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Adoption of Vaping Cessation Methods by US Adolescent E-Cigarette Users

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Abstract

BACKGROUND: A large number of adolescent e-cigarette users intend to quit vaping or have past-year quit attempts. However, it remains unknown which methods they use in their vaping cessation efforts.

METHODS: We analyzed current (past 30-day) e-cigarette users who made 1 quit attempt in the past 12 months from the 2021 National Youth Tobacco Survey (NYTS) to examine the prevalence and associations of sociodemographic factors, vaping behaviors, and harm perception with the adoption of different vaping cessation methods.

RESULTS: In the 2021 NYTS, there were 1436 current vapers, and 889 (67.9%) had made a past-year quit attempt. Of those, 575 (63.7%) (weighted $N = 810\,000$) reported they did not use any resources (unassisted quitting). Peer support (14.2%), help on the Internet (6.4%), a mobile app or text messaging (5.9%), and parent support (5.8%) were the top 4 cessation methods. Female (versus male) vapers were less likely to solicit parent support (adjusted odds ratio [AOR], 0.2; 95% confidence interval [95% CI], 0.1–0.5), whereas Hispanic (versus White) vapers were more likely to seek friend support (AOR, 2.1; 95% CI, 1.1–3.9) and parent support (AOR, 2.7, 95% CI, 1.2–6.3). Those who perceived vaping to be harmful were less likely to get friend support, but more likely to use a mobile app or text messaging program. Dual users of e-cigarettes and any other tobacco product were more likely to get help from a teacher/coach or a doctor/health care provider and treatment from medical facilities than sole e-cigarette users.

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CONCLUSIONS: There were different correlates with the adoption of vaping cessation methods, highlighting the need for tailored approaches to meet the cessation needs and preferences of the adolescent vaping population.

In recent years, the use of e-cigarettes among adolescents in the United States has become a major public health concern.¹ Although the prevalence of cigarette smoking among youth has been declining, the intensity of e-cigarette use has increased dramatically among teenagers, with many using these products on a regular basis.² The median frequency of e-cigarette use increased from 3 to 5 days per month during 2014 through 2018 to 6 to 9 days per month during 2019 through 2020 and 10 to 19 days per month in 2021.² Although the long-term health effects of e-cigarette use remain unknown,¹ e-cigarette aerosol contains a number of potentially toxic substances,¹ and vaping is linked to higher risk of respiratory symptoms,^{3,4} cardiovascular diseases,⁵⁻⁷ and other adverse health outcomes.¹ Furthermore, youth e-cigarette use is associated with an increased risk of future cigarette smoking, marijuana, and poly use of other substances.^{8,9} Therefore, quitting e-cigarette use at an early age is crucial for maintaining healthy development with long-term health benefits.

A large number of adolescent e-cigarette users are interested in quitting vaping. Notably, the 2020 National Youth Tobacco Survey (NYTS) data reported that nearly two-thirds of current e-cigarette users among US youths were interested in quitting.¹⁰ Overcoming vaping addiction has become a challenge to youth as a majority (67.3%) of adolescent vapers experienced unsuccessful attempts at quitting.¹¹ Currently, there are no Food and Drug Administration-approved e-cigarette cessation products for adolescents. Cessation medications (eg, nicotine replacement therapy, bupropion, varenicline) have been widely developed for adult tobacco users,¹² but their efficacy in youth vaping cessation has not been examined across the full age range of adolescence.¹³⁻¹⁵

A few behavioral vaping cessation interventions and resources have emerged, including educational programs such as “CATCH My Breath,” and “The Real Cost” campaign.¹⁶⁻¹⁸ Several digital text messaging and mobile apps for vaping cessation have also been developed. For instance, the Truth Initiative launched a digital text-messaging vaping program, “This is Quitting,” in 2019.¹⁹ A recent study has reported that young adults participating in “This is Quitting” are more likely to achieve vaping abstinence compared with control (odds ratio [OR], 1.39; $P < .01$) at 7 months.²⁰ The family environment continues to be an essential venue for youth growth, and parental support has been long documented as a critical protective factor for youth substance use.^{21,22} Youth can also receive support to quit vaping from other conventional resources such as advice from a doctor/health provider, treatment at a medical facility, and quitline.

Despite the expansion of youth cessation program options, there is a lack of assessment on the reach and adoption among adolescent e-cigarette users in using these approaches to assist vaping cessation at the population level. Furthermore, it is crucial to determine whether specific demographic characteristics, vaping habits, and other correlates are associated with different cessation methods so that tailored intervention can assist adolescent e-cigarette users in increasing success in their vaping cessation efforts. To address the

knowledge gaps, this study analyzed the 2021 NYTS data to examine the prevalence and correlates with the adoption of different vaping cessation methods in US adolescents.

METHODS

Study Sample

The NYTS is an annual school-based survey to obtain a nationally representative sample of all regular public and private middle school (grades 6–8) and high school (grades 9–12) students in the 50 US states and the District of Columbia. A stratified, 3-stage cluster sampling approach was used to select participants. To comply with COVID-19 emergency protocols, data collection was conducted through an online survey between January and May 2021.²³ A total of 20 413 students from 279 schools completed the questionnaire. The school participation rate was 54.9% (ie, refusal rate = 45.1%), and the student response rate was 81.2% (ie, refusal rate = 18.8%), yielding an overall response rate of 44.6%.²³ Given the use of public data with deidentified information, this study is exempt from the University of Nebraska Medical Center institutional review board (IRB) approval.

