

## Vital Signs: Exposure to Electronic Cigarette Advertising Among Middle School and High School Students — United States, 2014

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### Abstract

**Introduction:** Electronic cigarette (e-cigarette) use has increased considerably among U.S. youths since 2011. Tobacco use among youths in any form, including e-cigarettes, is unsafe. Tobacco product advertising can persuade youths to start using tobacco. CDC analyzed data from the 2014 National Youth Tobacco Survey to estimate the prevalence of e-cigarette advertisement exposure among U.S. middle school and high school students.

**Methods:** The 2014 National Youth Tobacco Survey, a school-based survey of middle school and high school students in grades 6–12, included 22,007 participants. Exposure to e-cigarette advertisements (categorized as “sometimes,” “most of the time,” or “always”) was assessed for four sources: retail stores, Internet, TV and movies, and newspapers and magazines. Weighted exposure estimates were assessed overall and by school type, sex, race/ethnicity, and grade.

**Results:** In 2014, 68.9% of middle and high school students (18.3 million) were exposed to e-cigarette advertisements from at least one source. Among middle school students, exposure was highest for retail stores (52.8%), followed by Internet (35.8%), TV and movies (34.1%), and newspapers and magazines (25.0%). Among high school students, exposure was highest for retail stores (56.3%), followed by Internet (42.9%), TV and movies (38.4%), and newspapers and magazines (34.6%). Among middle school students, 23.4% reported exposure to e-cigarette advertising from one source, 17.4% from two sources, 13.7% from three sources, and 11.9% from four sources. Among high school students, 21.1% reported exposure to e-cigarette advertising from one source, 17.0% from two sources, 14.5% from three sources, and 18.2% from four sources.

**Conclusions and Implications for Public Health Practice:** Approximately seven in 10 U.S. middle and high school students were exposed to e-cigarette advertisements in 2014. Exposure to e-cigarette advertisements might contribute to increased use of e-cigarettes among youths. Multiple approaches are warranted to reduce youth e-cigarette use and exposure to e-cigarette advertisements, including efforts to reduce youth access to settings where tobacco products, such as e-cigarettes, are sold, and regulation of youth-oriented e-cigarette marketing.

### Introduction

Electronic cigarettes (e-cigarettes) are battery-powered devices capable of delivering nicotine and other additives (e.g., flavorings) to the user in an aerosol form. E-cigarette use has increased considerably among U.S. youths in recent years. During 2011–2014, past-30-day e-cigarette use increased from 0.6% to 3.9% among middle school students and from 1.5% to 13.4% among high school students; in 2014, e-cigarettes

became the most commonly used tobacco product among middle school and high school students (1). Youth use of tobacco in any form (combustible, noncombustible, or electronic) is unsafe (2,3). E-cigarettes typically deliver nicotine derived from tobacco, which is highly addictive, might harm brain development, and could lead to sustained tobacco product use among youths (2). In April 2014, the Food and Drug Administration



(FDA) issued a proposed rule to deem all products made or derived from tobacco subject to FDA jurisdiction (4).

In the United States, e-cigarette sales have increased rapidly since entering the U.S. marketplace in 2007, reaching an estimated \$2.5 billion in sales in 2014 (5,6). Corresponding increases have occurred in e-cigarette advertising expenditures, which increased from \$6.4 million in 2011 to an estimated \$115 million in 2014 (7,8). Tobacco product advertising is causally related to tobacco product initiation among youths (9). Many of the themes used in conventional tobacco product advertising, including independence, rebellion, and sexual attractiveness, also are used to advertise e-cigarettes (9,10). Moreover, almost all tobacco use begins before age 18 years, during which time there is great vulnerability to social influences, such as youth-oriented advertisements and youth-generated social media posts (9). This report assesses exposure to e-cigarette advertisements among U.S. middle school and high school students.

## Methods

Data from the 2014 National Youth Tobacco Survey (NYTS) were analyzed to assess exposure to e-cigarette advertisements from four sources: retail stores (convenience stores, supermarkets, or gas stations); Internet; TV and movies; and newspapers and magazines. NYTS is a cross-sectional, school-based, self-administered, pencil-and-paper questionnaire administered to U.S. middle school (grades 6–8) and high school (grades 9–12) students.\* A three-stage cluster sampling procedure was used to generate a nationally representative sample of U.S. students who attend public and private schools in grades 6–12. In 2014, 207 of 258 selected schools (80.2%) participated, yielding a sample of 22,007 participants (91.4%) among 24,084 eligible students; the overall response rate was 73.3%.

