Tobacco use is the leading cause of preventable disease and death in the United States; if current smoking rates continue, 5.6 million Americans aged <18 years who are alive today are projected to die prematurely from smoking-related disease (1). Tobacco use and addiction mostly begin during youth and young adulthood (1,2). CDC and the Food and Drug Administration (FDA) analyzed data from the 2011–2015 National Youth Tobacco Surveys (NYTS) to determine the prevalence and trends of current (past 30-day) use of seven tobacco product types (cigarettes, cigars, smokeless tobacco, electronic cigarettes [e-cigarettes], hookahs [water pipes used to smoke tobacco], pipe tobacco, and bidis [small imported cigarettes wrapped in a tendu leaf]) among U.S. middle (grades 6–8) and high (grades 9–12) school students. In 2015, e-cigarettes were the most commonly used tobacco product among middle (5.3%) and high (16.0%) school students. During 2011–2015, significant increases in current use of e-cigarettes and hookahs occurred among middle and high school students, whereas current use of conventional tobacco products, such as cigarettes and cigars decreased, resulting in no change in overall tobacco product use. During 2014–2015, current use of e-cigarettes increased among middle school students, whereas current use of hookahs decreased among high school students; in contrast, no change was observed in use of hookahs among middle school students, use of e-cigarettes among high school students, or use of cigarettes, cigars, smokeless tobacco, pipe tobacco, or bidis among middle and high school students. In 2015, an estimated 4.7 million middle and high school students were current tobacco product users, and, therefore, continue to be exposed to harmful tobacco product constituents, including nicotine. Nicotine exposure during adolescence, a critical period for brain development, can cause addiction, might harm brain development, and could lead to sustained tobacco product use among youths (1,3). Comprehensive and sustained strategies are warranted to prevent and reduce the use of all tobacco products among U.S. youths.

The NYTS is a cross-sectional, school-based, self-administered, pencil-and-paper questionnaire administered to U.S. middle school and high school students. Information is collected on tobacco control outcome indicators to monitor the impact of comprehensive tobacco control policies and strategies (4) and to inform the FDA’s regulatory actions (5). A three-stage cluster sampling...
procedure was used to generate a nationally representative sample of U.S. students attending public and private schools in grades 6–12. This report uses data from 5 years of NYTS (2011–2015). Sample sizes and overall response rates for 2011, 2012, 2013, 2014, and 2015 were 18,866 (72.7%), 24,658 (73.6%), 18,406 (67.8%), 22,007 (73.3%), and 17,711 (63.4%), respectively.

Participants were asked about current (past 30-day) use of cigarettes, cigars, smokeless tobacco, e-cigarettes, hookahs, and pipe tobacco, and bidis. Current use for each product was defined as use on ≥1 day during the past 30 days. Current tobacco use was categorized as “any tobacco product use,” defined as use of one or more tobacco products in the past 30 days; and “≥2 tobacco product use,” defined as use of two or more tobacco products in the past 30 days. Kreteks (sometimes referred to as clove cigarettes) are no longer legally sold in the United States, and were excluded from the definition of current any tobacco product use, consistent with other recent reports. Data were weighted to account for the complex survey design and adjusted for nonresponse; national prevalence estimates with 95% confidence intervals and population estimates rounded down to the nearest 10,000 were computed. Estimates for current use in 2015 are presented for any tobacco product use, use of ≥2 tobacco products, and use of each tobacco product, by selected years when data were collected to assess trends across the study period (2011, 2012, and 2013).

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use increased from 3.9% in 2014 to 5.3% in 2015. Use of other tobacco products, including cigarettes, cigars, hookahs, and smokeless tobacco remained unchanged.

During 2011–2015, among all high school students, significant nonlinear increases were observed for current use of e-cigarettes (1.5% to 16.0%) and hookahs (4.1% to 7.2%) (Figure 1). Significant linear decreases were observed for current use of cigarettes (15.8% to 9.3%) and smokeless tobacco (7.9% to 6.0%), and significant nonlinear decreases were observed for current use of cigars (11.6% to 8.6%), pipe tobacco (4.0% to 1.0%), and bidis (2.0% to 0.6%). Current use of any tobacco product (24.2% to 25.3%) did not change significantly during 2011–2015. Among middle school students, significant linear increases were observed for current use of e-cigarettes (0.6% to 5.3%) and hookahs (1.0% to 2.0%) (Figure 2). Significant linear decreases were observed for current use of cigarettes (4.3% to 2.3%), cigars (3.5% to 1.6%), and smokeless tobacco (2.7% to 1.8%), and significant nonlinear decreases were observed for current use of pipe tobacco (2.2% to 0.4%) and bidis (1.7% to 0.2%). There was also a significant nonlinear change in the percentage of middle school students reporting current use of ≥2 tobacco products.

