roll-your-own tobacco, and smokeless tobacco (FDA, 2012), and in 2011, announced its intent to expand jurisdiction to all tobacco products, including e-cigarettes (GPO, 2011).

Many public health professionals are concerned that e-cigarettes may have an adverse impact on users' health, encourage smoking initiation, perpetuate the use of nicotine and tobacco products among smokers who might otherwise quit, and counter the effectiveness of smoke-free policies (Etter et al., 2011; Henningfield & Zaatari, 2010). Potentially harmful constituents also have been identified in some e-cigarette cartridges (Cobb et al., 2010; FDA, 2009). Conversely, proponents of e-cigarettes contend that the product is markedly less harmful to health than traditional cigarettes and may help some smokers quit (Cahn & Siegel, 2011). Although e-cigarettes are becoming increasingly popular (Ayers, Ribisl, & Brownstein, 2011), data on awareness and use of the product are limited (McMillen, Maduka, & Winickoff, 2012; Pearson, Richardson, Niaura, Vallone, & Abrams, 2012). A recent study found that awareness of e-cigarettes doubled from 16.4% in 2009 to 32.2% in 2010, whereas ever use among those aware of the product quadrupled from 0.6% to 2.7% (Regan, Promoff, Dube, & Arrazola, 2011). However, no known study has assessed more recent changes in e-cigarette awareness and use. To address this need, we analyzed data from the 2010 and 2011 *HealthStyles* surveys to determine estimates of the prevalence and sociodemographic correlates of awareness and ever use of e-cigarettes among U.S. adults.

METHODS

Data Source

Data were obtained from *Styles*, a series of national consumer panel surveys administered in seasonal waves. The *HealthStyles* survey assesses exposure to health-related information and self-reported symptoms, risk factors, and diseases among U.S. adults aged ≥18 years old. In preparation for transitioning to online-only methodology, both mail (August–September) and web (July–August) versions of *HealthStyles* were fielded in 2010. Only a web (July–August) version was fielded in 2011.

Sample

For the 2010 mail-based *Styles*, sampling and data collection were conducted by Synovate, Inc., which recruited consumers to join a mail panel. Stratified random sampling (by region, household income, population density, age, and household size) of the panel was used to select a nationally representative sample, which received the *ConsumerStyles* survey. The 2010 mail-based *HealthStyles* was sent to households that completed *ConsumerStyles* (*n* = 6,255).

For the 2010 and 2011 web-based *Styles*, sampling and data collection were conducted by Knowledge Networks, which recruited a nationally representative online panel. Panel members are randomly recruited by probability-based sampling (random-digit dial and address based) to reach respondents regardless of whether they have a landline phone or Internet access. Households are provided with a computer and Internet access as needed. The panel is continuously replenished and maintains approximately 50,000 panelists. A random sample of 3,922 and 5,865 panelists were asked to participate in the 2010 and 2011 web-based *HealthStyles*, respectively.

Final sample sizes were 4,184 for the 2010 mail survey, 2,505 for the 2010 web survey, and 4,050 for the 2011 web survey. Response rates were 66.9%, 64.0%, and 69.0%, respectively.

Measures

Awareness—Awareness of e-cigarettes was assessed using the question, “Which, if any, of the following products have you heard of?” Respondents who selected “electronic cigarettes or e-cigarettes” were considered aware of e-cigarettes.

Ever Use—Ever use of e-cigarettes was assessed using the question, “Have you ever tried any of the following products, even just one time?” Respondents who selected “electronic cigarettes or e-cigarettes” were considered ever e-cigarette users.

Respondent Characteristics—Respondent characteristics included sex, age, race/ethnicity, education, annual household income, U.S. Census region, and smoking status. Current smokers were defined as respondents who smoked ≥100 cigarettes in their lifetime and now smoked everyday or somedays.