Sources of exposure to e-cigarette advertisements were assessed by participants' responses to the following four questions: 1) Internet: "When you are using the Internet, how often do you see advertisements or promotions for electronic cigarettes or e-cigarettes?" 2) Newspapers and magazines: "When you read newspapers or magazines, how often do you see advertisements or promotions for electronic cigarettes or e-cigarettes?" 3) Retail stores: "When you go to a convenience store, supermarket, or gas station, how often do you see advertisements or promotions for electronic cigarettes or e-cigarettes?" 4) TV and movies: "When you watch TV or go to the movies, how often do you see advertisements or promotions for electronic cigarettes or e-cigarettes?" For each question, respondents could select the following options: they

do not use the specific source (e.g., "I do not read newspapers or magazines"), "never," "rarely," "sometimes," "most of the time," or "always." Respondents who said they saw promotions or advertisements "sometimes," "most of the time," or "always" were considered to have been exposed to advertisements from the source; those who selected "never" or "rarely" were considered not exposed. Respondents who did not use a source were also classified as not exposed.† Data were weighted to account for the complex survey design and adjusted for nonresponse. National prevalence estimates with 95% confidence intervals and population estimates were computed; population estimates were rounded down to the nearest tenth of a million. Estimates of exposure for each source were assessed overall and by school type, sex, race/ethnicity, and grade. T-tests were used to calculate differences between groups; a p-value <0.05 was considered statistically significant. The number of exposure sources were summed for each student and reported as the proportion who were exposed to one, two, three, or four sources.

## Results

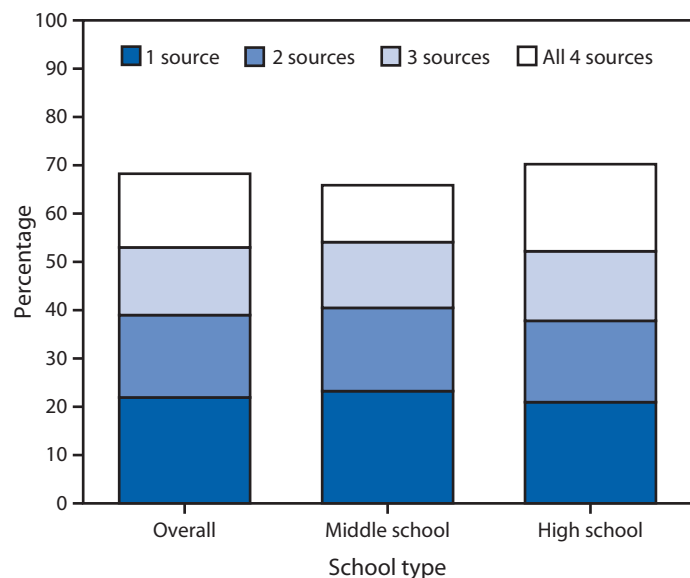
**All students.** Overall, 68.9% of participants (an estimated 18.3 million students) were exposed to e-cigarette advertisements from  $\geq 1$  source (Figure). Retail stores were the most frequently reported exposure source (54.8% of respondents, or an estimated 14.4 million students), followed by the Internet (39.8%, 10.5 million), TV and movies (36.5%, 9.6 million), and newspapers and magazines (30.4%, 8.0 million) (Table). Exposure to e-cigarette advertisements on the Internet and in newspapers and magazines was reported more frequently by females than males. Exposure in retail stores was higher among non-Hispanic whites (whites) than non-Hispanic blacks (blacks) and students of other non-Hispanic races/ethnicities. Exposure from TV and movies was higher among blacks and Hispanics than whites. Exposure was higher among students in higher grade levels for all sources. Overall, 22.1% of participants (5.8 million students) reported exposure to e-cigarette advertising from one source, 17.2% (4.5 million) from two sources, 14.1% (3.7 million) from three sources, and 15.4% (4.1 million) from four sources (Figure).

