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Characteristics of Adults Who Switched From Cigarette Smoking to E-cigarettes

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Abstract

Introduction—Because of the rapidly increasing use of electronic cigarettes (e-cigarettes), this study aimed to investigate the individual characteristics and state-level prevalence of U.S. adults who have switched to e-cigarettes from traditional cigarettes.

Methods—Data from the 2012–2013 and 2013–2014 National Adult Tobacco Surveys were analyzed in 2016. Relative percent change in switching was estimated, and the state-specific prevalence of adults who switched to e-cigarettes from traditional cigarettes was calculated and mapped. Multivariate logistic regression was conducted to examine how switching varied by sociodemographic subgroups and region.

Results—Overall, the number of individuals who switched from traditional cigarettes to e-cigarettes increased by approximately 100% over the 1-year interval. Significant increases were found among a number of sociodemographics and regions. Multivariate logistic regression analyses showed that young adults and those living in the South and West were more likely to switch to e-cigarettes, compared to former smokers who did not switch. Compared with current dual users, those with higher education and those who were not single were more likely to switch to e-cigarettes. The state with the highest prevalence of switching was New Mexico (7.3%), whereas Connecticut had the lowest prevalence (0.8 %) among former smokers.

Conclusions—There is an increase in the progression from traditional cigarette use to e-cigarette use. Further research is warranted to determine whether this change continues and

facilitates cigarette smoking cessation as a possible public health benefit and opportunity to save lives rather than constitutes a potential threat to public health.

INTRODUCTION

Since electronic cigarettes (e-cigarettes) entered the U.S. marketplace in 2007, there has been a rapid increase in their use among both adolescents and adults. Within just a few years, current use of e-cigarettes rose from 1.9% to 3.3% among adults,^{1,2} and a remarkable tenfold increase from 1.5% to 16.0% among adolescents,³ while the prevalence of current cigarette smoking among U.S. adults has declined steadily.⁴ In 2014, 12.6% of U.S. adults overall and 55.4% of former cigarette smokers had tried e-cigarettes.⁵ The diversity of its products and patterns of use pose challenges for researchers to make definitive conclusions about the place of e-cigarettes in tobacco control; research suggests that e-cigarettes have the potential to assist smoking cessation or risk reduction by decreasing cigarette consumption among cigarette smokers.^{6,7} In contrast, a number of studies have also highlighted the potential risks associated with use of e-cigarettes, such as nicotine addiction⁸ and transition to traditional cigarettes⁵ and other tobacco products.⁹

A recent Cochrane review of e-cigarette use for cigarette cessation has indicated, based on data from two RCTs, that ex-cigarette smokers who use e-cigarettes are more likely to abstain from tobacco smoking for at least 6 months as compared to those using a placebo e-cigarette.¹⁰ This review, however, was based on only two studies, both of which have a number of shortcomings, such as small sample sizes and short follow-up periods. Nevertheless, several observational studies have indicated the potential benefits of e-cigarettes for treatment of tobacco use, such as alleviating desire to smoke, eliciting tobacco abstinence, and decreasing cigarette consumption.^{7,11–14} In contrast, the U.S. Preventive Services Task Force concluded in 2015 that the evidence was insufficient to recommend e-cigarettes for smoking cessation because of the limited amount of research.¹⁵ These concerns have been corroborated by a 2016 meta-analysis of e-cigarettes and smoking cessation that found that the odds of successful smoking cessation were 28% lower in those who used e-cigarettes in comparison with those who did not.¹⁶

To date, no nationally representative survey has been conducted to investigate the characteristics and state-specific prevalence of former smokers who switched to e-cigarettes at the national level. This study utilizes data from the 2012–2013 and 2013–2014 National Adult Tobacco Survey (NATS) to better understand the characteristics of former smokers who reported switching from conventional cigarettes to e-cigarettes.