Analysis

Data were analyzed using SAS v. 9.2 and weighted according to 2010 and 2011 Current Population Survey population distributions. National prevalence estimates and 95% *CI*s were calculated. Differences were considered statistically significant if *CI*s did not overlap. Estimates with a relative *SE* of ≥40% were not reported.

RESULTS

Awareness

Awareness of e-cigarettes was 38.5% in the 2010 mail survey, 40.9% in the 2010 web survey, and 57.9% in the 2011 web survey (Table 1). No significant difference in awareness of e-cigarettes was observed between males and females, irrespective of survey method or year. In all three surveys, awareness of e-cigarettes was significantly lower among individuals ≥65 years old compared with younger age groups, and significantly lower among non-Hispanic Blacks compared with non-Hispanic Whites. Awareness of e-cigarettes was significantly lower among those with less than a high school education in the 2010 mail and 2011 web surveys, but no significant difference was observed by education level in the 2011 mail survey. No consistent differences in awareness of e-cigarettes were observed by income level or U.S. region across surveys. By smoking status, awareness of e-cigarettes was significantly higher among current smokers compared with former and never-smokers, regardless of survey method or year. When compared with the 2010 web survey, awareness of e-cigarettes in the 2011 web survey increased among all subpopulations except for those aged 18–34 years, Hispanics, those of non-Hispanic "Other" race, those with less than a high school education, and those with annual household income <$25,000.

Ever Use

Ever use of e-cigarettes was 2.1% in the 2010 mail survey, 3.3% in the 2010 web survey, and 6.2% in the 2011 web survey (Table 1). Irrespective of survey method or year, no significant difference in ever use of e-cigarettes was observed by sex, age, race/ethnicity, education, income, or U.S. region. In all three surveys, ever use of e-cigarettes was significantly higher among current smokers compared with both former and never-smokers. Among current smokers, ever use of e-cigarettes was 21.2% in the 2011 web survey compared with 6.8% in the 2010 mail survey and 9.8% in the 2010 web survey. When compared with the 2010 web survey, ever use of e-cigarettes in the 2011 web survey increased among both sexes, those aged 45–54 years, non-Hispanic Whites, those who live in the South, and both current and former smokers.

DISCUSSION

This study is the first to report changes in the national prevalence of e-cigarette awareness and use among U.S. adults between 2010 and 2011. The findings reveal that the awareness and use of e-cigarettes are increasing. Approximately 6 in 10 adults were aware of e-cigarettes in 2011 compared with 4 in 10 adults in 2010. Moreover, in 2011, 6.2% of all adults and 21.2% of current smokers had ever used e-cigarettes, representing an approximate doubling of 2010 estimates. These findings underscore the need for rigorous surveillance of

e-cigarettes and their impact on smoking initiation, smoking cessation, concurrent use with combustible products, users' health, and smoke-free policy compliance.

Differences in awareness and use of e-cigarettes were observed across subpopulations. Specifically, adults <65 years of age, non-Hispanic Whites, and current/former smokers were most aware of e-cigarettes. Higher awareness among younger adults may be related to the fact that e-cigarettes are traditionally marketed through electronic and social media (Noel, Rees, & Connolly, 2011; Yamin, Bitton, & Bates, 2010). In contrast, the only consistent statistically significant difference in e-cigarette use was between current smokers and nonsmokers. The higher prevalence of use among current smokers could be related to the marketing of e-cigarettes as smoking cessation aids (FDA, 2010a, 2010b, 2010c, 2010d, 2010e). Because e-cigarettes resemble traditional cigarettes and their use could potentially result in increased nicotine addiction and the initiation of tobacco smoking, further surveillance of e-cigarette use is warranted, particularly among youth and young adults, who are particularly susceptible to social and environmental influences to use tobacco (U.S. Department of Health and Human Services, 2012).