**Middle school students.** Among middle school students, 66.4% (7.7 million) were exposed to e-cigarette advertisements from at least one source (Figure). Retail stores were the most frequently reported source of exposure (52.8% of respondents, or an estimated 6.0 million middle school students), followed by the Internet (35.8%, 4.1 million), TV and movies (34.1%, 3.9 million), and newspapers and magazines (25.0%,

† Respondents who indicated that they did not use the specified source, and who were reclassified as not exposed, included 717 (3.3%) who did not visit retail stores, 715 (3.3%) who did not use the Internet, 697 (3.2%) who did not watch TV/movies, and 5,567 (25.3%) who did not read newspapers/magazines.

\* Additional information available at [http://www.cdc.gov/tobacco/data\\_statistics/surveys/nyts/index.htm](http://www.cdc.gov/tobacco/data_statistics/surveys/nyts/index.htm).

**FIGURE. Proportion of U.S. students exposed to electronic cigarette (e-cigarette) advertisements, by school type and number of exposure sources\* — National Youth Tobacco Survey, 2014**



\* The four sources were retail stores, Internet, TV and movies, and newspapers and magazines.

2.8 million) (Table). Exposure to e-cigarette advertisements on the Internet was higher among female than male middle school students. Exposure in retail stores was higher among whites than blacks and other non-Hispanic race/ethnicities. Exposure from TV or movies was higher among blacks than whites. A single source of exposure was reported by 23.4% of participants (2.7 million middle school students); two sources by 17.4% (2.0 million), three sources by 13.7% (1.5 million), and four sources by 11.9% (1.3 million) (Figure).

**High school students.** Among high school students, 70.9% of respondents (an estimated 10.5 million high school students) reported exposure to e-cigarette advertisements from at least one source (Figure). Similar to middle school students, more than half of reported e-cigarette advertising exposures (56.3%, 8.3 million) occurred in retail stores, followed by the Internet (42.9%, 6.3 million), TV and movies (38.4%, 5.6 million), and newspapers and magazines (34.6%, 5.1 million) (Table). Exposure in retail stores was higher among whites than blacks and other non-Hispanic race/ethnicities. Exposure from TV and movies was higher among blacks than whites. One source of exposure was reported by 21.1% of participants (3.1 million high school students), two sources by 17.0% (2.5 million), three sources by 14.5% (2.1 million), and four sources by 18.2% (2.7 million) (Figure).

## Conclusions and Comments

In 2014, nearly seven in 10 (18.3 million) U.S. middle school and high school students were exposed to e-cigarette

advertisements from at least one source, and approximately 15%, or 4.1 million students, were exposed to e-cigarette advertisements from all four sources. Approximately half were exposed to e-cigarette advertisements in retail stores, whereas approximately one in three were exposed on the Internet, on TV or at the movies, or while reading newspapers or magazines. Although there were slight variations by sex and race/ethnicity, the magnitude of exposure was consistent across groups. Implementation of comprehensive efforts to reduce youth exposure to e-cigarette advertising and promotion is critical to reduce e-cigarette experimentation and use among youths.

Retail store exposure to e-cigarette advertising in this study (54.8%) was lower than levels of exposure to conventional cigarette and other tobacco product advertising reported in the NYTS in 2014 (80.6%), but comparable to exposure on the Internet (39.8% versus 46.8%, respectively) and in newspapers and magazines (30.4% versus 34.3%, respectively) (11).<sup>§</sup> Advertising for conventional tobacco products, such as cigarettes, has been shown to prompt experimentation as well as increase and maintain tobacco product use among youths (9). Similarly, according to a recent randomized controlled study, adolescents who were exposed to e-cigarette advertisements on TV were 54% more likely to say they would try an e-cigarette soon, and 43% more likely to say they would try an e-cigarette within the next year, compared with adolescents who were not exposed to e-cigarette advertisements (12). The study also determined that youths exposed to e-cigarette advertisements were more likely to agree that e-cigarettes can be used in places where smoking is not allowed (12). This is consistent with findings that certain e-cigarette marketers are using advertising tactics similar to those used in the past to market conventional cigarettes, including youth-oriented themes, and promoting e-cigarette use as an alternative in places where smoking is not allowed (2,9,10). An analysis of 57 online e-cigarette vendors determined that 70.2% of vendors used more than one social network service to market e-cigarettes (13). Moreover, 61.4% of vendors only required users to click a pop-up or dialog box to self-verify age, and 35.1% of vendors had no detectable age verification process. This unrestricted marketing of e-cigarettes, coupled with rising use of these products among youths (1), has the potential to compromise decades of progress in preventing tobacco use and promoting a tobacco-free lifestyle among youths (2,9).