METHODS

Study Sample

Data from the 2012–2013 and 2013–2014 NATS were used. These are the first years for which questions regarding e-cigarettes were asked. Details of the NATS design and methodologies are available elsewhere.^{17,18} Briefly, NATS was designed as a stratified, national telephone survey of U.S. non-institutionalized adults (aged ≥ 18 years) residing in

the 50 states and the District of Columbia; respondents were selected by random-digit dialing.

The sample design for NATS had specific semi-proportional goals by state and by sample frame. The state goals of the 2012–2013 NATS targeted a minimum of 800 completed surveys per state: 600 landline (75%) and 200 cell-only (25%) from each state. The top 20 most populous states with goals above 800 accounted for the remaining 36,000 surveys allocated across these states in approximate proportion to their population.¹⁷ For the 2013–2014 NATS, each state and the overall sample goals included 30% cell-only households and 70% landline households (regardless of whether they also had a cell phone). The state goals of the 2013–2014 NATS wave included a minimum of 1,000 combined completed surveys per state: 700 landline (70%) and 300 cell-only (30%). The 20 most populous states had goals above 1,000 interviews, with the remaining 44,000 completed surveys distributed across these states in approximate proportion to their populations.¹⁸ The samples of each frame were also disproportionately stratified by state to ensure adequate representation of each state, along with higher numbers of completed surveys from states with larger populations. The response rates of the NATS surveys were as follows: 2012–2013, total 44.9% with the response rate for landline being 47.2% and for cellular 36.3%; and 2013–2014, total 36.1%, landline 47.6%, cellular 17.1%.^{17,18} As the NATS is publicly available, this study was exempt from IRB approval.

Measures

Three main outcomes of interests were included: (1) switching to e-cigarettes; (2) former smokers who quit without switching; and (3) current dual e-cigarettes and cigarettes users. Switching to e-cigarettes from cigarette smoking was defined based on three question items. Respondents were asked the switching question only if they answered *less than or equal to 12 months* to the question *How long has it been since you completely stopped smoking cigarettes?* and *yes* to the question *Have you ever used an electronic cigarette, even just one time in your lifetime?* Among respondents who received the switching question, people who switched to electronic cigarettes from traditional cigarettes were identified by *yes* responses to the following question: *At any time during the past 12 months, did you completely switch from smoking traditional cigarettes to using electronic or e-cigarettes?* Participants were classified as former smokers if they smoked ≥ 100 cigarettes in their entire life and reported currently not smoking at all. Current dual use of e-cigarettes and cigarettes were identified using two questions. Current cigarette smokers were those who reported smoking ≥ 100 cigarettes in their life and who smoked “every day” or “some days” (versus “not at all”). Current e-cigarette users were those who responded *every day*, *some days*, or *rarely* to the question: *Do you now use electronic cigarettes?* Current dual use of e-cigarettes and cigarettes was identified when they were classified as both current cigarette smokers and current e-cigarette users.

Sociodemographic variables included age (18–24, 25–34, 35–44, 45–64, and ≥ 65 years); gender; race/ethnicity (non-Hispanic white, non-Hispanic black, non-Hispanic Asian, Hispanic, and non-Hispanic other); annual household income (<\$20,000, \$20,000–\$49,999, \$50,000–\$99,999, $\geq$ \$100,000); educational attainment (less than high school diploma, high

school graduate, some college or associate degree, bachelor's degree or higher); marital status (married/living with a partner, divorced/widowed/separated/single/never married/not living with partner); and U.S. region (Northeast, Midwest, South, and West). All 50 U.S. states and the District of Columbia were included in the analyses.

Statistical Analysis

For this study, data from the 2012–2013 and 2013–2014 NATS were merged (N=135,425) and analyzed in 2016. Because NATS is a nationally representative survey that employs a stratified, multistage sampling design, statistical analyses were performed using the “survey” module of Stata, version 14.0, to account for the complex sample design and responses.