The impact of e-cigarette use on public health remains uncertain (Etter et al., 2011). Some research has shown that e-cigarettes are most frequently used as a smoking cessation aid (Etter, 2010), might alleviate the desire to smoke after abstinence (Bullen et al., 2010), and may reduce cigarette consumption and encourage short periods of smoking abstinence (Caponnetto, Polosa, Russo, Leotta, & Campagna, 2011; Polosa et al., 2011; Siegel, Tanwar, & Wood, 2011). However, e-cigarettes are presently unregulated and produced by numerous small manufacturers (Etter et al., 2011). Potentially harmful constituents have also been documented in some e-cigarette cartridges, including diethylene glycol, irritants, genotoxins, and animal carcinogens (Cobb et al., 2010; FDA, 2009). In addition, the tobacco industry is evolving rapidly. The e-cigarette manufacturer, blu Cigs, was recently acquired by Lorillard, Inc. (PR Newswire, 2012), and the product has been advertised as an alternative to cigarettes in a nationally televised commercial (Internet Movie Database, 2012). Other noncombustible nicotine products have been promoted by the tobacco industry as an alternative that allows smokers to access nicotine in situations where it is legally or socially unacceptable to smoke (Curry, Pederson, & Stryker, 2011). Accordingly, further research is needed on the long-term impact of e-cigarette use on tobacco cessation and initiation, concurrent product use, and users' health.

The impact of e-cigarettes on smoke-free policy compliance should also be evaluated. The use of e-cigarettes in public areas in which cigarette smoking is prohibited could counter the effectiveness of these policies by complicating enforcement and giving the appearance that smoking is acceptable (Etter et al., 2011). Research suggests that smoke-free policies increase the social unacceptability of smoking and enhance quit intentions and behaviors (Brown, Moodie, & Hastings, 2009). To date, some states and localities have enacted policies that restrict e-cigarette use in public places, whereas others have exempted e-cigarettes from smoke-free legislation (Global Advisors Smoke-Free Policy, 2011).

This study is subject to at least four limitations. First, *HealthStyles* is not a population-based probability survey. Research suggests that random-digit-dial and Internet panel probability

samples may be more representative than nonprobability Internet samples (Yeager et al., 2011). Nonetheless, data were weighted to be nationally representative and tobacco use estimates from *Styles* are consistent with other national household surveys (Regan et al., 2011). Second, data collection methods varied across surveys; however, estimates from the 2010 mail and web surveys were comparable. Third, small sample sizes for some subpopulations resulted in less precise estimates that could not be presented. Limited sample size also prevented the presentation of estimates of current e-cigarette use. Finally, survey responses were self-reported, which could lead to reporting bias; although studies have confirmed the validity of self-reported smoking (Caraballo, Giovino, & Pechacek, 2004), the accuracy of self-reported e-cigarette use is uncertain.

In conclusion, findings from the *HealthStyles* survey suggest that awareness and use of e-cigarettes increased among U.S. adults during 2010–2011, particularly among current smokers. Since e-cigarette use may continue to increase with time and could have either deleterious or beneficial effects on public health depending on its impact on smoking initiation and cessation, appropriate public health surveillance of the product is warranted.

ACKNOWLEDGMENTS

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

FUNDING

This project was supported in part by an appointment to the Research Participation Program at the Centers for Disease Control and Prevention (CDC) administered by the Oak Ridge Institute for Science and Education through an interagency agreement between the U.S. Department of Energy and the CDC (DE-AC05-06OR23100).

