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## Self-Reported Reasons for Vaping Among 8<sup>th</sup>, 10<sup>th</sup>, and 12<sup>th</sup> Graders in the US: Nationally-Representative Results

Megan E. Patrick<sup>\*,a</sup>, Richard A. Miech<sup>a</sup>, Carola Carlier<sup>a</sup>, Patrick M. O'Malley<sup>a</sup>, Lloyd D. Johnson<sup>a</sup>, and John E. Schulenberg<sup>a,b</sup>

<sup>a</sup>Institute for Social Research, University of Michigan, 426 Thompson Street, Ann Arbor, MI 48106-1248, USA

<sup>b</sup>Department of Psychology, University of Michigan, 530 Church Street, Ann Arbor, MI 48106-1043, USA

### Abstract

**Objective**—The study describes the most common reasons for using vaporizers (such as e-cigarettes) among US adolescents and investigates how reasons for use differ by grade, lifetime cigarette use, frequency of vaporizer use, gender, race/ethnicity, and parent education.

**Method**—Data were collected from 4,066 students in the 8<sup>th</sup>, 10<sup>th</sup>, and 12<sup>th</sup> grades in 2015 as part of the Monitoring the Future study, a cross-sectional and nationally representative US survey

**Results**—Common reasons for vaporizer use reported by respondents who had ever used a vaporizer were experimentation (53.0%), taste (37.2%), boredom (23.5%), having a good time (22.4%), and relaxation (21.6%). Reasons differed little across grades or parent education; reasons differed by lifetime use of regular cigarettes, frequency of vaping, gender, and race/ethnicity.

**Conclusions**—Overall, results suggest that decisions to vape are based on curiosity, taste, and pleasure, rather than for reasons such as quitting regular cigarettes or substituting for regular cigarette smoking.

### Keywords

vaporizers; electronic cigarettes; e-cigarettes; adolescents; reasons

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\*Corresponding Author: Megan E. Patrick, Ph.D., Institute for Social Research, University of Michigan, 426 Thompson Street, Ann Arbor, MI 48106-1248, USA. Phone 734-763-7107, Fax 734-936-0043, [meganpat@umich.edu](mailto:meganpat@umich.edu).

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### Contributors

All authors are responsible for the reported research. M. Patrick conceptualized and designed the analysis. M. Patrick and C. Carlier drafted the initial manuscript. M. Patrick, R. Miech, P. O'Malley, L. Johnston, and J. Schulenberg were responsible for data collection. All authors critically reviewed the manuscript and approved the final manuscript as submitted.

### Conflict of Interest

The authors declare no conflict of interest.

## 1. INTRODUCTION

Adolescent use of electronic vaporizers to inhale nicotine and other aerosols is increasing at an alarming rate. From 2011 to 2014, the use of “electronic cigarettes or e-cigarettes”—a specific type of vaporizer—increased nine-fold among US high school students and six-fold among middle school students (Arrazola et al., 2015; CDC, 2015). Among national samples of 8<sup>th</sup> and 10<sup>th</sup> graders, at least twice as many students reported using electronic vaporizers (such as e-cigarettes), compared to regular cigarettes (Miech et al., 2015a). The current study reports nationally representative data on adolescent reasons for vaping and differences across sociodemographic and tobacco-use subgroups.

Vaporizers deliver an inhalable aerosol that can contain flavors and/or nicotine, in addition to other chemicals (e.g., Behar et al., 2014; Goniewicz et al., 2014). This study intentionally uses the general term “vaporizers,” which casts a wide net including “e-cigarettes” and other newly available vaping devices. Over 450 e-cigarette brands and 7,700 flavors exist today, marketed to youth much as cigarettes were before regulations (CDC, 2015; Zhu, 2014), with advertising dollars for vaping increasing almost 20-fold from 2011 to 2014 (CDC, 2016). Packaging labels and device settings do not precisely indicate the ingredients delivered, and “nicotine-free” e-liquids have been found to contain nicotine (Cameron et al., 2014; Goniewicz et al., 2014; Walton et al., 2014).