Measures

Current E-Cigarette Use and Vaping Quit Attempts—Students who reported using e-cigarettes ≥ 1 day(s) in the past 30 days were classified as current e-cigarette users.²⁴ They were further asked, “During the past 12 months, how many times have you stopped using e-cigarettes for 1 day or longer because you were trying to quit using e-cigarettes for good?” Those who responded ≥ 1 time to the question were classified as current e-cigarette users with past-year quit attempts and constituted this study’s analytical sample. The frequency of quit attempts was coded as a continuous variable from 1 to 10 (Table 1 footnote).¹¹

Vaping Cessation Methods (Outcome Variable)—Current e-cigarette users with ≥ 1 past-year quit attempt(s) were asked, “When you tried to quit using e-cigarettes, did you use any of the following?” Those who endorsed “I did not use any resources (exclusive)” were classified as “no use of any cessation methods” or unassisted quitting. We then coded the adoption of each cessation method (Table 1) as “1” when respondents marked the option (vs “0”), and the adoption of these cessation methods is not mutually exclusive.

Vaping Characteristics—We categorized current e-cigarette users as occasional users (≤ 5 days), moderate users (6–19 days), and frequent users (≥ 20 days) based on the frequency of e-cigarette use in the past 30 days.²⁵ Vaping duration is derived from the difference between the age when respondents first used an e-cigarette and their current age.¹¹ Based on the approximate midpoints of vaping frequency and duration, we created a 4-level index to measure the combination of vaping frequency (low [≤ 5 days] versus high [≥ 6 days]) and vaping duration (low [≤ 2 years] versus high [>2 years]).

Current e-cigarette users who reported using e-cigarettes that tasted like menthol, mint, clove or spice, alcohol, candy, fruit, chocolate, or any other flavor were classified as flavored e-cigarette users. Vaping product used in the past 30 days included “A disposable e-cigarette,” “An e-cigarette that uses prefilled or refillable pods or cartridges,” “An e-

cigarette with a tank,” and “I don’t know the type.” Perceived harm of e-cigarette use was measured by a binary variable (0 = no harm/little harm vs 1 = some harm/a lot of harm).²⁶

Tobacco Use Status—Current “other tobacco users” were defined as those who reported using 1 or more non–e-cigarette tobacco products on 1 day in the past 30 days.²⁷ Those who reported only using e-cigarettes in the past 30 days were defined as “sole e-cigarette users,” and those who reported co-use of e-cigarettes and other tobacco products were defined as “dual users.”¹¹

The presence of nicotine dependence was a binary variable (yes versus no) measured by the question, “During the past 30 days, have you had a strong craving or felt like you really needed to use a tobacco product of any kind?”²⁸

Other Covariates—Demographic variables include sex, race/ethnicity, school level, and sexual minority status. Self-reported race and ethnicity are considered as social constructs rather than as generic or biological categories. Those identified as Asian, American Indian or Alaska Native, Native Hawaiian or other Pacific Islander, other races, or multi-racial groups are grouped as “other” category. We also include measures of tobacco use by household members (no, non–e-cigarette tobacco use, e-cigarette use)²⁹ and perceived peer use of e-cigarettes³⁰ to control for family and peer influences.

Statistical Methods

Distribution of sample characteristics, sample n , weighted population N , the weighted prevalence, and 95% confidence interval (CI) of each vaping cessation adoption are reported, along with the median and interquartile range (IQR) of the number of past-year quit attempts.

The logistic regressions estimated the factors associated with adopting each vaping cessation method, whereas multivariable models included demographic factors, vaping characteristics, and tobacco use status. We reported both unadjusted and adjusted odds ratios (ORs) for the adoption of “unassisted quitting” method and each of the most commonly used vaping cessation methods (ie, parent support, friend support, Internet, a mobile app, or text messaging). For the least commonly used vaping cessation methods (ie, advice from a teacher/coach, a doctor/health care provider, hospital/treatment, and quitline), only unadjusted ORs are reported in the exploratory analysis due to the low prevalence of cessation methods. Sampling weights, survey stratum, and primary sampling units were included in the analysis to account for the complex survey design and adjust for nonresponse. Statistical analyses were performed using SAS 9.4 (Cary, NC), and the survey procedure (eg, proc surveyfreq) was conducted to generate the weighted population estimates. Missing covariate data (n range: 0–137) were managed with multiple imputations using 20 multiply imputed data sets.³¹ P values $< .05$ were considered statistically significant.

RESULTS

Among 889 (representing population $N = 1\,271\,000$) current e-cigarette users with past-year quit attempts in 2021, 50.8% were female, 83.6% were high school students, 70.1% were non-Hispanic (NH) white, 7.4% were NH-black, and 19.1% were Hispanic. Approximately 32.5% of sample participants reported dual use of tobacco products, and 63.4% perceived vaping as harmful (Supplemental Table 5).

As shown in Table 1, 63.7% (weighted $N = 810\,000$) of current vapers with past-year quit attempts reported they did not use any resources (“unassisted quitting”). Peer support (14.2%, $N = 181\,000$), help on the Internet (6.4%, $N = 82\,000$), a mobile app or text messaging (5.9%, $N = 76\,000$), and parent support (5.8%, $N = 73\,000$) were the top 4 cessation methods used by adolescent vapers, followed by getting help from a doctor or health care provider (3.9%, $N = 50\,000$), getting help from a teacher or coach (2.4%, $N = 30\,000$), using a quitline (1.7%, $N = 21\,000$), and getting treatment from a medical facility (1.5%, $N = 19\,000$). Overall, participants using a quitline and those getting treatment from a medical facility had the highest number of past-year quit attempts (median [IQR] = 5.1 [2.2–7.3]) and 4.5 [1.0–6.9], respectively).