The relative percent change in prevalence, representing a comparison of the two waves (2012–2013 and 2013–2014), was also calculated by dividing the difference between the 2013–2014 and 2012–2013 estimates by the 2012–2013 estimates, and expressed as a percentage. Additionally, a logistic regression model was used to examine the linear trend in switching across survey years for each group. The percentages of people who switched from traditional cigarettes to e-cigarettes among former smokers were calculated for each wave with 95% CIs. The state-specific prevalence of people who switched from cigarettes to e-cigarettes among former smokers was calculated and mapped using ArcGIS, version 10.3.

Descriptive analyses were calculated as weighted percentages and CIs. Multivariate logistic regression was conducted to examine factors associated with (1) switching completely from cigarettes to e-cigarettes, compared with quitting cigarettes but not switching, and (2) switching to e-cigarettes compared with current dual use of cigarettes and e-cigarettes. Results were reported as adjusted ORs (AORs) with CIs.

RESULTS

The sociodemographic characteristics of the individuals in each sample who reported switching and the relative percent change between the two samples are presented in Table 1. The proportion of adults who reported completely switching from smoking traditional cigarettes to using e-cigarettes among former smokers was 1.9% ($n=225$) in the 2012–2013 sample; it doubled to 3.8% ($n=513$) in the 2013–2014 sample ($p<0.05$). Significant increases (relative percent changes) in switching from 2012–2013 to 2013–2014 were found among a number of sociodemographics and regions, such as among those aged 18–24 years (156.4%); those identifying as non-Hispanic black (171.4%); individuals with less than high school diploma (200.0%); and those living in the Northeast (225.0%) (Table 1).

Table 2 shows the estimates of respondents who switched from traditional cigarettes to e-cigarettes (versus those who quit cigarettes but did not switch and those who currently use both e-cigarettes and cigarettes). Among those who stopped smoking cigarettes, young adults were more likely to switch to e-cigarettes than older adults. For example, adults aged 18–24 years were more likely to switch to e-cigarettes than those aged 35–44 years (AOR=3.6, 95% CI=2.4, 5.5). Those identifying as Hispanic had lower odds of switching as compared with non-Hispanic whites (AOR=0.5, 95% CI=0.3, 0.8). Those with the highest

income level (\$100,000) and education level were less likely to switch (AOR=0.7, 95% CI= 0.5, 0.9, AOR=0.5, 95% CI=0.4, 0.7, respectively).

Compared with current dual users, no significant difference was found in age group. Other race, non-Hispanic, and those with the lowest education level were less likely to switch to e-cigarettes (AOR=0.6, 95% CI=0.4, 0.9, AOR=0.6, 95% CI=0.4, 1.0, respectively). Those who were married or living with a partner were more likely to switch to e-cigarettes (AOR=1.3, 95% CI=1.0, 1.7).

The weighted percentages of switching among former smokers for the combined 2012–2014 samples by state were presented in Table 3. New Mexico had the highest estimate of switching, at 7.3%, whereas Connecticut had the lowest estimate, at 0.8%. The estimate of switching among former smokers for each state was presented in Figure 1 (color-coded by quintile).

DISCUSSION

This study is the first to analyze individual characteristics and state-level prevalence of people who switched completely from traditional cigarettes to e-cigarettes in a nationally representative sample of U.S. adults. The results demonstrate that the overall prevalence of people who switched to e-cigarettes from traditional cigarettes among former smokers increased by 100.0% over a 2-year period. Consistent with the demographics of e-cigarette users,^{19–21} people who were younger were more likely to switch to e-cigarettes, compared with former smokers who did not switch. Estimates of people who switched to e-cigarettes from traditional cigarette smoking among former smokers varied by region and state.

