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What Are Kids Vaping? Results from a National Survey of U.S. Adolescents

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Abstract

Objective—To examine what substances U.S. youth vape.

Methods—Data come from Monitoring the Future, an annual, nationally-representative survey of U.S. 12th, 10th, and 8th grade students. Respondents reported what substance they vaped the last time they used a vaporizer such as an e-cigarette.

Results—Among students who had ever used a vaporizer, 65–66% last used "just flavoring" in 12th, in 10th, and in 8th grade, more than all other responses combined. In all three grades the percentage using "just flavoring" was above 57% for males, females, African-Americans, Hispanics, whites, and students both and without a parent with a college degree. Nicotine use came in a distant second, at about 20% in 12th and 10th grade and 13% in 8th grade. Taking into account youth who vaped nicotine at last use increases national estimates of tobacco/nicotine prevalence in the past 30 days by 24%–38% above and beyond cigarette smoking, which is substantial but far less than estimates that assume all vaporizer users inhale nicotine.

Conclusions—These results challenge the common assumption that all vaporizer users inhale nicotine. They (a) call into question the designation of vaporizers and e-cigarettes as ENDS ("Electronic Nicotine Delivery System"), (b) suggest that the recent rise in adolescent vaporizer use does not necessarily indicate a nicotine epidemic, and (c) indicate that vaporizer users can be candidates for *primary* prevention programs. Finally, the results suggest the importance of developing different rationales for the regulation of vaporizer devices as compared to regulation of substances marketed for vaporizer use.

Keywords

electronic nicotine delivery devices; surveillance and monitoring; harm reduction

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Data sharing statement The data are drawn from a wider survey that examines trends in the use of more than 50 substances among adolescents. Each year a deidentified version of the previous year's data is made publicly available and can be downloaded for no charge at: http://www.icpsr.umich.edu/icpsrweb/NAHDAP/index.jsp

INTRODUCTION

Adolescent use of vaporizers such as e-cigarettes has increased rapidly in recent years in the U.S. In 2015, 30-day prevalence of e-cigarettes was 16% among 12th graders, 14% among 10th graders, and 10% among 8th graders.[1] This is rapid growth from a 30-day prevalence of near 1% among secondary school students in 2011.[2] Use has grown to such an extent that among adolescents 30-day prevalence of e-cigarette use in 2015 was higher than prevalence of any tobacco product, including traditional tobacco cigarettes.[1,3] A common assumption among researchers and policymakers is that adolescents are vaping nicotine, although this assumption has yet to be examined closely.

This study presents some of the first information on the substances that U.S. youth are vaping. We present results from the 2015 Monitoring the Future Study (MTF), which asked students if they vaped nicotine, marijuana, just flavoring, some other substance, or if they did not know what they vaped. MTF is a large, nationally-representative study of U.S. 8th-, 10th-, and 12th-grade students in the 48 contiguous states.[4]

The term “vaporizer” refers to battery-powered devices with a heating element, and is a term that includes the specific vaporizer device of e-cigarettes. Vaporizers produce both an aerosol, small particulates suspended in air, and vapor, the gas phase of chemicals, that users inhale. The liquid that is used in vaporizers comes in hundreds of flavors, which are available both with and without nicotine per the user’s choice.

The extent to which youth vape nicotine is not currently known. On the one hand, a common assumption in the field is that nicotine is the predominant substance that youth vape. This assumption is implicit in the name “ENDS,” the term often used for vaporizers in academic and government reports. This acronym stands for “Electronic Nicotine Delivery Systems,” a name that implies all users are inhaling nicotine. The term “e-cigarette” that is widely used in the research and popular literatures also implies nicotine use. Further, this assumption of nicotine vaping underlies the practice of categorizing all vaporizer users as tobacco/nicotine users, a practice used in U.S. national estimates of tobacco use.[5]

On the other hand, it is possible that a large percentage of youth who use vaporizers do not vape nicotine. For example, 70% of Canadian high school students who had ever used an e-cigarette had never vaped nicotine,[6] a finding replicated among the general, adult Canadian population.[7] It is important to note that the generalizability of this finding to countries other than Canada is not certain; Canada’s regulatory context is unique because e-cigarettes with nicotine are technically not legal,[7] which may lower the prevalence of nicotine vaping.