The rising use of vaporizers is of public health concern because of its potential negative impact on adolescent health. Use of nicotine in vaporizers can harm the developing adolescent brain (Breland et al., 2016), particularly affecting attention and learning. Nicotine also has a high potential for addiction (England et al., 2015; Kandel and Kandel, 2015). Recent studies show that adolescent use of e-cigarettes is associated with intention to use and actual use of regular cigarettes (Bunnell et al., 2015; Dutra and Glantz, 2014; Leventhal et al., 2015) and with progression to regular cigarette smoking (Primack et al., 2015), although additional research is needed. If vaporizer use leads to use of regular cigarettes then vaporizers may reverse the decades-long decline in adolescent smoking prevalence and its associated benefits for population health.

The potential public health impact of vaporizers has generated substantial interest in the reasons that adolescents self-report for using them. Knowing why adolescents use vaporizers is a first step toward identifying strategic approaches and policies to effectively counter and ideally reverse the rise in youth vaporizer use (e.g., Carroll Chapman and Wu, 2014; Kong et al., 2015; Lippert, 2015). In initial findings, quitting smoking does not appear to be a primary reason for vaporizer use among youth. Curiosity, flavors, and peer influences were identified as top reasons for e-cigarette use in seven middle schools, high schools, and colleges in Connecticut (Kong et al., 2015). Enjoyment was the primary reason for using e-cigarettes among undergraduates at four colleges in New York State (Saddleson et al., 2016). In a national study of teen flavored tobacco use, the primary reason for e-cigarette use was flavoring, followed closely by doing less harm than with cigarettes (Ambrose et al., 2015). These studies suggest that reasons for vaporizer use among youth differ substantially and warrant separate study from the reasons given by adults, who are more likely to report use of

vaporizers in an attempt to quit smoking and improve personal health (e.g., Berg et al, 2014; Pepper et al., 2014; Soule et al., 2016).

The current study reports nationally representative data on adolescent reasons for vaping. Research aims were to examine: (1) the most common reasons for vaporizer use among US adolescents in 8<sup>th</sup>, 10<sup>th</sup>, and 12<sup>th</sup> grades; and (2) how reasons for use differ by grade, lifetime use of regular cigarettes, frequency of vaporizer use, gender, race/ethnicity, and parent education. Based on research to date, we expect reasons other than quitting smoking to predominate. National data on the reasons why adolescents use vaporizers will inform national policy on vaporizer use, and help build a cumulative scientific literature on the topic.

## 2. METHODS

### 2.1 Sample

The Monitoring the Future (MTF) project conducts annual cross-sectional surveys of 8<sup>th</sup>, 10<sup>th</sup>, and 12<sup>th</sup> graders in the contiguous US (Miech et al., 2015b), administered to each grade in separate schools that participate for two consecutive years. The 2015 samples total 44,892 students in 382 public and private schools (Johnston et al., 2016). Students are randomly assigned to different questionnaires to increase coverage of MTF topics and reduce respondent burden; accordingly, one third of 8<sup>th</sup> and 10<sup>th</sup> graders and one sixth of 12<sup>th</sup> graders received questions about vaporizer use. Participants who indicated ever having used a vaporizer were asked about reasons for use. The weighted sample sizes of lifetime vaporizer users were 962 in 8<sup>th</sup> grade, 1,654 in 10<sup>th</sup> grade, and 1,449 in 12<sup>th</sup> grade. MTF is approved by the University of Michigan Institutional Review Board.

### 2.2 Measures

Reasons for use were assessed with the survey question, “What have been the most important reasons for your using an electronic vaporizer such as an e-cigarette? (Mark all that apply.)” The reasons were “to help me quit regular cigarettes,” “because regular cigarette use is not permitted,” “to experiment—to see what it’s like,” “to relax or relieve tension,” “to feel good or get high,” “because it looks cool,” “to have a good time with my friends,” “because of boredom, nothing else to do,” “because it tastes good,” and “because I am ‘hooked’—I have to have it.”