Perceptions of the safety of cigarette smoking and e-cigarette use may lead to switching from traditional cigarettes to e-cigarettes. Most tobacco users perceive e-cigarettes to be safer than tobacco or other methods of smoking cessation, and regard cigarettes as harmful.²¹ There have been many studies showing that perception of a product as less harmful than another leads to an increase in experimentation among both smokers and nonsmokers, as corroborated by studies demonstrating this among young adults^{22,23} and adults.^{24–26} Another study also indicated that among adult smokers, 71% perceived e-cigarettes as safer than cigarettes, and 28% perceived them as safer than nicotine replacement therapy.²⁵ The same has been found among young adults²⁷ and especially among e-cigarette users.²⁸

Socioeconomic factors also played a role in switching from cigarettes to e-cigarettes. For education level, those with higher education were less likely to switch to e-cigarettes from cigarettes, possibly suggesting that awareness of e-cigarettes could differ by education level, which might affect their use. However, the opposite was found for e-cigarette/cigarette dual users, such that those with a bachelor's degree or higher were less likely to be dual users. Adkison et al.¹¹ also reported that, compared with those who have low (68.8%) or high (73.5%) education levels, those with a moderate level of education (78.7%) were more likely to be aware of e-cigarettes ($p<0.001$). These individuals might also have different perceptions of the safety of e-cigarettes compared to cigarettes, and thus be more likely to switch completely than to be dual users. Awareness and perception of safety may be closely

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tied, depending on the type of messaging individuals in different education and income brackets are receiving. In regard to income level, results indicate that those with higher income were less likely to switch to e-cigarettes. Another study reported that low-income individuals were more willing to switch to e-cigarettes if cheaper than tobacco,²⁹ although individuals with high income were more likely to try e-cigarettes than low-income individuals. More research is needed to understand the impact of socioeconomic characteristics on individuals' proclivity for switching completely to e-cigarettes, versus becoming a dual user, versus quitting without use of e-cigarettes.

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Non-Hispanic whites were more likely to switch to e-cigarettes compared to Hispanics, which might also be explained by the marketing and advertisement of e-cigarettes. Similarly, non-Hispanic whites were also more likely to be dual users of both e-cigarettes and cigarettes than those who reported their race as "Other, Non-Hispanic." Whites are more likely than some racial/ethnic groups, such as blacks, to use/have regular access to the Internet,³⁰ which is a major source of e-cigarette advertisements.³¹ Retail availability of e-cigarettes, which is associated with increased use of e-cigarettes,³² is also more likely in neighborhoods with higher household income and less likely in predominantly Hispanic or black neighborhoods.^{23,33}

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Variation in state and regional differences was observed in the prevalence of switching to e-cigarettes. Although the NATS data set does not allow for further analysis of reasons behind state-level variation, such differences may be because of various reasons. Social stigma and perceptions of the acceptability of cigarette smoking may motivate people to switch products. For example, the prevalence of e-cigarette use in some states/regions of the U.S. may be influenced by the social acceptability of cigarettes versus the social stigma of using cigarettes. This might make individuals who smoke cigarettes more likely to switch to e-cigarettes if e-cigarettes are perceived as less dangerous than traditional cigarettes in their respective state/region. The relative price of cigarettes and e-cigarettes and their retail availability also could facilitate switching in certain states where there is higher cigarette prices compounded by e-cigarette retail market penetration. Other possible factors include state variations in e-cigarette marketing, warning labels on tobacco products, cessation counseling services, and the availability of state-funded quitlines.

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In addition to prior findings that young adults report higher rates of e-cigarette use than older adults, the current study also found that they are more likely to switch from cigarettes to e-cigarettes, suggesting differing reasons for use. There have been studies analyzing reasons for e-cigarette use among adults in general and college students (aged 18–24 years). Among adult ever e-cigarette users, the top reasons for trying were to quit smoking (59%); reduce cigarette consumption (58%); and convenience due to ability to use indoors (47%).^{34,35} Young adults and college students have reported similar reasons for initiating use, with the addition of flavors; the top reasons for e-cigarette use among this group were curiosity (54%), appealing flavor (44%), and peer influences (32%).³⁶ E-cigarette use among this population has been linked to aggressive marketing in specific locations, such as malls and magazines, as well as on popular Internet sites.^{20,37}