Table 2 presents the prevalence and correlates with adopting the “unassisted quitting” method. Females (versus males) were more likely to report not using any resources (69.2% vs 57.5%; AOR [95% CI], 1.7 [1.1–2.6]), whereas Hispanic (versus NH Whites) were less likely to report unassisted quitting (49.3% vs 67.9%; AOR [95% CI], 0.4 [0.3–0.7]). E-cigarette users who reported higher vaping frequency/vaping duration and those dual/poly users were less likely to report unassisted quitting (AOR [95% CI], 0.5 [0.3–0.9]) and AOR [95% CI], 0.7 [0.44–0.97], respectively).

The prevalence and AORs of correlates with adopting the 4 most commonly used vaping cessation methods are presented in Table 3, and the unadjusted ORs are presented in Supplemental Table 6. Females (versus males) were less likely to report using parental support as a vaping cessation method (2.8% vs 8.9%; AOR [95% CI], 0.2 [0.1–0.5]). Meanwhile, as compared with NH whites, Hispanics were more likely to report using parent support (10.9% vs 4.4%; AOR [95% CI], 2.7 [1.2–6.3]) and peer support (21.7% vs 12.1%; AOR [95% CI], 2.1 [1.1–3.9]). Current e-cigarette users who reported higher vaping frequency/vaping duration were more likely to report using a mobile app or text messaging. Perceived harmfulness of e-cigarette use was associated with lower odds of getting peer support (10.8% vs 20.9%; AOR [95% CI], 0.6 [0.32–0.97]) and higher odds of using a mobile app or text messaging (8.3% vs 3.3%; AOR [95% CI], 2.4 [1.1–5.3]). Nicotine-dependence symptoms were positively associated with using peer support and getting help or advice on the Internet.

Table 4 presents the prevalence and unadjusted ORs of specific correlates with the least commonly used vaping cessation methods. Overall, sexual minorities (versus heterosexuals) were more likely to report getting help from a teacher/coach and a doctor/health care provider. Compared with heterosexual vapers, gay/lesbian users and unsure individuals were more likely to seek treatment from a medical facility, whereas gay/lesbian and bisexual users

were more likely to get help from a doctor/health care provider or use a quitline. Participants with high vaping frequency and/or high vaping duration were more likely to use these cessation methods. Dual use (versus sole e-cigarette use) was associated with higher odds of getting help from a teacher/coach (OR [95% CI], 3.7 [1.1–12.2]) and a doctor/health care provider (OR [95% CI], 6.2 [2.8–13.7]) as well as seeking treatment from a medical facility (OR [95% CI], 7.5 [2.2–26.2]). However, because of the small sample cells, some estimates with the least commonly used cessation methods had wide CIs, so the results should be interpreted cautiously.

DISCUSSION

To the best of our knowledge, this is the first study to provide timely evidence on the cessation methods used by e-cigarette users by analyzing a nationally representative youth sample. Overall, a majority of adolescent vapers with past-year quit attempts reported unassisted quitting. Assisted tobacco cessation is generally considered more effective than unassisted tobacco cessation for youth because it provides additional resources and support to help youth quit.³² Given that peer influence plays a crucial role in youth e-cigarette use^{33,34} and the popularity of digital platforms used by adolescents,³⁵ it is not surprising to see that nearly 1 in 7 adolescent vapers with past-year quit attempts asked for peer support, and help on the Internet, mobile apps, or text messaging ranked as the top cessation methods used by adolescent vapers. Our study also shows that parental support continues to be an important resource. By providing a supportive and open environment, parents can help their children quit tobacco by engaging in conversations about the negative effects of tobacco, setting a good example by not using tobacco themselves, and offering emotional and practical support throughout the quitting process.³⁶

Importantly, this study identified several demographic differences with the adoption of vaping cessation methods. As compared with male vapers, females were more likely to report unassisted quitting, whereas they were less likely to ask for help from their parents. Meanwhile, Hispanic (versus white) vapers were less likely to report unassisted quitting but were more likely to seek peer or parental support in vaping cessation. Our study also shows differences in the adoption of vaping cessation methods by sexual minority status, with gay/lesbian (versus heterosexual) vapers being less likely to report using unassisted quitting. These differences underscore the heterogeneous preference for the adoption of vaping cessation methods by key demographic groups and the importance of developing tailored cessation interventions to increase youth vaping cessation success.

Youth vaping behaviors, harm perception, and nicotine dependence also influence the selection of vaping cessation methods. According to our study, fewer youth vapers engage in these cessation methods before they perceive that they are addicted, indicating a potential to expand assisted cessation opportunities before it becomes more difficult for them to quit. Clinical advice to try a period of abstinence may help adolescents understand their withdrawal symptoms resulting from nicotine addiction.³⁷ Furthermore, a mobile app or text messaging was particularly preferred by those with high vaping frequency and/or high vaping duration, whereas the presence of nicotine dependence symptoms was associated with higher adoption rates of friend support or getting help on the Internet. Although

those with nicotine dependence (versus without) also tended to have a higher prevalence of reporting use of a mobile app or text messaging (8.4% vs 5.3%), the statistically insignificant finding might be because this variable is measured by any tobacco products, rather than specially for e-cigarette use. Therefore, adolescents may underreport symptoms if they do not identify an e-cigarette as a “tobacco product.” Furthermore, some of the mobile apps and text messaging programming for adolescents specifically targeted e-cigarette use rather than other tobacco products, which could be why more adolescents who vaped frequently used these resources relative to those with tobacco dependence generally. Additionally, because of the dearth of evidence-based and empirically validated vaping cessation programs for youth, adolescent vapers may choose the available resources based on their individual needs. For instance, adolescent vapers with higher vaping frequency and/or longer duration might prefer a mobile app or text messaging because the program is often positioned as a nonjudgmental and supportive friend and delivered to participants through interactive text messages.¹⁹