Identifying the percentage of U.S. adolescents who use vaporizers to inhale nicotine contributes to the literature in at least two ways. First, this information is important for the interpretation of the recent, exponential increase in e-cigarette use among U.S. adolescents. Whether or not the increase should be interpreted as an epidemic of adolescent nicotine use is contingent on the percentage of youth who are using vaporizers to inhale nicotine. Second, the percentage who vape nicotine has important implications for regulation. A percentage substantially below 100% underscores the need to consider the difference between regulating vaporizer devices as compared to regulating the substances that are vaped.

METHODS

Data

Data come from the annual Monitoring the Future study, which since 1975 has used questionnaires administered in classrooms to survey nationally-representative samples of students in the 48 contiguous United States.[4] The survey consists of three separate, nationally-representative samples of 12th-, 10th-, and 8th-grade students and this analysis uses data from the year 2015, the first year that the survey asked respondents what substances they vaped. Data collection was approved by the University of Michigan Institutional Review Board. Students were informed that their answers in the aggregate would be used to produce national estimates, that their answers would be confidential, that participation was completely voluntary, and that they should leave blank any question they did not wish to answer.

In 2015 a total of 44,892 students located in 382 public and private schools participated, with student response rates of 89%, 87%, and 83% in 8th, 10th, and 12th grades, respectively. The great majority of non-response is due to student absence. Schools are selected using a multistage, stratified research design.[8] The first stage is geographic area and consists of 164 primary areas. The second stage is schools, and response rates of originally selected schools were 41% in 8th grade, 52% in 10th grade, and 48% in 12th grade. For schools that do not participate replacements are chosen to be as similar as possible to the original school being replaced in terms of region, demographics, and population density; 93% of sample slots were filled with an original or replacement. Given that most variation in substance use is within schools and not across them – only about 4% to 5% of the variation in 30-day marijuana use is between schools[9] – any bias introduced by replacement schools is expected to be small.

Questions about vaping were asked of a randomly-selected one-third of the samples in 12th grade (n=4,591), 10th grade (n=5,379) and 8th grade (n=5,013). In 2015 respondents were asked if they ever used a vaporizer with the question “Electronic vaporizers make a mist that is inhaled and have the feel of cigarette smoking. Examples include e-cigarettes and e-pens. Have you ever used an electronic vaporizer such as an e-cigarette?” Respondents who had ever used a vaporizer were asked “The LAST TIME you used an electronic vaporizer such as an e-cigarette, what was in the mist you inhaled?” to which respondents chose one reply from the choices “Nicotine,” “Marijuana or hash oil,” “Just flavoring,” “Other,” and “Don’t know.” Respondents who had ever used a vaporizer were also asked the frequency of use in the last 30 days, with responses of 0, 1–5 days, and more than 5 days. Respondents were also asked if they had smoked a regular cigarette in the past 30 days. The survey included self-reported sociodemographic information on gender, parental education, and race/ethnicity, the latter of which identified the categories of non-Hispanic White, non-Hispanic Black, and Hispanic respondents. For 12th grade students the survey also included questions on e-cigarettes, in particular. Students were asked “During the LAST 30 DAYS (if any), have you used electronic cigarettes (e-cigarettes)?”

The analyses are based on all data available for univariate and bivariate distributions (Tables 1–3), and use listwise deletion for comparison of different ways to estimate tobacco/nicotine

prevalence (Table 4). All analyses use weights and were performed with Stata MP 12.1 software.[10] We use the STATA "survey" algorithms to take into account clustering within strata and schools for the calculation of standard errors.

Analysis of missing data indicated that it had little influence on the results of this study. Completion rates for the question on lifetime vaporizer use were 90%, 94%, and 91% in 12th, 10th, and 8th grade respectively. To consider the potential influence of missing data on the distribution of substance vaped we ran an imputed data analysis, which generated 20 data sets that assigned values to missing data on the basis of responses to other survey questions, including cigarette smoking. Of this study's 70 estimates for prevalence of different substances vaped (reported in Table 2), none of the values from the imputed analysis differed by more than 1.07 percentage points from the analysis based on reported data only. Of the respondents who answered the question on lifetime vaporizer use, missing data values for demographic characteristics were 6% or less in all grades with the exception of parents' education as reported by 8th grade students, which was missing 13%. Missing values on demographic variable did not significantly predict type of substance vaped in any grade. We report results from analyses using non-imputed results for ease of interpretation.