Limitations

There are a number of limitations in the present study that deserve mention. First, the NATS is a cross-sectional survey and, as a result, it is not possible to make inferences regarding causality or to investigate individual-level changes, such as whether individuals who have switched to e-cigarettes remain e-cigarette users, become dual/poly-tobacco users, or switched back to cigarette use. Additionally, the survey was not able to identify how long the participants had been smokers and how frequently they smoked traditional cigarettes. Although geographical differences by state and region level were investigated to explore such behavior on a population-level, future research should consider a geographic modeling approach that provides a more complete picture of population-level characteristics. The analyses also were based on self-reported data, which are subject to recall and social desirability bias. Lastly, there were no data about reasons or motivation for switching, the specific type of e-cigarettes used, and harm perceptions of e-cigarettes. As a result, it is not possible to make any conclusive statements as to why there has been an increase in individuals switching from cigarettes to e-cigarettes or on the users' perceptions regarding the role of e-cigarettes in smoking cessation.

Despite these limitations, this study provides crucial insights by focusing on former cigarette smokers who switched to e-cigarettes, whereas most previous research has focused on the correlates of both ever and current e-cigarette users and on the uptake of tobacco use by current and former e-cigarette users. Furthermore, because there are still uncertain questions concerning e-cigarettes about both their short-term and long-term health effects, it is unknown what implications these results will have on public health.

CONCLUSIONS

This study highlights a new and increasing change in the progression from cigarette use to e-cigarette use, which may or may not be the result of successful intentional smoking cessation attempts. Further experimental and longitudinal research on the long-term health effects of e-cigarettes should be performed to clarify whether traditional cigarette users' switching to e-cigarettes is beneficial or a potential threat to public health.

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Figure 1.
State-specific weighted prevalence of people who switched to e-cigarettes in the U.S.:
National Adult Tobacco Survey, 2012–2013 and 2013–2014.

Table 1

Percentages of Adults Who Switched to E-cigarettes^a Among Former Smokers^b: National Adult Tobacco Survey, 2012–2013 and 2013–2014 (*n*=40,558)^c

Characteristics	NATS 2012–2013, % (95% CI) ^d (<i>n</i> =18,218)	NATS 2013–2014, % (95% CI) ^d (<i>n</i> =22,340)	Relative percent change (%) ^e
Overall	<i>n</i> =225, 1.9 (0.6, 2.2)	<i>n</i> = 513, 3.8 (3.4, 4.2)	100.0
Age, years			
18–24	9.4 (5.6, 15.4)	24.1 (17.9, 31.6)	156.4
25–34	4.0 (2.7, 5.7)	9.6 (7.8, 11.7)	140.0
35–44	3.4 (2.3, 4.8)	5.1 (3.9, 6.5)	50.0
45–54	2.2 (1.6, 3.0)	3.6 (2.9, 4.6)	63.6
55–64	1.2 (0.8, 1.6)	1.8 (1.4, 2.2)	50.0
65	0.3 (0.2, 0.4)	0.6 (0.4, 0.8)	100.0
Gender			
Male	2.0 (1.6, 2.6)	4.1 (3.5, 4.8)	105.0
Female	1.6 (1.3, 2.1)	3.4 (2.9, 4.0)	112.5
Race/ethnicity			
White, non-Hispanic	1.8 (1.5, 2.2)	3.6 (3.2, 4.1)	100.0
Black, non-Hispanic	1.4 (0.6, 3.0)	3.8 (2.5, 5.7)	171.4
Asian, non-Hispanic	1.7 (0.3, 10.5)	7.4 (3.6, 14.5)	335.3
Hispanic	1.7 (0.9, 3.5)	3.9 (2.6, 5.7)	129.4
Other, non-Hispanic	3.2 (2.1, 5.0)	6.0 (2.7, 12.8)	87.5
Annual household income			
<\$20,000	2.8 (1.9, 4.0)	3.9 (2.8, 5.4)	39.3
\$20,000–\$49,999	1.7 (1.2, 2.3)	4.4 (3.6, 5.4)	158.8
\$50,000–\$99,999	2.6 (1.9, 3.4)	3.8 (3.1, 4.7)	46.2
\$100,000	1.1 (0.7, 1.8)	2.7 (2.0, 3.5)	145.5
Education attainment			
Less than high school diploma	1.3 (1.7, 2.5)	3.9 (2.4, 6.2)	200.0
High school graduate	2.1 (1.5, 2.9)	4.9 (4.1, 5.9)	133.3
Some college or associate degree	2.5 (2.0, 3.2)	4.0 (3.4, 4.8)	60.0
Bachelor degree or higher	0.9 (0.7, 1.3)	2.2 (1.7, 2.8)	144.4
Marital status			
Married/with a partner	1.7 (1.4, 2.2)	3.0 (2.6, 3.5)	76.5
Single ^f	2.0 (1.6, 2.6)	5.2 (4.3, 6.2)	160.0
U.S. region ^g			
Northeast	0.8 (0.5, 1.2)	2.6 (1.9, 3.5)	225.0
Midwest	1.7 (1.1, 2.4)	3.7 (3.0, 4.6)	117.6
South	2.3 (1.7, 2.9)	4.6 (3.9, 5.4)	100.0