REFERENCES

Ayers JW, Ribisl KM, Brownstein JS. Tracking the rise in popularity of electronic nicotine delivery systems (electronic cigarettes) using search surveillance. American Journal of Preventive Medicine. 2011; 40:448–453. doi:10.1016/j.amepre.2010.12.007. [PubMed: 21406279]

Brown A, Moodie C, Hastings G. A longitudinal study of policy effect (smoke-free legislation) on smoking norms: ITC Scotland/United Kingdom. Nicotine & Tobacco Research. 2009; 11:924–932. doi:10.1093/ntr/ntp087. [PubMed: 19541947]

Bullen C, McRobbie H, Thornley S, Glover M, Lin R, Laugesen M. Effect of an electronic nicotine delivery device (e cigarette) on desire to smoke and withdrawal, user preferences and nicotine delivery: Randomised cross-over trial. Tobacco Control. 2010; 19:98–103. doi:10.1136/tc.2009.031567. [PubMed: 20378585]

Cahn Z, Siegel M. Electronic cigarettes as a harm reduction strategy for tobacco control: A step forward or a repeat of past mistakes? Journal of Public Health Policy. 2011; 32:16–31. doi:10.1057/jphp.2010.41. [PubMed: 21150942]

Caponnetto P, Polosa R, Russo C, Leotta C, Campagna D. Successful smoking cessation with electronic cigarettes in smokers with a documented history of recurring relapses: A case series. Journal of Medical Case Reports. 2011; 5:585. doi:10.1186/1752-1947-5-585. [PubMed: 22185668]

Caraballo RS, Giovino GA, Pechacek TF. Self-reported cigarette smoking vs. serum cotinine among U.S. adults. Nicotine & Tobacco Research. 2004; 6:19–25. doi:10. 1080/14622200310001656821. [PubMed: 14982684]

Cobb NK, Byron MJ, Abrams DB, Shields PG. Novel nicotine delivery systems and public health: The rise of the “e-cigarette”. American Journal of Public Health. 2010; 100:2340–2342. doi:10.2105/AJPH.2010.199281. [PubMed: 21068414]

Curry LE, Pederson LL, Stryker JE. The changing marketing of smokeless tobacco in magazine advertisements. Nicotine & Tobacco Research. 2011; 13:540–547. doi:10.1093/ntr/ntr038. [PubMed: 21436294]

U.S. Court of Appeals. Sottera, Inc. v. Food & Drug Administration. 2010 D.C. Circuit. 627 F.3d 891.

Etter JF. Electronic cigarettes: A survey of users. BMC Public Health. 2010; 10:231. doi: 10.1186/1471-2458-10-231. [PubMed: 20441579]

Etter JF, Bullen C, Flouris AD, Laugesen M, Eissenberg T. Electronic nicotine delivery systems: A research agenda. Tobacco Control. 2011; 20:243–248. doi:10.1136/tc.2010.042168. [PubMed: 21415064]

Food and Drug Administration (FDA). Evaluation of e-cigarettes. 2009. Center for Drug Evaluation and Research. Retrieved November 17, 2012, from www.fda.gov/downloads/Drugs/ScienceResearch/UCM173250.pdf

FDA. Warning letter to E-CigaretteDirect, LLC. 2010a. Retrieved November 17, 2012, from www.fda.gov/ICECI/EnforcementActions/WarningLetters/2010/ucm225178.htm

FDA. Warning letter to Ruyan America, Inc. 2010b. Retrieved November 17, 2012, from www.fda.gov/ICECI/EnforcementActions/WarningLetters/2010/ucm225181.htm

FDA. Warning letter to Gamucci America. 2010c. Retrieved November 17, 2012, from www.fda.gov/ICECI/EnforcementActions/WarningLetters/2010/ucm225177.htm

FDA. Warning letter to E-Cig Technology Inc. 2010d. Retrieved November 17, 2012, from www.fda.gov/ICECI/EnforcementActions/WarningLetters/2010/ucm225187.htm

FDA. Warning letter to Johnson Creek Enterprises, LLC. 2010e. Retrieved November 17, 2012, from www.fda.gov/ICECI/EnforcementActions/WarningLetters/2010/ucm225206.htm

FDA. Electronic cigarettes (e-cigarettes). 2012. Retrieved January 9, 2013, from www.fda.gov/newsevents/publichealthfocus/ucm172906.htm