RESULTS

Table 1 presents the sociodemographic distribution of the analysis samples. About half of respondents are female and slightly more than half have at least one parent who has a college degree. In terms of racial/ethnic composition, the majority of 8th graders are members of minority racial/ethnic groups, while the 10th and 12th grade cohorts are majority white.

Table 2 presents the substances students vaped at last use, asked only of those who had ever vaped. "Just flavoring" is by far the most commonly vaped substance. In all grades, for both lifetime and past 30-day vaping subgroups, "just flavoring" was vaped more than all other substances combined. Of the students who had ever used a vaporizer in their life (34% of 12th graders, 32% of 10th graders, and 21% of 8th graders), 65–66% in each grade reported vaping "just flavoring" at last use. Of the students who had used a vaporizer in the past month (16% of 12th graders, 14% of 10th graders, and 8% of 8th graders), 59–63% of students in each grade reported vaping "just flavoring" at last use.

Vaping of nicotine came in a distant second place. Among respondents who had ever vaped, about 20% of 12th and 10th grade students and 13% of 8th grade students reported vaping nicotine at last use.

Vaping of marijuana at last use was reported by about 6% of respondents who had ever vaped in their life in all three grades. Levels of marijuana vaping were higher among those who reported vaping in the past 30 days among 10th and 8th grade students, with a prevalence of 9% and 11%, respectively, but slightly lower among 12th grade students at 5%.

Respondents who vaped 6 or more times as compared to 1–5 times in the past 30 days showed significant differences in substances vaped in 12th and 10th grades. Specifically, in

both grades the respondents with higher frequency of vaping were significantly more likely to vape nicotine and significantly less likely to vape flavoring.

Table 3 presents the demographic distribution of substances last vaped among respondents who had ever used a vaporizer by 12th grade. Nicotine was more likely to be vaped by males, by Whites, and by respondents who had at least one parent with a college degree. Flavoring was more likely to be vaped by females and by Hispanics (compared to Whites).

In 10th and 8th grade few comparisons across sociodemographic groups were significantly different and no strong pattern emerged (online supplementary Table S2). In 10th grade only one out of 35 comparisons significantly differed. More significant differences are present among 8th grade students, although these differences do not follow a clear pattern.

Table 4 presents two ways to incorporate vaporizer use into estimates of past 30-day tobacco/nicotine prevalence among youth. One current approach is to consider all vaporizer users to be tobacco and nicotine users, regardless of what substance they are vaping. This approach doubles estimates of tobacco prevalence in 12th grade as compared to estimates based solely on cigarette smoking. In 10th and 8th grade this approach almost triples the estimate of tobacco/nicotine prevalence. An alternative approach is to consider vaporizers to be tobacco/nicotine users only if they reported nicotine as the last substance they vaped in the past 30 days, an approach that leads to much smaller increases in prevalence estimates; specifically, this approach increases tobacco/nicotine prevalence above and beyond cigarette use by 24% in 12th grade (1.24=12.44/10.06), by 38% in 10th grade, and by 23% in 8th grade.

Online supplementary Tables S1 and S3 show that study results are similar when substituting e-cigarette use for vaporizer use. Table S1 shows that the distribution of substances vaped among e-cigarette users is nearly identical to the results with vaporizers (compare with Table 2). Table S3 indicates that questions on “e-cigarettes” produce similar tobacco/nicotine prevalence estimates as questions on “vaporizers” (compare with Table 4).

DISCUSSION

This study presents some of the first information on the substances that U.S. adolescents vape. Nicotine is assumed by many to be the predominant substance that youth vape, although to our knowledge this assumption is not based on scientific data.

“Just flavoring” – and not nicotine – was by far the most commonly vaped substance in all grades. Among students who had ever used a vaporizer in their life, the portion who used “just flavoring” the last time they vaped was greater than all other substances combined. This response was markedly consistent across grades and was reported by 65% to 66% of students in 12th, in 10th, and in 8th grade. In all grades the percentage reporting that they had last vaped “just flavoring” was above 57% for males, females, Whites, Blacks, Hispanics, and students with and without a parent who had a college degree. The percentage who vaped “just flavoring” at last use was also high among students who used a vaporizer in the past 30 days, at a prevalence of 59% or higher in all three grades.