Seeking professional advice from a teacher/coach, a doctor/health care provider, a medical facility, and quitline were generally less commonly used among adolescent vapers. However, the adoption of these vaping cessation methods was generally higher among those with high vaping frequency/duration as well as dual users of e-cigarettes and other tobacco products, and sexual minority vapers. Previous studies have reported higher e-cigarette use, nicotine dependence, and co-use of other tobacco products among sexual minority adolescents.^{38,39} Lesser peer and parental support in these minority groups might be another plausible reason for the high utilization of professional help. Quitting vaping can be challenging, especially for those addicted to nicotine. Seeking professional help to assess the situation and provide appropriate support or treatment can overcome addiction and improve vaping cessation success.³⁷

Evident of fewer than 4% of adolescent vapers got support on their quit attempt from a doctor may reflect a lack of disclosure to their health care provider and/or a lack of engagement by primary care doctors with adolescents regarding their e-cigarette use. Encouraging youth to discuss their tobacco use with their doctor may yield more quit attempts, better access to available supports, medications to help cut down or at least better control of withdrawal symptoms, and ultimately a greater chance of success in quitting tobacco products.³⁷ Interventions with health care systems to ensure universal screening, motivational messaging, medications, referral to available online apps, and texting programs may also expand the percentage of adolescents who are supported in their quit attempts.

This study has some limitations. First, the adoption of vaping cessation methods is self-reported, and they are subject to recall and social desirability biases.⁴⁰ However, the test and retest reliability of self-reported behaviors related to tobacco use among adolescents is high.⁴⁰ In addition, the NYTS data are cross-sectional; thus, we were unable to establish causal inferences. Second, the school participation rate during the COVID-19 pandemic was lower (eg, 54.9% in 2021) compared with recent NYTS cycles (~78.2% between 2011 and 2019 NYTS). However, the 2021 NYTS had a high student participation rate (81.2%), and the weighted sample produced nationally representative estimates. Furthermore, the 2021 survey was administered online to allow participation from various locations, and the

survey format and the broad context of COVID-19 could potentially affect the adoption and prevalence estimates of vaping cessation methods.⁴¹ For instance, students with remote schooling might be less likely to report peer support in their vaping cessation than those attending school in person. Future studies should assess whether patterns of vaping cessation methods may vary after the pandemic. Finally, vaping cessation methods, except unassisted quitting, were not mutually exclusive. Indeed, approximately one-third of e-cigarette users with past-year assisted quit attempts reported utilization of 2 or more cessation methods (Table 1 footnote), signaling that many adolescent vapers are unable to quit after trying multiple methods in the current landscape of available cessation strategies.

CONCLUSIONS

A majority of adolescent vapers reported not using any cessation methods in their quit attempts. Of those who seek support, the 4 most commonly used vaping cessation methods include parent support, friend support, Internet, and a mobile app or text messaging. Sex differences, cultural and sexual minority background, and vaping experience were the most influential factors in adolescents' preference for vaping cessation methods. Future studies should examine the pathways connecting these potential drivers to the adoption of cessation treatment and develop optimal strategies to increase youth vaping cessation success.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Dr Dai conceptualized the study, acquired the data, performed analyses, drafted the initial manuscript, and critically revised the manuscript; Ms Hanh assisted in data analysis, data presentation, and result interpretation, drafted the initial manuscript, and critically reviewed and revised the manuscript; Dr Guenzel conceptualized the study, assisted in result interpretation, and critically reviewed and revised the manuscript; Ms Morgan assisted in result interpretation, drafted the initial manuscript, and critically reviewed and revised the manuscript; Dr Kerns assisted in the result interpretation and critically reviewed and revised the manuscript; Dr Winickoff conceptualized the study, assisted in data presentation and result interpretation, and critically reviewed and revised the manuscript; and all authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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ABBREVIATIONS

CI	confidence interval
IQR	interquartile range

NH	non-Hispanic
OR	odds ratio
NYTS	National Youth Tobacco Survey

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WHAT'S KNOWN ON THIS SUBJECT:

E-cigarettes are the tobacco product most commonly used by youth, and nearly two-thirds of current adolescent e-cigarette users reported past-year quit attempts. However, there is a dearth of research about factors associated with the adoption of vaping cessation methods.

WHAT THIS STUDY ADDS:

Most adolescent vapers reported unassisted quit attempts. For adolescents who did seek assistance, they used peer and parental support more than doctors or health care providers. Adoption of different vaping cessation methods was associated with demographic factors and vaping behaviors.

TABLE 1

Adoption of Vaping Cessation Methods, 2021 NYTS

Quit (Q) Methods ^a	Sample <i>n</i>	Weighted <i>N</i> ^b	Among E-Cigarette Users With Quit Attempt(s) Weighted % (95% CI)	Among Those Seeking Cessation Methods Weighted % (95% CI)	No. of Past-Year Quit Attempt(s), Weighted Median (IQR) ^c
I did not use any resources (unassisted quit)	575	810 000	63.7 (58.2–69.3)	Not applicable	3.4 (1.5–8.2)
Help or advice from a friend or peer	113	181 000	14.2 (8.9–19.5)	42.6 (31.4–53.7)	4.0 (2.4–8.0)
Help or advice you found on the Internet	56	82 000	6.4 (4.0–8.8)	19.2 (13.2–25.3)	3.2 (1.3–6.6)
A mobile app or texting program	49	76 000	5.9 (3.8–8.1)	17.8 (11.4–24.2)	3.6 (2.1–7.2)
Help or advice from a parent or caregiver	48	73 000	5.8 (3.7–7.8)	17.3 (11.9–22.6)	3.7 (1.3–8.2)
Help, advice, or counseling from a doctor or health care provider	30	50 000	3.9 (2.2–5.7)	11.8 (6.8–16.8)	2.5 (1.4–3.7)
Help or advice from a teacher or coach	25	30 000	2.4 (1.2–3.5)	7.1 (4.0–10.2)	3.8 (2.0–8.5)
A telephone helpline or Quitline	18	21 000	1.7 (0.6–2.7)	5.0 (2.2–7.7)	5.1 (2.2–7.3)
Treatment from a hospital, medical center, or some other facility	16	19 000	1.5 (0.7–2.3)	4.5 (1.9–7.0)	4.5 (1.0–6.9)
Something else	102	137 000	10.8 (8.3–13.3)	32.3 (25.3–39.3)	3.0 (1.0–8.0)