Characteristics	NATS 2012–2013, % (95% CI) ^d (n=18,218)	NATS 2013–2014, % (95% CI) ^d (n=22,340)	Relative percent change (%) ^e
West	2.4 (1.8, 3.2)	3.6 (2.7, 4.2)	50.0

Note: Boldface indicates statistical significance ($p < 0.05$).

^a Respondents who responded *yes* to the question: *At any time during the past 12 months, did you completely switch from smoking traditional cigarettes to using electronic or e-cigarettes?*

^b Respondents who reported smoking at least 100 cigarettes in their entire life, and reported currently not smoking at all.

^c Unweighted *n*.

^d Weighted percentages with 95% CIs.

^e Relative percent change (RPC) was calculated by dividing the difference between the 2013–2014 and 2012–2013 estimates by the 2012–2013 estimates, and expressed as a percentage.

^f Includes those people who were divorced/widowed/separated.

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

NATS, National Adults Tobacco Survey.

Table 2

Estimates and AORs^a of Factors Associated With E-cigarette Switching: National Adult Tobacco Survey, 2012–2013 and 2013–2014 (*n*=135,425^b)

Characteristics	Switched to e-cigarettes, ^c % (95% CI) ^d (<i>n</i> =738)	Switched to e-cigarettes ^c vs former smokers ^e who quit without switching (ref), AOR (95% CI) ^d (<i>n</i> =39,820)	Switched to e-cigarettes ^c vs current e-cigarette/cigarette dual users ^f (ref), AOR (95% CI) ^d (<i>n</i> =3,800)
Age, years			
18–24	1.1 (0.8, 1.4)	3.6 (2.4, 5.5)**	0.9 (0.6, 1.5)
25–34	1.1 (1.0, 1.4)	1.5 (1.1, 2.1)**	1.0 (0.7, 1.4)
35–44	0.8 (0.7, 1.0)	ref	ref
45–54	0.7 (0.6, 0.9)	0.6 (0.4, 0.9)**	1.0 (0.7, 1.4)
55–64	0.5 (0.4, 0.6)	0.3 (0.2, 0.4)**	1.0 (0.7, 1.4)
65	0.2 (0.1, 0.2)	0.1 (0.0, 0.1)**	1.0 (0.6, 1.5)
Gender			
Male	0.9 (0.8, 1.0)	1.2 (1.0, 1.5)	1.2 (1.0, 1.6)
Female	0.6 (0.5, 0.6)	ref	ref
Race/ethnicity			
White, non-Hispanic	0.8 (0.7, 0.9)	ref	ref
Black, non-Hispanic	0.5 (0.3, 0.7)	0.8 (0.5, 1.4)	1.1 (0.7, 1.9)
Asian, non-Hispanic	0.6 (0.3, 1.2)	1.0 (0.4, 2.5)	1.0 (0.4, 2.8)
Hispanic	0.5 (0.3, 0.7)	0.5 (0.3, 0.8)**	0.8 (0.5, 1.3)