Nicotine came in a distant second place among youth who had used a vaporizer. About 20% of 12th and 10th grade students, and 13% of 8th grade students vaped nicotine at last use. Across the demographic groups of gender, race/ethnicity, and parental education, nicotine use in vaporizers never exceeded 26% in any of the three grades. In 12th grade its use was highest among whites, males, and students with at least one parent who had a college degree. This unusual pattern of greater use among more advantaged demographic groups is similar to the early diffusion of other substances such as cigarettes and cocaine, which had been concentrated in advantaged groups in past decades but are now concentrated in disadvantaged groups after the substances developed a reputation as dangerous.[11–13]

Among the group of students who had vaped in the past 30 days, the portion who last vaped nicotine was 31% in 12th, 27% in 10th, and 16% in 8th grade. Among students who had vaped 6+ times in the past 30 days these percentages were 25% to 50% higher as compared to those who had vaped 1–5 times. This result indicates that the importance of the cutoff between vaping 1–5 as compared to 6+ times in the past 30 days – a threshold highlighted by previous research[14] – extends to substances vaped. In no case did the prevalence of nicotine vaping reach 50% or greater.

We note that the percentage who vaped nicotine was higher in the older age groups; longitudinal data is required to determine whether this represents younger vapers progressing to nicotine and/or an influx of new vapers at older ages.

Levels of marijuana vaping were about 6% in each of the three grades among students who had ever used a vaporizer. These levels did not significantly differ by sociodemographic groups, with the exception in 8th grade of higher prevalence of marijuana vaping among Hispanics as compared to Whites. Among students who had used a vaporizer in the last 30 days, vaping of marijuana was highest in 8th grade.

Some youth did not know what substance they last vaped. This percentage was 14% in 8th grade and declined at older age groups, reaching 6% in 12th grade. The lowest percentage was 2% among heavy vapers, who presumably are more intentional in the substances that they vape.

Four major implications follow from the study's main finding that most youth who use vaporizers do not use nicotine. First, these results suggest the need to reconsider the term "ENDS" to denote vaporizers and e-cigarettes, at least among U.S. adolescents. The term stands for "electronic nicotine delivery system," which seems inaccurate for the description of a device that the majority of youth do not use to vape nicotine.

A second implication is the need to reconsider the impact of vaporizers on the estimated national prevalence of nicotine use among U.S. youth. The current assumption that vaporizer use is synonymous with nicotine use leads to a doubling of past 30-day tobacco/nicotine prevalence in 12th grade and a near tripling in 10th and 8th grades (see Tables 4 and A3) as compared to estimates based on cigarette use alone. However, the results from this study indicate that many vaporizer users do not vape nicotine. If vaporizer users are considered nicotine users only if they last vaped nicotine in the last 30 days, then national estimates of nicotine prevalence increase by a much smaller percentage of 23% to 38% across the three

grades. These results indicate that while taking into account vaporizer use does indeed increase tobacco/nicotine prevalence, the impact of vaporizers is likely not as large as might appear by their recent, dramatic increase in use among adolescents.

A third implication is that vaporizer use may serve as an indicator for primary prevention programs aimed at nicotine use. Because many U.S. youth who use vaporizers do not vape nicotine they are candidates for primary interventions, which are particularly strategic to combat nicotine use because they take place before the need to address nicotine's addictive properties. Further, recent evidence that vaporizer use is a risk factor for future cigarette use[15–19] suggests that vaporizer use can serve as an important marker for youth who are at elevated risk for future nicotine use.

A fourth implication is that a different rationale for the regulation of vaporizer devices will be required as compared to the regulation of vaporizer contents. The finding that most U.S. youth do not vape nicotine makes it difficult to ban sales of vaporizers to youth on the grounds that all of them intrinsically deliver harmful substances to children in all circumstances, a primary rationale to ban the sale of cigarettes to youth. In the absence of an established body of evidence that links vaping any substance to impaired health, bans on sales of vaporizers to youth may need to draw on other rationales, such as the potential of vaporizers to desensitize youth to the dangers of tobacco smoking, and/or the argument that children are at high risk to unintentionally vape substances that will harm them.

In contrast, the rationale that children should be protected from harmful substances can be readily extended to the regulation of specific *substances* marketed for vaporizers. The fact that a substantial portion of youth are vaping nicotine, even if not the majority, underscores the importance of regulations aimed at clearly labelling the contents of these commercial materials and preventing children from access to the ones known to be harmful. Recently proposed "deeming" rules by the U.S. Food and Drug Administration[20] provide a cornerstone for regulations along these lines.