CI, confidence interval; IQR, interquartile range; NYTS, National Youth Tobacco Survey.

^aCurrent e-cigarette users with 1 past-year quit attempt were asked, “When you tried to quit using e-cigarettes, did you use any of the following?” with response options “I did not use any resources (exclusive),” “Help or advice from a parent or caregiver,” “Help or advice from a friend or peer,” “Help or advice from a teacher or coach,” “Help, advice, or counseling from a doctor or health care provider,” “Treatment from a hospital, medical center, or some other facility,” “Help or advice you found on the Internet,”

“A mobile app or texting program,” “A telephone helpline or Quitline,” and “Something else.” The response “I did not use any resources” is exclusive of other cessation methods. Respondents can select 1 or more on other cessation methods. Among those who reported using vaping cessation methods, 194 (weighted %, 67%) reported the use of 1 cessation method, 53 (19%) reported the use of 2 cessation methods, and 42 (14%) reported the use of 3 or more cessation methods.

^bWeighted *N* is rounded to 1000.

^cAny quit attempts in the past 12 months, not limited to the cessation method. The number of past-year quit attempts was coded as a continuous variable based on the response options “1 time,” “2 times,” “3–5 times” [recoded = 4], “6–9 times” [recoded = 7.5], “10 or more times” [recoded = 10].

TABLE 2

Prevalence and Correlates with “Unassisted Quitting” Method^a

Unassisted Quitting	Weighted %	Unadjusted		Adjusted ^b	
		OR	P	AOR	P
Overall (n = 575)					
Sex					
Male	57.5	Ref	Ref	Ref	Ref
Female	69.2	1.7 (1.1–2.4)	.01	1.7 (1.1–2.6)	.02
Grade					
Middle school	57.2	Ref	Ref	Ref	Ref
High school	64.9	1.4 (0.9–2.1)	.11	1.4 (0.9–2.2)	.12
Race/ethnicity					
NH white	67.9	Ref	Ref	Ref	Ref
NH Black	62.6	0.8 (0.3–1.9)	.60	0.8 (0.3–1.9)	.56
Hispanic	49.3	0.5 (0.3–0.8)	.01	0.4 (0.3–0.7)	.002
Others	75.5	1.5 (0.5–3.9)	.45	1.6 (0.7–3.7)	.25
Sexual minority					
Heterosexual	67.9	Ref	Ref	Ref	Ref
Gay/lesbian	43.9	0.4 (0.2–0.8)	.01	0.6 (0.3–1.2)	.12
Bisexual	64.0	0.8 (0.4–1.6)	.59	0.9 (0.4–1.7)	.70
Unsure	59.5	0.7 (0.3–1.6)	.37	0.7 (0.3–1.7)	.47
Frequency and duration of e-cigarette use ^c					
Low frequency-low duration	72.2	Ref	Ref	Ref	Ref
Low frequency-high duration	63.6	0.7 (0.4–1.2)	.20	0.6 (0.3–1.1)	.12
High frequency-low duration	59.9	0.6 (0.3–1.1)	.11	0.5 (0.2–1.1)	.08
High frequency-high duration	61.6	0.6 (0.4–1.0)	.03	0.5 (0.3–0.9)	.02
Type of e-cigarette used in the past 30 days					
A disposable e-cigarette	65.0	Ref	Ref	Ref	Ref
An e-cigarette with prefilled pods or cartridges	67.6	1.1 (0.7–1.8)	.64	1.2 (0.7–2.0)	.44
An e-cigarette with a tank	68.8	1.2 (0.6–2.3)	.61	1.5 (0.8–2.9)	.23

Unassisted Quitting	Weighted %	Unadjusted		Adjusted ^b	
		OR	P	AOR	P
Overall (n = 575)					
I don't know the type	43.8	0.4 (0.2-0.8)	.005	0.5 (0.2-1.1)	.08
Multiple tobacco product use ^d					
Sole e-cigarette	70.5	Ref	Ref	Ref	Ref
Dual/poly use	54.4	0.5 (0.3-0.7)	.0004	0.7 (0.44-0.97)	.03
Flavor use in e-cigarette					
No	53.4	Ref	Ref	Ref	Ref
Yes	65.9	1.7 (1.0-2.9)	.06	1.2 (0.7-2.3)	.48
Perceived harmfulness of e-cigarette use ^e					
No harm/little harm	65.0	Ref	Ref	Ref	Ref
Some harm/a lot of harm	65.8	1.0 (0.6-1.8)	.89	0.9 (0.6-1.5)	.80
Symptoms of nicotine dependence					
No	68.1	Ref	Ref	Ref	Ref
Yes	61.4	0.7 (0.5-1.1)	.18	0.8 (0.4-1.3)	.29
Tobacco use by household members					
None	62.0	Ref	Ref	Ref	Ref
Other tobacco products	68.3	1.3 (0.8-2.1)	.24	1.2 (0.7-2.0)	.46
E-cigarettes	69.1	1.4 (0.8-2.4)	.26	1.3 (0.7-2.3)	.42
Perceived peer use of e-cigarettes ^f					
		1.0 (1.0-1.1)	.24	1.0 (0.9-1.1)	.96

AOR, adjusted odds ratio; NH, non-Hispanic; OR, odds ratio.