Research supports the importance of a multifaceted approach to youth tobacco prevention involving multiple levels of government (2,9,14). Local, state, and federal efforts to reduce youth access to the settings where tobacco products, including

<sup>§</sup> A question assessing exposure to advertisements for cigarettes and other tobacco products from TV and movies is not available for the 2014 NYTS.

**TABLE. Electronic cigarette (e-cigarette) advertisement exposure among U.S. middle school and high school students, by sources of exposure — National Youth Tobacco Survey, 2014**

Characteristic	Retail stores		Internet		TV and movies		Newspapers and magazines	
	% (95% CI)	Population estimate (millions)*	% (95% CI)	Population estimate (millions)	% (95% CI)	Population estimate (millions)	% (95% CI)	Population estimate (millions)
<b>Overall</b>								
<b>Total</b>	<b>54.8 (53.6–56.0)</b>	<b>14.4</b>	<b>39.8 (38.5–41.1)</b>	<b>10.5</b>	<b>36.5 (35.3–37.7)</b>	<b>9.6</b>	<b>30.4 (29.3–31.6)</b>	<b>8.0</b>
<b>Sex</b>								
Female (referent)	54.9 (53.5–56.3)	7.2	41.1 (39.4–42.9)	5.4	36.4 (34.8–38.0)	4.7	32.1 (30.2–34.1)	4.2
Male	54.6 (52.9–56.4)	7.1	38.5 <sup>†</sup> (37.1–39.8)	5.0	36.7 (35.2–38.2)	4.8	28.7 <sup>†</sup> (27.6–29.9)	3.7
<b>Race/Ethnicity</b>								
Non-Hispanic white (referent)	56.7 (55.0–58.4)	8.4	40.2 (38.5–42.0)	5.9	35.2 (33.7–36.6)	5.2	31.1 (29.7–32.5)	4.6
Non-Hispanic black	51.7 <sup>§</sup> (49.4–53.9)	1.9	41.3 (38.5–44.2)	1.5	42.2 <sup>§</sup> (40.0–44.3)	1.5	32.2 (30.0–34.5)	1.2
Hispanic	55.6 (53.8–57.4)	3.0	39.4 (37.8–41.1)	2.1	37.4 <sup>§</sup> (35.6–39.4)	2.0	29.2 (27.1–31.3)	1.5
Other (non-Hispanic)	44.4 <sup>§</sup> (39.2–49.7)	0.5	32.6 <sup>§</sup> (28.3–37.2)	0.3	29.9 <sup>§</sup> (26.1–33.9)	0.3	25.3 <sup>§</sup> (22.1–28.7)	0.2
<b>Grade</b>								
6	50.6 <sup>¶</sup> (47.2–54.0)	1.8	32.8 <sup>¶</sup> (30.8–34.8)	1.1	31.8 <sup>¶</sup> (29.4–34.3)	1.1	24.1 <sup>¶</sup> (22.1–26.2)	0.8
7	55.0 (51.7–58.3)	2.1	36.7 <sup>¶</sup> (34.4–39.0)	1.4	35.6 (32.8–38.5)	1.4	25.9 <sup>¶</sup> (24.0–28.0)	1.0
8	52.6 (48.9–56.3)	2.0	37.6 <sup>¶</sup> (34.7–40.5)	1.4	34.6 (32.2–37.1)	1.3	25.0 <sup>¶</sup> (21.5–28.9)	0.9
9	54.7 (52.1–57.2)	2.1	39.2 <sup>¶</sup> (37.0–42.8)	1.5	37.2 (32.2–37.1)	1.4	32.0 <sup>¶</sup> (30.1–34.0)	1.2