It is important to note three limitations of this study. First, it is possible that youth may self-report that they are not using nicotine when, in fact, they are vaping nicotine but do not realize it. This may increase somewhat the estimates of nicotine use among the least experienced users who may not recognize the physiological symptoms associated with nicotine use. The most accurate knowledge of substances vaped is expected to be among the most experienced users, which in this study are the 12th grade students who vaped six or more times in the last 30 days and presumably are more intentional in the substances they vape. The study's main conclusion that most youth who use vaporizers do not vape nicotine is bolstered by the fact that less than half of this experienced group reported vaping nicotine, a finding difficult to ascribe to inaccurate self-reports.

A second limitation is that the sample of frequent vapers who vaped six or more times in the past 30 days is not large enough to support in depth analysis. This small group is of considerable importance for theory and for policy. On the one hand it may represent a new class of substance user who uses vaporizers exclusively, a class supported by preliminary evidence in a recent analysis of e-cigarette users in 12th grade.[21] On the other hand it may

represent a standard, well-documented class of polysubstance users who have simply extended their use of drugs to a new device.[22–24] Further, the heightened use of nicotine in this group warrants future analysis to examine whether their level of nicotine inhaled reaches that of their peers who use cigarettes. A third limitation is that the study lacks information on youth who have vaped multiple, different substances within the past 30 days. Some nonsmoking youth who last vaped flavoring in the past 30 days may have also vaped nicotine earlier in the 30 day period, information not currently available in the data because the survey asks about only substance last vaped. Future MTF surveys will collect more detailed information on substances vaped, which will support an alternative measure of nicotine prevalence that takes into account this possibility of youth vaping multiple, different substances These measures will likely increase estimates of the percentage of youth who vape substances other than flavoring.

In conclusion, the majority of U.S. youth who use vaporizers and e-cigarettes do not vape nicotine. This finding challenges many common assumptions and practices, and points to the need for vaporizer-specific research to assess and ultimately regulate the public health threat of vaporizers. Taking into account this finding now, while the field is young, will help ensure that future vaporizer science and regulations are built on a solid footing.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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What this paper adds

Adolescent use of vaporizers such as e-cigarettes has grown exponentially in recent years, but little is known about what substances youth are vaping. Using a nationally-representative sample of adolescents we find that most youth (about 60%) report that they vaped “just flavoring” at last use. Less than a quarter reported vaping nicotine at last use. These results challenge the common assumption that most youth use vaporizers to vape nicotine.

Table 1

Sociodemographic Characteristics of the Samples by Grade Level (Entries are Percentages, Standard Errors in Parentheses)

Variable	12th grade[a]	10th grade[b]	8th grade[c]
Female	52.09 (1.13)	49.38 (.93)	51.40 (.75)
Non-Hispanic White	52.88 (3.21)	56.60 (2.90)	45.78 (3.12)
Hispanic	16.73 (2.66)	15.86 (2.07)	23.66 (2.66)
Non-Hispanic African-American	15.13 (2.27)	10.05 (1.57)	14.24 (1.83)
At least one parent with college degree	52.95 (2.33)	60.85 (2.37)	56.39 (2.07)

Note: Percentages for race/ethnicity do not add to 100% because smaller groups are not presented.

[a] n = 4090 to 4275 (unweighted)

[b] n = 4898 to 5219 (unweighted)

[c] n = 4780 to 4801, with exception n=4251 for parental education (unweighted)

Table 2

Distribution of Last Substance Vaped by Frequency of Vaporizer Use and Grade (Estimates Are Percentages, Standard Errors in Parentheses)