^aThe response "I did not use any resources" is exclusive of other cessation methods.

^bMultivariable analysis was conducted using the survey logistic regression model with unassisted quitting (yes versus no) as the outcome variable and all covariates listed in the table as simultaneous regressors. Missing covariate data were managed with multiple imputation using 20 multiply imputed data sets.

^cThe combination of vaping frequency (low, 5 days versus high, >6 days in the past 30 days) and vaping duration (low, 2 years versus high, >2 years).

^dOther non-e-cigarette tobacco products include cigarettes, cigars, little cigars, and cigarillos, smokeless tobacco (chewing tobacco, snuff, dip, snus, and dissolvable tobacco), hookahs, pipe tobacco, bidis, and nicotine pouches.

^ePerceived harmfulness of e-cigarette use was assessed by the question, "How much do you think people harm themselves when they use e-cigarettes some days but not every day?" We classified harm perception as a binary variable: "0 = harmless" for those who responded "no harm" or "little harm" vs "1 = harmful" for those who responded "some harm" or "a lot of harm."

This measure was assessed by the question "Out of every 10 students in your grade at school, how many do you think use e-cigarettes?"; with the response option of 0 to 10 (continuous).

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TABLE 3

Correlates With the Most Commonly Used Vaping Cessation Method^a

	Friend Support			Internet			A Mobile App			Parent Support		
	Weighted %	AOR ^b	P	Weighted %	AOR ^b	P	Weighted %	AOR ^b	P	Weighted %	AOR ^b	P
Sex												
Male	15.5	Ref	Ref	6.3	Ref	Ref	6.3	Ref	Ref	8.9	Ref	Ref
Female	13.2	0.8 (0.5–1.4)	.41	6.7	0.8 (0.4–1.8)	.66	5.7	0.8 (0.4–2)	.71	2.8	0.2 (0.1–0.5)	.001
Grade												
Middle school	21.5	Ref	Ref	7.2	Ref	Ref	2.3	Ref	Ref	6.7	Ref	Ref
High school	12.8	0.6 (0.2–1.4)	.22	6.3	1.1 (0.3–3.8)	0.82	6.6	1.2 (0.4–3.7)	.70	5.6	1.1 (0.4–3.0)	.85
Race/ethnicity												
NH white	12.1	Ref	Ref	6.1	Ref	Ref	6.0	Ref	Ref	4.4	Ref	Ref
NH Black	13.8	1.3 (0.4–4.7)	.69	6.8	1.2 (0.4–3.9)	.71	4.2	1.1 (0.3–3.5)	.93	6.5	1.4 (0.5–4.1)	.56
Hispanic	21.7	2.1 (1.1–3.9)	.02	6.2	1.0 (0.4–2.6)	.99	6.3	1.6 (0.7–3.6)	.25	10.9	2.7 (1.2–6.3)	.02
Others	13.7	1.1 (0.3–3.7)	.85	7.2	1.2 (0.3–4.6)	.80	7.8	1.7 (0.3–8.7)	.56	5.8	0.9 (0.2–3.9)	.94
Sexual minority												
Heterosexual	13.8	Ref	Ref	4.8	Ref	Ref	5.1	Ref	Ref	4.8	Ref	Ref
Gay/lesbian	34.8	1.6 (0.6–4.3)	.32	13.3	1.4 (0.4–5.5)	.60	22.4	2.4 (0.8–7.7)	.13	7.7	1.3 (0.4–4.8)	.68
Bisexual	17.4	1.1 (0.5–2.4)	.81	14.2	2.4 (0.9–6.8)	.09	8.2	1.8 (0.6–5.6)	.28	7.4	1.5 (0.5–4.4)	.43
Unsure	6.6	N/A	N/A	6.0	N/A	N/A	5.6	N/A	N/A	2.4	N/A	N/A
Frequency and duration of e-cigarette use ^c												
Low frequency-low duration	11.0	Ref	Ref	4.7	Ref	Ref	0.4	Ref	Ref	6.0	Ref	Ref
Low frequency-high duration	12.6	1.2 (0.5–3.2)	.66	5.9	1.1 (0.4–3.3)	.90	3.2	6.2 (1–37.6)	.05	5.5	0.8 (0.2–3.5)	.74
High frequency-low duration	20.0	2 (0.8–5.2)	.13	7.2	1.2 (0.3–4.5)	.81	4.1	8.2 (1.4–46.1)	.02	6.7	1.7 (0.4–6.7)	.44
High frequency-high duration	14.8	1.4 (0.6–3.6)	.44	6.8	0.9 (0.2–3.6)	.90	10.4	20.8 (3.9–110.1)	.0004	5.6	1.1 (0.3–3.7)	.86
Type of e-cigarette used in the past 30 days												