10	56.2 (53.6–58.8)	2.1	43.4 (40.9–45.8)	1.6	38.9 (36.5–41.3)	1.4	34.0 <sup>¶</sup> (31.6–36.5)	1.2
11	57.8 (54.9–60.6)	2.0	45.5 (43.3–47.6)	1.6	39.9 (37.1–42.7)	1.4	35.9 (33.7–38.1)	1.2
12 (referent)	56.8 (54.2–59.3)	1.9	44.1 (41.7–46.6)	1.5	37.8 (34.5–41.3)	1.3	37.1 (34.7–39.5)	1.2
<b>Middle School</b>								
<b>Total</b>	<b>52.8 (50.9–54.7)</b>	<b>6.0</b>	<b>35.8 (34.2–37.4)</b>	<b>4.1</b>	<b>34.1 (32.3–35.8)</b>	<b>3.9</b>	<b>25.0 (23.8–26.3)</b>	<b>2.8</b>
<b>Sex</b>								
Female (referent)	52.1 (50.0–54.1)	2.9	37.6 (35.4–39.8)	2.1	33.3 (31.4–35.3)	1.8	26.2 (23.8–28.8)	1.4
Male	53.5 (50.8–56.2)	3.1	34.0 <sup>§</sup> (32.1–36.0)	1.9	34.9 (32.4–37.4)	2.0	24.0 (22.4–25.6)	1.4
<b>Race/Ethnicity</b>								
Non-Hispanic white (referent)	55.1 (52.7–57.5)	3.4	36.5 (34.4–38.5)	2.3	32.6 (30.2–35.2)	2.0	25.7 (23.9–27.5)	1.6
Non-Hispanic black	50.6 <sup>§</sup> (47.6–53.5)	0.7	36.4 (33.2–39.7)	0.5	40.4 <sup>§</sup> (36.8–44.1)	0.6	26.5 (23.6–29.7)	0.4
Hispanic	53.7 (50.9–56.5)	1.3	36.0 (33.9–38.2)	0.9	35.1 (33.1–37.1)	0.8	24.5 (22.3–26.9)	0.6
Other (non-Hispanic)	41.2 <sup>§</sup> (32.9–50.1)	0.2	28.8 <sup>§</sup> (23.7–34.6)	0.1	30.3 (24.8–36.6)	0.1	21.0 <sup>§</sup> (16.9–25.8)	0.1
<b>High School</b>								
<b>Total</b>	<b>56.3 (54.7–57.9)</b>	<b>8.3</b>	<b>42.9 (41.4–44.4)</b>	<b>6.3</b>	<b>38.4 (36.8–40.1)</b>	<b>5.6</b>	<b>34.6 (33.3–36.0)</b>	<b>5.1</b>
<b>Sex</b>								
Female (referent)	57.1 (55.0–59.1)	4.2	43.8 (41.5–46.1)	3.2	38.8 (36.6–41.0)	2.8	36.7 (34.7–38.7)	2.7
Male	55.5 (53.5–57.5)	4.0	42.0 (40.4–43.6)	3.0	38.1 (36.0–40.2)	2.7	32.5 <sup>§</sup> (42.2–45.5)	2.3
<b>Race/Ethnicity</b>								
Non-Hispanic white (referent)	57.8 (55.6–60.0)	4.9	43.0 (40.7–45.4)	3.6	37.1 (35.2–39.1)	3.1	35.2 (33.8–36.6)	3.0
Non-Hispanic black	52.4 <sup>§</sup> (49.4–55.4)	1.1	44.6 (41.0–48.4)	0.9	43.3 <sup>§</sup> (39.7–46.9)	0.9	36.1 (32.8–39.5)	0.8
Hispanic	57.3 (54.9–59.7)	1.6	42.3 (40.1–44.5)	1.2	39.5 (36.4–42.7)	1.1	33.1 (30.0–36.4)	0.9
Other (non-Hispanic)	46.6 <sup>§</sup> (41.6–51.5)	0.3	35.2 <sup>§</sup> (29.8–40.9)	0.2	29.5 <sup>§</sup> (25.9–33.4)	0.1	28.7 <sup>§</sup> (24.6–33.2)	0.1

**Abbreviation:** CI = confidence interval.

\* Population estimate (rounded down to the nearest 0.1 million).

<sup>†</sup> Statistically significant difference from referent (female) (p-value <0.05).