Covariates included grade in school (8<sup>th</sup>, 10<sup>th</sup>, 12<sup>th</sup>), lifetime use of regular cigarettes (yes, no), frequency of vaporizer use in the last 30 days (1-2, 3 days), gender (male, female), race/ethnicity (White, Black, Hispanic, Other), and parent education (parent[s] graduated from college; yes, no).

### 2.3 Analyses

Data were analyzed using PROC SURVEYREG in SAS version 9.4 (2012). LSMEANS with the diff option calculated and compared differences between subgroups. All analyses used sampling weights to adjust for the complex sample design.

### 3. RESULTS

The percentage of ever-users of vaporizers who report the various reasons for vaporizer use are provided in Table 1. The most common reason for use was to experiment (53.0%), followed by taste (37.2%), boredom (23.5%), to have a good time (22.4%), and to relax (21.6%). Less common reasons were because it looks cool (13.7%) and to feel good or get high (8.3%). Reasons pertaining to regular cigarette use, including to quit regular cigarettes (7.3%) and because regular cigarette use is not permitted (6.1%), were not common. The least common reason reported for vaping was being hooked (1.1%).

Differences in reasons for vaporizer use by grade, lifetime use of regular cigarettes, and frequency of vaping are shown in Table 1. There were few differences by grade, although younger students were less likely to report taste (8<sup>th</sup> < 10<sup>th</sup> and 12<sup>th</sup> graders) and to quit regular cigarettes (8<sup>th</sup> < 10<sup>th</sup> < 12<sup>th</sup> graders) as reasons for vaping. Students who had ever used regular cigarettes were significantly more likely than never smokers to report all reasons, except to experiment (more common among never-smokers) and to have a good time with friends or to look cool (no significant differences). Although “to quit regular cigarettes” and “because regular cigarette use is not permitted” were reported more frequently among regular cigarette users than non-users, these cigarette-related reasons were still among the least common reasons to vape even for smokers. Teens who reported frequent past-month vaping were significantly more likely than infrequent vapers to report 6 out of 10 reasons; infrequent vapers were more likely to report experimenting.

Differences in reasons for vaporizer use by gender, race/ethnicity, and parent education are shown in Table 2. Girls were more likely than boys to say they used to experiment, and boys were more likely than girls to say they used because of boredom, to have a good time with their friends, because it looks cool, or to feel good/get high. Differences by race/ethnicity suggested that Whites were more likely (than Black and Hispanics) and Others were more likely (than Hispanics) to report taste; Blacks and Others were more likely (than Whites and Hispanics) to report because it looks cool; Blacks were less likely to report have a good time (compared to all other groups), to relax (compared to all other groups), to help quit regular cigarettes (compared to Hispanics and Others), because regular cigarettes use is not permitted (compared to Whites and Others), and being hooked (compared to all other groups); Hispanics were less likely (than Whites and Others) to report feel good or get high. Three of the ten reasons differed by parent education: Students whose parent(s) graduated from college were more likely to report because it tastes good and to have a good time with friends, and less likely to report using to relax, compared to students with lower parent education.

### 4. DISCUSSION

Overall, results suggest that adolescent decisions to vape are based on curiosity, taste, and pleasure, which is somewhat consistent with the existing but limited research on adolescent experimentation with e-cigarettes (Ambrose et al., 2015, Kong et al., 2015). Vaping for taste and pleasure (e.g., boredom, to have a good time with friends, and to relax) may be similar to using e-cigarettes for enjoyment, a primary reason found among college students

(Saddleson et al., 2016). Reasons associated with quitting or reducing regular cigarette use were not commonly found among US adolescents, echoing other research (Kong et al., 2015). Adolescents who had ever used regular cigarettes were more likely than never smokers to report almost all reasons for vaping, yet quitting smoking was still among their least common reasons. Adolescents who vaped frequently reported taste as a primary reason.