Overall	Friend Support			Internet			A Mobile App			Parent Support		
	Weighted %	AOR ^b	P	Weighted %	AOR ^b	P	Weighted %	AOR ^b	P	Weighted %	AOR ^b	P
A disposable e-cigarette	12.9	Ref	Ref	5.4	Ref	Ref	6.4	Ref	Ref	3.0	Ref	Ref
An e-cigarette with prefilled pods or cartridges	16.8	1.4 (0.8-2.4)	.26	7.5	1.4 (0.7-3.1)	.35	6.1	1.1 (0.5-2.6)	.82	3.6	1.2 (0.4-3.1)	.77
An e-cigarette with a tank	9.6	0.5 (0.1-2.3)	.41	6.5	0.9 (0.1-7.3)	.94	3.5	0.6 (0.2-1.7)	.35	15.4	4.6 (1.6-13.5)	.006
I don't know the type	17.7	1.9 (0.8-4.4)	.13	9.4	2.4 (0.7-8.6)	.18	5.2	0.8 (0.2-2.9)	.78	20.9	16.9 (4.9-57.7)	<.0001
Multiple tobacco product use												
Sole e-cigarette	12.2	Ref	Ref	4.9	Ref	Ref	5.5	Ref	Ref	4.2	Ref	Ref
Dual/poly use	18.2	1.2 (0.7-2.1)	.55	9.8	1.6 (0.7-4.0)	.29	6.7	0.9 (0.4-2.2)	.81	8.2	1.1 (0.5-2.4)	.77
Flavor use in e-cigarette												
No	9.6	Ref	Ref	5.3	Ref	Ref	6.2	Ref	Ref	6.9	Ref	Ref
Yes	15.2	2.1 (0.9-5)	.09	6.7	1.7 (0.6-4.8)	.29	5.9	0.8 (0.3-2)	.60	5.5	2.1 (0.7-6.2)	.17
Perceived harmfulness of e-cigarette use												
No harm/little harm	20.9	Ref	Ref	7.8	Ref	Ref	3.3	Ref	Ref	5.3	Ref	Ref
Some harm/a lot of harm	10.8	0.6 (0.32-0.97)	.04	6.2	0.9 (0.4-2)	.80	8.3	2.4 (1.1-5.3)	.03	5.3	1.2 (0.5-2.7)	.68
Symptoms of nicotine dependence												
No	11.5	Ref	Ref	4.2	Ref	Ref	5.3	Ref	Ref	4.7	Ref	Ref
Yes	20.3	1.9 (1.1-3.1)	.01	11.3	2.4 (1.2-5.1)	.02	8.4	1.2 (0.5-2.9)	.73	6.4	1.9 (0.9-4.0)	.11
Tobacco use by household members												
None	15.5	Ref	Ref	5.0	Ref	Ref	8.9	Ref	Ref	4.5	Ref	Ref
Other tobacco products	13.5	0.7 (0.3-1.4)	.32	6.1	1.0 (0.4-2.8)	.92	4.8	0.4 (0.1-1.2)	.09	4.0	0.9 (0.3-2.5)	.78
E-cigarettes	15.7	0.9 (0.4-1.8)	.70	8.5	1.5 (0.5-4.5)	.47	5.9	0.6 (0.2-1.6)	.27	7.7	1.8 (0.7-4.6)	.22
Perceived peer use of e-cigarettes												
		1.0 (0.9-1.1)	.81		1.0 (0.8-1.1)	.74		0.9 (0.8-1.1)	.30		1.1 (0.9-1.3)	.23

AOR, adjusted odds ratio; N/A, not reported because of small sample size and unreliable estimates; NH, non-Hispanic.

^aThe response to each vaping cessation is not mutually exclusive.

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^q Multivariable analysis was conducted by using separate survey logistic regression models for the adoption of each vaping cessation method (yes versus no) as the outcome variable and all covariates listed in the table as simultaneous regressors. Missing covariate data were managed with multiple imputations using 20 multiply imputed data sets.

^c The combination of vaping frequency (low, 5 d versus high, >6 d in the past 30 d) and vaping duration (low, 2 y versus high, >2 y).

TABLE 4

Correlates With Least Commonly Used Vaping Cessation Methods^a

	Doctor/Health Care			Teacher/Coach			Quitline			Hospital/Treatment		
	Weighted %	OR ^b	P	Weighted %	OR ^b	P	Weighted %	OR ^b	P	Weighted %	OR ^b	P
Overall												
Sex												
Male	4.8	Ref	Ref	2.3	Ref	Ref	1.1	Ref	Ref	1.0	Ref	Ref
Female	3.2	0.7 (0.3–1.5)	.29	2.5	1.1 (0.4–3.3)	.83	2.2	2.0 (0.5–8.4)	.34	2.0	2.0 (0.6–7.4)	.28
Grade												
Middle school	4.5	Ref	Ref	3.0	Ref	Ref	2.7	Ref	Ref	3.3	Ref	Ref
High school	3.8	0.8 (0.2–2.9)	.78	2.3	0.8 (0.1–3.9)	.73	1.5	0.5 (0.1–2.3)	.39	1.1	0.3 (0.1–1.2)	.09
Race/ethnicity												
NH white	3.4	Ref	Ref	1.5	Ref	Ref	1.4	Ref	Ref	1.5	Ref	Ref
NH Black	0.5	0.1 (0.0–1.2)	.07	1.8	1.2 (0.2–6.2)	.86	0.8	0.6 (0.1–6.6)	.66	0.9	0.6 (0.1–3.3)	.54
Hispanic	5.5	1.7 (0.6–4.7)	.31	4.2	2.8 (0.7–12.1)	.16	1.2	0.8 (0.1–4.8)	.83	1.8	1.2 (0.3–4.7)	.77
Others	14.4	4.8 (1.1–21.1)	.04	3.5	2.3 (0.2–21.3)	.46	6.1	4.5 (0.4–51.9)	.22	0.0	N/A	N/A
Sexual minority												
Heterosexual	1.6	Ref	Ref	1.0	Ref	Ref	0.4	Ref	Ref	0.6	Ref	Ref
Gay/lesbian	24.4	19.8 (4.4–88.9)	.0002	5.1	5.1 (0.7–38.5)	.11	10.2	30.2 (5.7–159.9)	.0001	7.7	14 (2.1–93.5)	.01
Bisexual	6.4	4.2 (1.0–17.7)	.049	7.5	7.7 (1.9–30.9)	.005	5.7	16.1 (3.3–79.7)	.001	1.9	3.2 (0.5–18.7)	.19
Unsure	8.3	5.6 (1.1–28)	.04	6.4	6.5 (0.9–45.9)	.06	2.9	8.0 (0.8–80.5)	.08	5.9	10.5 (1.3–87.5)	.03
Frequency and duration of e-cigarette use ^c												
Low frequency-low duration	0.0	N/A	N/A	0.1	Ref	Ref	0.1	Ref	Ref	N/A	Ref	Ref
Low frequency-high duration	3.1	Ref	Ref	2.2	22.9 (2.5–205.8)	.01	2.5	27.3 (2.2–337.6)	.01	1.0	Ref	Ref