Other, non-Hispanic	1.0 (0.7, 1.7)	0.9 (0.6, 1.4)	0.6 (0.4, 0.9)*
Annual household income			
<\$20,000	0.8 (0.6, 1.0)	1.2 (0.8, 1.6)	1.0 (0.7, 1.5)
\$20,000–\$49,999	0.8 (0.6, 0.9)	ref	ref
\$50,000–\$99,999	0.9 (0.7, 1.0)	1.1 (0.8, 1.4)	1.2 (0.9, 1.6)
\$100,000	0.5 (0.4, 0.6)	0.7 (0.5, 0.9)*	1.0 (0.7, 1.5)
Education attainment			
Less than high school diploma	0.6 (0.4, 0.9)	0.7 (0.4, 1.1)	0.6 (0.4, 1.0)*
High school graduate	0.9 (0.8, 1.1)	ref	ref
Some college or associate degree	0.9 (0.8, 1.0)	0.9 (0.7, 1.2)	1.1 (0.8, 1.4)
Bachelor degree or higher	0.4 (0.3, 0.4)	0.5 (0.4, 0.7)**	1.5 (1.1, 2.1)*
Marital status			
Married/with a partner	0.7 (0.6, 0.8)	0.8 (0.6, 1.0)	1.3 (1.0, 1.7)*
Single ^g	0.8 (0.7, 0.9)	ref	ref
U.S. region ^h			
Northeast	0.4 (0.3, 0.6)	ref	ref
Midwest	0.7 (0.6, 0.8)	1.4 (1.0, 2.1)	1.2 (0.8, 1.8)
South	0.8 (0.7, 1.0)	1.8 (1.3, 2.5)**	1.4 (1.0, 2.0)

Characteristics	Switched to e-cigarettes, ^c % (95% CI) ^d (n=738)	Switched to e-cigarettes ^c vs former smokers ^e who quit without switching (ref), AOR (95% CI) ^d (n=39,820)	Switched to e-cigarettes ^c vs current e-cigarette/cigarette dual users ^f (ref), AOR (95% CI) ^d (n=3,800)
West	0.7 (0.6, 0.9)	1.5 (1.0, 2.2)*	1.4 (0.9, 2.1)

Note: Boldface indicates statistical significance (* $p < 0.05$; ** $p < 0.01$).

^aAdjusted for age, sex, ethnicity, educational level, income level, smoking status, marital status, and region.

^bUnweighted *n*.

^cRespondents who responded *yes* to the question: *At any time during the past 12 months, did you completely switch from smoking traditional cigarettes to using electronic or e-cigarettes?*

^dWeighted row percentages (95% CI) are presented.

^eRespondents who reported smoking at least 100 cigarettes in their entire life, and reported currently not smoking at all.

^fRespondents who reported smoking at least 100 cigarettes during their lifetime and smoked *every day* or *some days* at time of survey, and reported *every day*, *some days* or *rarely* to the question: *Do you now use electronic cigarettes?*

^gIncludes those people who were divorced/widowed/separated.