Patterns by sociodemographic subgroups were somewhat similar and corresponded to known differences in adolescent e-cigarette use (Lippert, 2015). Differences in reasons for use by grade were minor, indicating that reasons are similar across ages 13 to 18. Differences by gender and parent education showed girls more likely to vape to experiment and less likely to vape because of boredom, to have a good time with friends, to look cool, or to get high than boys; adolescents with higher-educated parents more likely to vape because it tastes good and to have a good time with friends, and less likely to vape to relax. Overall by race/ethnicity, Black adolescents less often reported vaping for reasons such as taste, to have a good time, or to relax.

Strengths of the study include the use of data from nationally representative samples of US middle and high school students who reported on reasons for and frequency of vaping. Limitations include the use of a closed-form list of reasons, rather than a more comprehensive open-ended measure or scale. Reasons for vaporizer use did not specify use for specific substances being vaped, suggesting a needed direction for future research.

These results have specific implications for policy. First, they cast doubt on claims that vaporizers have high potential to benefit public health, at least for adolescents. Very few adolescents vaped to help them quit smoking regular cigarettes, which is purported to be a main health benefit of vaporizers. Second, the results point to flavoring as a potential, strategic target for policies and interventions aimed at reducing vaporizer use among adolescents. The attractive taste of vaping is the second most common reason for adolescent vaping overall, and the most common reason among frequent vapers, raising the possibility that a restrictions on added flavorings could substantially reduce the appeal. There is precedent for such measures, as the FDA has restricted the flavorings added to cigarettes explicitly to reduce their appeal to children (e.g., FDA, 2009; FDA, 2015b; Klein et al., 2008). Third, the findings point to the importance of regulating media advertising that promotes the pleasurable experience of vaping, which has been shown to increase teens' self-reported likelihood of future use (Farrelly et al., 2015). Such advertising is banned for regular cigarettes (FDA, 2015a), and similar bans could be considered for e-cigarettes and other vaporizers. Ongoing monitoring of when, why, and what adolescents vape is crucial for public efforts to prevent use of tobacco and other harmful substances among youth.

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### Highlights

- The most common reasons for vaping were to experiment and because it tastes good.
- Additional reasons for vaping were because of boredom, to have a good time, and to relax.
- Uncommon reasons were vaping to quit regular cigarettes or because regular cigarette use was not permitted.
- Reasons for vaping were similar across grades and level of parent education.
- Reasons differed by lifetime cigarette use, vaping frequency, gender, and race/ethnicity.



Reasons for vaporizer use among adolescent vaporizer users, overall and by grade, regular cigarette smoking, and frequency of vaporizer use

TABLE 1

	Total	Grade			Lifetime Regular Cigarette Use		Frequency of Past 30 Day Vaporizer Use	
		Grade 8	Grade 10	Grade 12	No	Yes	1-2 days	3+ days
To experiment--to see what it's like	53.0	54.8	51.4	53.6	60.1***	46.6	49.9***	30.0
Because it tastes good	37.2	31.5 <sup>b2,c2</sup>	39.4 <sup>a2</sup>	38.4 <sup>a2</sup>	33.7***	40.4	41.8***	59.3
Because of boredom, nothing else to do	23.5	24.7	24.1	22.0	21.1**	26.0	24.6	32.2
To have a good time with my friends	22.4	22.5	23.9	20.5	23.8	21.1	24.0	25.7
To relax or relieve tension	21.6	22.0	22.2	20.7	14.7***	28.0	20.4***	42.2
Because it looks cool	13.7	14.3	13.5	13.5	14.1	13.3	11.7**	19.9
To feel good or get high	8.3	9.8	8.3	7.2	5.7***	10.5	8.7	11.3
To help me quit regular cigarettes	7.3	4.7 <sup>b1,c3</sup>	7.0 <sup>a1,c1</sup>	9.57 <sup>a3,b1</sup>	1.2 <sup>†***</sup>	12.9	4.1***	23.3
Because regular cigarette use is not permitted	6.1	6.3	6.7	5.2	3.2***	8.8	4.8**	12.4
Because I am "hooked"--I have to have it	1.1	1.2	1.3	0.8	0.2***	1.9	0.0**	2.4
	N	4066	962	1654	1449	1907	2075	261
								313

Table presents weighted % responding affirmatively.