	Doctor/Health Care			Teacher/Coach			Quitline			Hospital/Treatment		
	Weighted %	OR ^b	P	Weighted %	OR ^b	P	Weighted %	OR ^b	P	Weighted %	OR ^b	P
Overall												
High frequency-low duration	6.6	2.2 (0.5-9.2)	.27	7.4	80.1 (8.3-774.6)	.0003	4.4	48.7 (3.9-601.7)	.003	3.9	4.2 (0.7-25.5)	.11
High frequency-high duration	5.4	1.8 (0.6-5.2)	.29	1.8	18.6 (1.9-18.02)	.01	1.1	11.8 (1.2-117.5)	.04	1.6	1.7 (0.3-9.8)	.55
Type of e-cigarette Used in the past 30 days												
A disposable e-cigarette	4.1	Ref	Ref	1.3	Ref	Ref	1.0	Ref	Ref	1.2	Ref	Ref
An e-cigarette with prefilled pods or cartridges	3.3	0.8 (0.3-2.4)	.67	3.3	2.7 (0.6-11.6)	.19	2.2	2.1 (0.4-12.0)	.38	0.8	0.6 (0.2-2.7)	.54
An e-cigarette with a tank	2.5	0.6 (0.2-1.9)	.37	2.3	1.9 (0.4-9.4)	.44	0.9	0.8 (0.1-8.8)	.87	5.4	4.6 (1.2-17.0)	.02
I don't know the type	6.0	1.5 (0.5-4.7)	.49	6.1	5.1 (1-24.9)	.04	4.1	4.0 (0.7-23.1)	.12	2.2	1.8 (0.2-16.2)	.59
Multiple tobacco product use												
Sole e-cigarette	1.4	Ref	Ref	1.3	Ref	Ref	1.5	Ref	Ref	0.5	Ref	Ref
Dual use	8.2	6.2 (2.8-13.7)	<.0001	4.8	3.7 (1.1-12.2)	.03	2.2	1.5 (0.4-5.8)	.53	3.5	7.5 (2.2-26.2)	.002
Flavor use in e-cigarette												
No	6.8	Ref	Ref	5.0	Ref	Ref	4.2	Ref	Ref	2.8	Ref	Ref
Yes	3.4	0.5 (0.1-1.7)	.25	1.8	0.4 (0.1-1.4)	.13	1.1	0.3 (0.1-1.2)	.09	1.2	0.4 (0.1-2.1)	.28
Perceived harmfulness of e-cigarette use												
No harm/little harm	3.9	Ref	Ref	2.4	Ref	Ref	2.2	Ref	Ref	1.5	Ref	Ref
Some harm/a lot of harm	3.8	1.0 (0.3-3.1)	.96	2.5	1.0 (0.3-3.1)	.96	1.6	0.7 (0.2-2.9)	.64	1.3	0.7 (0.2-2.8)	.58
Symptoms of nicotine dependence												
No	2.7	Ref	Ref	2.6	Ref	Ref	0.9	Ref	Ref	1.2	Ref	Ref
Yes	5.1	1.9 (0.6-5.8)	.23	2.0	0.8 (0.2-3.5)	.72	3.4	3.7 (0.9-14.9)	.07	2.3	2.0 (0.5-7.2)	.31
Tobacco use by household members												
None	2.8	Ref	Ref	1.9	Ref	Ref	1.8	Ref	Ref	1.6	Ref	Ref

	Doctor/Health Care			Teacher/Coach			Quitline			Hospital/Treatment		
	Weighted %	OR ^b	P	Weighted %	OR ^b	P	Weighted %	OR ^b	P	Weighted %	OR ^b	P
Overall												
Other tobacco products	3.6	1.3 (0.5–3.3)	.57	0.9	0.5 (0.1–2.6)	.38	3.1	1.7 (0.4–8)	.48	1.0	0.6 (0.1–3.3)	.57
E-cigarettes	4.7	1.7 (0.6–5.2)	.33	2.9	1.6 (0.3–7.6)	.55	0.3	0.1 (0–0.9)	.04	2.0	1.2 (0.2–6.2)	.80
Perceived peer use of e-cigarettes		1.0 (0.8–1.2)	.92		1.2 (0.8–1.7)	.37		0.7 (0.6–1.0)	.04		1.1 (0.7–1.6)	.76

NH, non-Hispanic; N/A, not reported because of small sample size and unreliable estimates; OR, odds ratio.

^aThe response to each vaping cessation is not mutually exclusive.

^bBivariate analysis was conducted by using separate survey logistic regression models for the adoption of each vaping cessation method (yes versus no) as the outcome variable. Because of the small sample size for each outcome variable, no covariates were adjusted.

^cThe combination of vaping frequency (low, 5 days versus high, >6 days in the past 30 days) and vaping duration (low, 2 years versus high, >2 years).