	Any Lifetime Use of Vaporizer	Used Vaporizer in Past 30 Days		
		Any Use	1–5 Times	6+ Times
Grade 12				
Unweighted n	n=1420	n=625	n=410	n=215
% of grade, weighted	34.44 (1.17)	15.58 (.90)	10.54 (.67)	5.03 (.44)
Just Flavoring	64.73 (1.60)	59.24 (2.05)	66.26 (2.57)	44.55 (4.28)[c]
Nicotine	22.16 (1.49)	30.72 (2.26)	22.73 (2.78)	47.48 (4.49)[c]
Marijuana	6.12 (.82)	5.23 (1.16)	5.01 (1.36)	5.69 (1.86)
Don't Know	6.33 (.74)	4.04 (.75)	5.14 (1.04)	1.74 (1.05)
Other	0.71 (.23)	0.76 (.34)	.86 (.47)	0.55 (.39)
Grade 10				
Unweighted n	n=1649	n=704	n=436	n=268
% of grade, weighted	32.02 (1.12)	13.75 (.79)	8.39 (.52)[a]	5.37 (.49)
Just Flavoring	65.24 (1.63)	59.49 (2.51)	65.57 (2.71)	49.98 (4.16)[c]
Nicotine	19.87 (1.30)	27.39 (2.30)	18.98 (2.28)	40.53 (4.23)[c]
Marijuana	6.61 (.79)	8.75 (1.50)	9.87 (2.39)	6.98 (1.70)
Don't Know	7.65 (.87)	3.70 (.84)	5.03 (1.31)	1.62 (.79)
Other	0.63 (.26)	.67 (.38)	.54 (.40)	.89 (.76)
Grade 8				
Unweighted n	n=968	n=372	n=239	n=133
% of grade weighted	21.07 (.94)[a,b]	7.75 (.58)[a,b]	5.08 (.35)[a,b]	2.67 (.37)[a,b]
Just Flavoring	65.96 (2.05)	62.66 (3.05)	64.26 (3.75)	59.61 (5.37)[a]
Nicotine	13.23 (1.48)[a,b]	16.23 (2.51)[a,b]	14.49 (2.87)	19.52 (4.82)[a,b]
Marijuana	5.80 (.89)	10.59 (2.23)[a]	9.71 (2.62)	12.26 (3.61)
Don't Know	13.71 (1.44)[a,b]	7.88 (1.25)[a,b]	8.43 (1.68)	6.84 (2.00)[a,b]
Other	1.30 (.46)	2.65 (1.16)[a]	3.11 (1.67)	1.77 (.99)

Note: only the categories in the last two columns are mutually exclusive

[a] Significantly differs from the percentage in 12th grade, p<.05

[b] Significantly differs from the percentage in 10th grade, p<.05

[c] Significantly different from group that vaped 1–5 times in past 30 days, p<.05

Table 3

Distribution of Last Substance Vaped by Demographic Groups, Among Respondents in 12th Grade Who Ever Used a Vaporizer (Estimates Are Percentages, Standard Errors in Parentheses)

	----- Sex -----		----- Race/Ethnicity -----			----- Parental Education -----	
Variable	**Female[a]**	**Male**	**Non-Hispanic White[a]**	**Hispanic**	**Non-Hispanic African-American**	**No Parent Has College Degree[a]**	**Parent(s) With College Degree**
Unweighted n	637	699	857	227	128	608	737
Just Flavoring	69.85 (2.40)	61.00* (2.23)	62.54 (2.08)	73.34* (3.26)	66.24 (4.69)	68.73 (2.03)	63.41 (2.11)
Nicotine	17.53 (2.04)	26.29* (2.26)	25.89 (1.83)	15.59* (2.80)	11.42* (4.29)	17.17 (1.74)	25.22* (2.18)
Marijuana	5.03 (1.01)	6.76 (1.03)	5.41 (.91)	4.54 (1.70)	10.52 (3.24)	6.33 (1.25)	6.18 (1.01)
Don’t Know	7.13 (1.12)	5.03 (.93)	5.57 (.85)	5.65 (1.48)	10.25 (3.00)	6.96 (1.11)	4.60 (.87)
Other	.47 (.28)	.91 (.36)	.59 (.24)	.87 (.54)	1.57 (1.50)	.80 (.34)	.59 (.27)

*p<.05 in comparison to reference group

[a]Reference group for the statistical tests in this category

Note: not all sample sizes add up to sizes reported in previous table due to missing data on demographic characteristics, and in the case of race/ethnicity, due to the category of “other” not presented.

Table 4

Estimates of Nicotine Prevalence in the Past 30 Days (Standard Error in Parentheses)

	12th Grade (n=4039)	**10th Grade (n=5001)**	**8th Grade (n=4506)**
Vaped any substance or smoked regular cigarette(s)	20.95 (.91)	15.84 (.82)	8.76 (.61)
Vaped nicotine at last use or smoked regular cigarette(s)	12.44 (.71)	7.88 (.55)	3.96 (.36)
Smoked regular cigarette(s)	10.06 (.63)	5.71 (.45)	3.23 (.34)