<sup>§</sup> Statistically significant difference from referent (non-Hispanic white) (p-value <0.05).

<sup>¶</sup> Statistically significant difference from referent (12th grade) (p-value <0.05).

e-cigarettes, are sold could reduce youth e-cigarette initiation and consumption, as well as advertising exposure. Potential strategies include requiring that tobacco products, including e-cigarettes, be sold only in facilities that never admit youths; limiting tobacco outlet density or proximity to schools; and requiring that e-cigarette purchases be made only through face-to-face transactions. Adding e-cigarettes and other tobacco

products to the list of current tobacco products prohibited from being sent through U.S. mail and requiring age verification for online sales at purchase and delivery could also prevent sales to youths. In addition, potential strategies at the federal or state level include regulation of e-cigarette advertising in media, Internet, and retail settings that are demonstrated to appeal to youths or are viewed by a substantial number of youths.

**Key Points**

- E-cigarette advertising expenditures have increased dramatically in the United States in recent years, from approximately \$6.4 million in 2011 to \$115 million in 2014.
- Approximately 18.3 million U.S. middle school and high school students were exposed to at least one source of e-cigarette advertising in 2014.
- Approximately half of all middle school and high school students (an estimated 14.4 million students) were exposed to e-cigarette advertisements in retail stores.
- Approximately one third of middle school and high school students were exposed to e-cigarette advertisements on the Internet (10.5 million), on TV or at the movies (9.6 million), or while reading newspapers or magazines (8.0 million).
- Tobacco product advertising can entice youth to start using tobacco. Comprehensive efforts to reduce youth exposure to e-cigarette marketing would be expected to reduce this burden, and consequently reduce youth use of these products.
- Additional information is available at <http://www.cdc.gov/vitalsigns>.

The evidence base for restricting advertisements for conventional tobacco products indicates that these interventions would be expected to contribute to reductions in e-cigarette advertisement exposure and use among youths as well (2,9). To effectively implement these strategies, there is a need for fully funded and sustained comprehensive state tobacco control programs that address all forms of tobacco use, including e-cigarettes (14). These programs are critical to support the implementation and maintenance of proven population-based interventions to reduce tobacco use among youths, including tobacco price increases, comprehensive smoke-free laws, and high impact mass media campaigns (14). However, in 2015, states appropriated only 1.9% (\$490.4 million) of combined revenues of \$25.6 billion from settlement payments and

tobacco taxes for all states on comprehensive tobacco control programs,<sup>†</sup> representing <15% of the CDC-recommended level of funding (\$3.3 billion) for all states combined (14). Only two states (Alaska and North Dakota) currently fund tobacco control programs at CDC-recommended levels. Additionally, parents, caregivers, and health care providers can talk to children about the dangers of tobacco use, encourage or set limits on media use, and teach children critical media viewing skills to increase their resistance to pro-tobacco messages (15).

These findings are subject to at least three limitations. First, advertising exposure was self-reported and is subject to recall bias. Second, data were collected only from students who attended public or private schools and might not be generalizable to middle school- and high school-aged youths who are being homeschooled, youths who have dropped out of school, or youths in detention centers. However, data from the Current Population Survey indicate that 97.5% of U.S. youths aged 10–13 years and 95.4% of those aged 14–17 years were enrolled in a traditional school in 2014.\*\* Finally, exposure to e-cigarette advertisements might have been underestimated, as survey questions asked only about exposure from four sources, and did not assess exposure from other potential sources such as sporting events, radio, or billboards.

This report highlights youth exposure to e-cigarette advertisements, which might be contributing to increasing youth experimentation with and use of e-cigarettes in recent years. Multiple approaches are warranted to reduce youth e-cigarette use and exposure to e-cigarette advertisements, including efforts to reduce youth access to the settings where tobacco products, including e-cigarettes, are sold, and regulation of youth-oriented e-cigarette marketing. The implementation of these approaches, in coordination with fully funded and sustained comprehensive state tobacco control programs, has the potential to reduce all forms of tobacco use among youths, including e-cigarette use.

<sup>†</sup> Available at <http://www.tobaccofreekids.org/microsites/statereport2015/>.

\*\* Available at <http://www.census.gov/hhes/school/data/cps/2014/tables.html>.

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