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

Table 3

State- and Region-Specific Estimates^a of People Who Switched to E-cigarettes^b Among Former Smokers^c:
National Adults Tobacco Survey, 2012–2013 and 2013–2014 (*n*=40,558^d)

Region/state	Former smokers, ^c <i>n</i> (<i>n</i> =40,558 ^d)	People who switched from cigarettes smoking to e-cigarettes, ^b % (95% CI) (<i>n</i> =738 ^d)
Overall	40,558	2.8 (2.6, 3.1)
Northeast	7,860	1.7 (1.3, 2.2)
Connecticut	584	0.8 (0.3, 2.0)
Maine	600	1.6 (0.7, 3.8)
Massachusetts	719	2.0 (1.0, 3.9)
New Hampshire	581	3.5 (1.5, 8.0)
New Jersey	888	1.6 (0.8, 3.2)
New York	2,007	1.7 (1.0, 2.7)
Pennsylvania	1,273	1.5 (0.8, 2.7)
Rhode Island	610	2.5 (1.0, 6.3)
Vermont	598	1.7 (0.7, 3.9)
Midwest	8,469	2.7 (2.2, 3.2)
Indiana	641	2.7 (1.4, 5.0)
Illinois	1,265	2.1 (1.3, 3.4)
Iowa	537	1.2 (0.3, 5.0)
Kansas	500	4.8 (2.6, 9.0)
Michigan	1,039	2.1 (1.2, 3.7)
Minnesota	595	2.2 (1.0, 4.7)
Missouri	628	2.3 (1.2, 4.3)
Nebraska	515	3.6 (1.8, 7.2)
North Dakota	510	1.4 (0.5, 3.5)
Ohio	1,155	3.5 (2.3, 5.3)
South Dakota	492	1.2 (0.4, 3.5)
Wisconsin	592	3.5 (1.9, 6.4)
South	13,752	3.4 (3.0, 3.9)
Alabama	524	5.4 (2.9, 9.8)
Arkansas	540	2.3 (1.0, 5.4)
Delaware	586	1.3 (0.5, 3.4)
District of Columbia	437	1.0 (0.2, 4.8)
Florida	2,249	2.7 (1.9, 3.9)
Georgia	948	3.0 (1.8, 4.9)
Kentucky	544	5.4 (3.1, 9.2)
Louisiana	504	3.4 (1.7, 6.8)
Maryland	551	2.7 (1.2, 5.9)
Mississippi	476	3.3 (1.6, 7.0)

Region/state	Former smokers, ^c <i>n</i> (<i>n</i> =40,558 ^d)	People who switched from cigarettes smoking to e-cigarettes, ^b % (95% CI) (<i>n</i> =738 ^d)
North Carolina	985	2.3 (1.4, 3.7)
Oklahoma	533	4.8 (2.8, 8.1)
South Carolina	565	3.3 (1.6, 6.7)
Tennessee	643	2.0 (1.0, 3.9)
Texas	2,341	4.9 (3.7, 6.6)
Virginia	842	3.1 (1.8, 5.3)
West Virginia	484	2.4 (0.8, 6.7)
West	10,477	3.0 (2.4, 3.7)
Alaska	551	2.6 (1.3, 5.1)
Arizona	732	3.7 (2.0, 6.6)
California	3,666	2.7 (1.8, 4.0)
Colorado	569	2.2 (1.1, 4.4)
Hawaii	583	2.5 (1.3, 4.8)
Idaho	490	4.9 (2.7, 8.7)
New Mexico	586	7.3 (4.4, 11.8)
Montana	546	1.7 (0.7, 4.0)
Oregon	592	2.3 (1.1, 4.9)
Nevada	560	4.6 (2.7, 7.5)
Utah	314	2.0 (0.7, 5.5)
Washington	761	2.5 (1.4, 4.6)
Wyoming	527	3.9 (2.1, 7.1)

^aWeighted percentages (95% CIs) are presented.

^bRespondents who responded *yes* to the question: *At any time during the past 12 months, did you completely switch from smoking traditional cigarettes to using electronic or e-cigarettes?*

^cRespondents who reported smoking at least 100 cigarettes in their entire life, and reported currently not smoking at all.

^dUnweighted *n*.