Differences between dichotomous groups:

<sup>a</sup> =significantly different from frequency reported by Grade 8;

<sup>b</sup> =significantly different from frequency reported by Grade 10;

<sup>c</sup> =significantly different from frequency reported by Grade 12;

<sup>†</sup> *p*<.05,

<sup>2</sup> *p*<.01

<sup>3</sup> *p*<.001.

\* *p*<.05,

\*\* *p*<.01,

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\*\*\*  
 $p < .001$ .

<sup>†</sup> A small number of students reported both never having smoked regular cigarettes and “to help me quit regular cigarettes,” as a reason for using vaporizers; this contradiction was allowed to remain in the data.

Reasons for vaporizer use among adolescent vaporizer users by gender, race/ethnicity, and parent education

TABLE 2

	Gender		Race/Ethnicity				Parent Education Level	
	Men	Women	White	Black	Hispanic	Other	Non-graduate	College graduate
To experiment--to see what it's like	49.5***	57.9	52.8	55.2	53.4	50.8	53.1	53.3
Because it tastes good	37.6	36.9	39.8 <sup>b1,c3</sup>	31.87 <sup>a1</sup>	29.6 <sup>a3,d2</sup>	37.9 <sup>c2</sup>	34.3**	40.7
Because of boredom, nothing else to do	25.1*	21.4	22.8	22.9	23.7	25.0	22.2	24.0
To have a good time with my friends	24.8**	19.7	23.6 <sup>b3,c1</sup>	13.7 <sup>a3,c1,d3</sup>	19.8 <sup>b1</sup>	24.2 <sup>b3</sup>	18.5***	26.4
To relax or relieve tension	21.5	21.1	21.2 <sup>b2</sup>	13.5 <sup>a2,c2,d3</sup>	22.4 <sup>b2</sup>	25.2 <sup>b3</sup>	23.2*	19.5
Because it looks cool	15.1*	12.1	12.3 <sup>b1,d2</sup>	17.9 <sup>a1,c1</sup>	12.1 <sup>b1,d2</sup>	17.9 <sup>a2,c2</sup>	12.4	14.5
To feel good or get high	8.0*	6.0	8.5 <sup>c3</sup>	6.0	4.5 <sup>a3,d1</sup>	7.9 <sup>c1</sup>	7.8	6.6
To help me quit regular cigarettes	7.7	8.5	7.3	4.7 <sup>c2,d1</sup>	9.8 <sup>b2</sup>	9.2 <sup>b1</sup>	7.1	9.1
Because regular cigarette use in not permitted	5.8	5.9	6.1 <sup>b2</sup>	3.1 <sup>a2,d1</sup>	5.7	7.0 <sup>b1</sup>	6.1	5.6
Because I am "hooked"-- I have to have it	1.0	1.1	1.2 <sup>b3</sup>	0.0 <sup>a3,c2,d2</sup>	0.9 <sup>b2</sup>	1.5 <sup>b2</sup>	1.2	1.0
	<i>N</i>	2086	1841	2286	304	760	579	1762
								2026

Table presents weighted % responding affirmatively. Differences between dichotomous groups:

\*  $P < .05$ ,

\*\*  $P < .01$ ,

\*\*\*  $P < .001$ .

<sup>a</sup> =significantly different from frequency reported by White students;

<sup>b</sup> =significantly different from frequency reported by Black students;

<sup>c</sup> =significantly different from frequency reported by Hispanic students;

<sup>d</sup> =significantly different from frequency reported by students of other races/ethnicities;

<sup>1</sup>  $P < .05$ ,

<sup>2</sup>  $P < .01$ ,

$p < .001$

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