Global Advisors Smoke-Free Policy. Electronic cigarettes (E-cigarettes). 2011. Tobacco Control Policy and Legal Resource Center. Retrieved November 17, 2012, from www.njgasp.org/E-Cigs_White_Paper.pdf

Government Printing Office (GPO). Family Smoking Prevention and Tobacco Control Act. 2009. Public Law 111-31. Retrieved January 9, 2013, from www.gpo.gov/fdsys/pkg/PLAW-111publ31/content-detail.html

GPO. 2011. Federal Register/Vol. 76, No. 130/Thursday, July 7, 2011/Unified Agenda. Retrieved November 17, 2012, from www.gpo.gov/fdsys/pkg/FR-2011-07-07/pdf/2011-15487.pdf

Henningfield JE, Zaatari GS. Electronic nicotine delivery systems: Emerging science foundation for policy. Tobacco Control. 2010; 19:89–90. doi:10.1136/tc.2009.035279. [PubMed: 20378582]

Internet Movie Database. Demo Reel (Blu E-cig National TV Commercial). 2012. Retrieved November 17, 2012, from www.imdb.com/video/demo_reel/vi2066392089/

McMillen R, Maduka J, Winickoff J. Use of emerging tobacco products in the United States. Journal of Environmental Public Health. 2012; 2012:989474. doi:10.1155/2012/989474. [PubMed: 22654922]

Noel JK, Rees VW, Connolly GN. Electronic cigarettes: A new 'tobacco' industry? Tobacco Control. 2011; 20:81. doi:10.1136/tc.2010.038562. [PubMed: 20930060]

Pearson JL, Richardson A, Niaura RS, Vallone DM, Abrams DB. E-cigarette awareness, use, and harm perceptions in U.S. adults. American Journal of Public Health. 2012; 102:1758–1766. doi:10.2105/AJPH/2011.300526. [PubMed: 22813087]

Polosa R, Caponnetto P, Morjaria J, Papale G, Campagna D, Russo C. Effect of an electronic nicotine delivery device (e-cigarette) on smoking reduction and cessation: A prospective 6-month pilot study. BMC Public Health. 2011; 11:786. doi:10.1186/1471-2458-11-786. [PubMed: 21989407]

PR Newswire. Blu ecigs the leading electronic cigarette company acquired by Lorillard. 2012. Retrieved November 17, 2012, from www.prnewswire.com/news-releases/bluecigs-the-leading-electronic-cigarette-company-acquired-by-lorillard-148846505.html

Public Health Service (PHS). Treating tobacco use and dependence: 2008 update. 2008. Clinical practice guideline. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service. Retrieved November 17, 2012, from www.ahrq.gov/path/tobacco.htm

Regan AK, Promoff G, Dube SR, Arrazola R. Electronic nicotine delivery systems: Adult use and awareness of the 'e-cigarette' in the USA. Tobacco Control. 2011 [Epub ahead of print]. doi: 10.1136/tobaccocontrol-2011-050044.

Siegel MB, Tanwar KL, Wood KS. Electronic cigarettes as a smoking-cessation tool: Results from an online survey. American Journal of Preventive Medicine. 2011; 40:472–475. doi:10.1016/j.amepre.2010.12.006. [PubMed: 21406283]

U.S. Department of Health and Human Services. Preventing tobacco use among youth and young adults: A report of the Surgeon General. 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; Atlanta, GA: 2012. Retrieved from www.surgeongeneral.gov/library/reports/preventing-youth-tobacco-use/index.html

Yamin CK, Bitton A, Bates DW. E-cigarettes: A rapidly growing internet phenomenon. Annals of Internal Medicine. 2010; 53:607–609. doi:10.1059/0003/4819-153-9-201011020-00011. [PubMed: 21041581]

Yeager DS, Krosnick JA, Chang LC, Javitz HS, Levendusky MS, Simpser A, Wang R. Comparing the accuracy of RDD telephone surveys and internet surveys conducted with probability and non-probability samples. Public Opinion Quarterly. 2011; 75:709–747. doi:10.1093/poq/nfr020.

Table 1

Awareness and Ever Use of Electronic Cigarettes Among U.S. Adults—*HealthStyles*, 2010–2011

	Awareness of electronic cigarettes[a] (% [95% *CI*])			Ever use of electronic cigarettes[b] (% [95% *CI*])		
	2010 Mail	2010 Web	2011 Web	2010 Mail	2010 Web	2011 Web
Characteristic	***n* = 4,184**	***n* = 2,505**	***n* = 4,050**	***n* = 4,184**	***n* = 2,505**	***n* = 4,050**
Sex						
Male	40.8 [37.4–44.2]	44.1 [40.7–47.5]	60.9 [57.9–63.8]	2.3 [1.3–3.4]	3.0 [1.9–4.2]	5.8 [4.4–7.2]
Female	36.4 [32.7–40.1]	37.9 [34.7–41.1]	55.1 [52.2–58.0]	1.9 [1.3–2.6]	3.7 [2.4–4.9]	6.6 [5.1–8.2]
Age (years)						
18–24	47.4 [32.6–62.2]	45.0 [37.4–52.6]	56.8 [49.7–63.9]	*c*	7.0 [3.0–10.9]	8.1 [4.0–12.2]
25–34	48.6 [43.0–54.1]	48.4 [42.6–54.3]	58.3 [52.6–63.8]	2.9 [1.1–4.7]	3.1 [1.4–4.8]	6.6 [3.9–9.3]
35–44	39.9 [35.8–43.9]	43.7 [38.3–49.1]	60.0 [55.4–64.6]	3.4 [2.0–4.8]	3.2 [1.4–5.0]	5.7 [3.6–7.7]
45–54	42.8 [39.7–45.8]	47.9 [42.6–53.2]	65.4 [61.1–69.6]	1.9 [1.0–2.8]	3.2 [1.3–5.2]	8.0 [5.5–10.5]
55–64	33.8 [30.1–37.4]	37.7 [32.6–42.8]	61.2 [56.8–65.6]	2.2 [0.9–3.4]	2.9 [1.1–4.8]	5.5 [3.4–7.5]
≥65	19.0 [16.2–21.7]	21.4 [16.9–25.9]	44.6 [40.0–49.2]	0.8 [0.2–1.4]	*c*	3.7 [1.9–5.4]
Race/ethnicity						
White, non-Hispanic	42.5 [39.6–45.4]	44.3 [41.5–47.2]	62.6 [60.3–64.9]	2.4 [1.6–3.2]	3.8 [2.7–4.9]	6.8 [5.6–8.1]
Black, non-Hispanic	26.6 [20.8–32.3]	25.6 [19.7–31.4]	50.0 [43.0–57.0]	*c*	*c*	4.5 [1.6–7.3]
Other, non-Hispanic	31.3 [23.6–39.0]	41.8 [32.6–51.1]	48.5 [39.4–57.6]	1.8 [0.4–3.2]	*c*	6.1 [1.8–10.4]
Hispanic	31.9 [23.3–40.6]	36.2 [30.1–42.3]	44.4 [37.8–51.1]	2.3 [0.9–3.7]	3.0 [1.0–5.1]	3.9 [1.1–6.7]
Education						
Less than high school	19.1 [12.8–25.3]	40.3 [33.9–46.7]	42.6 [35.0–50.2]	*c*	4.3 [1.7–6.9]	7.4 [3.4–11.4]
High school graduate	37.2 [32.3–42.0]	41.0 [36.8–45.2]	56.4 [52.6–60.3]	3.1 [1.3–5.0]	4.0 [2.2–5.7]	7.5 [5.4–9.7]
Some college	41.3 [36.6–46.0]	40.6 [36.3–44.9]	62.5 [59.0–66.0]	2.3 [1.4–3.2]	3.6 [2.0–5.1]	6.1 [4.6–7.7]
College graduate	39.3 [36.1–42.5]	41.4 [36.8–45.9]	61.7 [58.4–64.9]	1.5 [0.7–2.2]	2.0 [0.8–3.2]	4.4 [2.9–5.9]
Annual household income						
<$15,000	26.1 [21.1–31.1]	42.6 [36.2–49.0]	52.1 [45.2–58.9]	1.1 [0.3–1.9]	3.5 [1.5–5.6]	7.5 [4.3–10.7]
$15,000-$24,999	31.8 [24.7–39.0]	43.5 [36.0–50.9]	54.6 [47.2–62.0]	1.6 [0.4–2.9]	*c*	5.7 [1.9–9.4]
$25,000-$39,999	39.5 [32.8–46.3]	36.4 [31.1–41.6]	55.9 [50.4–61.3]	2.9 [0.6–5.2]	3.5 [1.3–5.8]	9.4 [5.7–13.0]
$40,000-$59,999	41.2 [35.3–47.1]	41.7 [36.5–46.8]	53.4 [48.4–58.4]	1.9 [0.7–3.1]	2.5 [1.1–3.8]	4.9 [2.9–6.9]
≥$60,000	42.7 [38.8–46.6]	41.1 [37.3–44.8]	61.8 [59.0–64.6]	2.4 [1.5–3.3]	3.5 [2.1–4.9]	5.6 [4.3–7.0]
U.S. Census region[d]						
Northeast	35.3 [29.1–41.5]	38.5 [32.7–44.3]	57.3 [52.6–62.0]	1.1 [0.3–1.9]	*c*	5.6 [3.5–7.7]
Midwest	46.3 [41.3–51.3]	46.6 [42.0–51.2]	61.1 [57.0–65.1]	3.3 [1.5–5.1]	5.4 [3.1–7.6]	7.7 [5.3–10.1]
South	35.3 [31.5–39.1]	38.4 [34.4–42.4]	57.9 [54.3–61.5]	1.4 [0.8–2.0]	2.5 [1.4–3.6]	6.2 [4.4–8.0]
West	37.4 [31.4–43.4]	41.3 [36.7–46.0]	55.4 [51.0–59.7]	3.0 [1.7–4.2]	3.7 [2.0–5.5]	5.3 [3.3–7.3]
Smoking status						
Current smokers	58.5 [52.5–64.4]	59.3 [54.2–64.3]	76.9 [72.2–81.5]	6.8 [4.6–8.9]	9.8 [6.9–12.6]	21.2 [17.0–25.4]
Former smoker	36.2 [31.8–40.5]	41.5 [37.0–46.0]	65.4 [61.7–69.1]	0.6 [0.2–1.1]	2.5 [0.8–4.2]	7.4 [5.0–9.7]
Never-smoker	33.8 [30.4–37.3]	34.6 [31.3–37.8]	50.1 [47.3–52.9]	1.2 [0.5–2.0]	1.3 [0.5–2.0]	1.3 [0.7–1.8]
Total	38.5 [36.0–41.0]	40.9 [38.6–43.2]	57.9 [55.8–60.0]	2.1 [1.5–2.7]	3.3 [2.5–4.2]	6.2 [5.2–7.3]

Note.

[a] Defined as a response of “electronic cigarettes or e-cigarettes” to the question, “Which, if any, of the following products have you heard of?”

[b] Defined as a response of “electronic cigarettes or e-cigarettes” to the question, “Have you tried any of the following products, even just one time?”

[c] Relative *SE* ≥ 40%.

[d] Northeast = Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont; Midwest = Indiana, Illinois, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin; South = Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, West Virginia; West = Alaska, Arizona, California, Colorado, Hawaii, Idaho, New Mexico, Montana, Oregon, Nevada, Utah, Washington, Wyoming.