In 2015, one in four high school students and one in 13 middle school students reported current use of any tobacco product (≥1 day in the past 30 days). An estimated 4.7 million high school and middle school students reported current use of any tobacco product. During 2011–2015, substantial increases were observed in e-cigarette and hookah use among high school and middle school students, whereas significant decreases were observed in the use of cigarettes, cigars, smokeless tobacco, pipe tobacco, and bidis, resulting in no decline in tobacco use overall. During 2015, electronic cigarettes (e-cigarettes) were the most commonly used tobacco product among middle (5.3%) and high (16.0%) school students.

What are the implications for public health practice?

Use of emerging tobacco products, including e-cigarettes, is on the rise among middle and high school students; therefore, it is critical that comprehensive tobacco control and prevention strategies for youths address all tobacco products and not just cigarettes.
Hispanic ≥2 tobacco product use is past 30-day use of two or more of cigarettes, cigars, smokeless tobacco, electronic cigarettes, hookahs, pipe tobacco, and/or bidis on ≥1 day in the past 30 days.* Past 30-day use of cigarettes was determined by asking, “During the past 30 days, on how many days did you smoke cigarettes?”; Past 30-day use of cigars was determined by asking, “During the past 30 days, on how many days did you use cigars?”, “During the past 30 days, on how many days did you use chewing tobacco, snuff, or dip?”, “During the past 30 days, on how many days did you use chewing tobacco, snuff, or dip?”, and the following question for use of snus during 2014–2015, making cigarettes the most commonly used tobacco products among youths in 2015.

TABLE. Estimated percentage of tobacco use in the past 30 days, by product, race/ethnicity, school level, and sex — National Youth Tobacco Survey, United States, 2015

<table>
<thead>
<tr>
<th>Tobacco product use</th>
<th>Sex</th>
<th>Race/Ethnicity</th>
<th>% (95% CI)</th>
<th>% (95% CI)</th>
<th>% (95% CI)</th>
<th>% (95% CI)</th>
<th>% (95% CI)</th>
<th>% (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>Male</td>
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<td></td>
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<td>Non-Hispanic white</td>
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<tr>
<td></td>
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<td>Non-Hispanic black</td>
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<td></td>
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<td>Hispanic</td>
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<td></td>
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<td>Other race</td>
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<tr>
<td></td>
<td></td>
<td>Total</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Any tobacco product use</td>
<td>20.3 (18.0–22.9)</td>
<td>30.0 (27.4–32.8)</td>
<td>26.2 (23.2–29.4)</td>
<td>21.9 (18.7–25.5)</td>
<td>25.4 (22.6–28.3)</td>
<td>25.3 (16.9–36.1)</td>
<td>25.3 (23.1–27.6)</td>
<td>3,820,000</td>
</tr>
<tr>
<td>≥2 tobacco product use</td>
<td>9.6 (8.0–11.6)</td>
<td>16.2 (14.5–18.0)</td>
<td>14.2 (12.0–16.7)</td>
<td>9.5 (6.8–13.0)</td>
<td>13.0 (11.1–15.3)</td>
<td>9.4 (6.8–12.8)</td>
<td>13.0 (11.5–14.7)</td>
<td>1,960,000</td>
</tr>
</tbody>
</table>

Male

<table>
<thead>
<tr>
<th>Tobacco product use</th>
<th>% (95% CI)</th>
<th>% (95% CI)</th>
<th>% (95% CI)</th>
<th>% (95% CI)</th>
<th>% (95% CI)</th>
<th>% (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronic cigarettes</td>
<td>12.8 (11.0–15.0)</td>
<td>9.0 (6.5–12.1)</td>
<td>17.2 (14.7–19.9)</td>
<td>8.9 (7.4–10.8)</td>
<td>16.4 (14.1–19.0)</td>
<td>18.9 (16.3–21.5)</td>
</tr>
<tr>
<td>Cigarettes</td>
<td>7.7 (6.3–9.3)</td>
<td>10.7 (8.9–12.9)</td>
<td>10.2 (8.4–12.3)</td>
<td>5.7 (3.2–10.0)</td>
<td>9.0 (7.0–11.7)</td>
<td>7.5 (5.0–10.9)</td>
</tr>
<tr>
<td>Cigars</td>
<td>5.6 (4.7–6.8)</td>
<td>11.5 (10.1–13.1)</td>
<td>8.4 (7.2–9.9)</td>
<td>12.8 (9.5–17.0)</td>
<td>7.3 (5.8–9.1)</td>
<td>5.9 (3.8–9.1)</td>
</tr>
<tr>
<td>Hookah</td>
<td>6.9 (5.6–8.4)</td>
<td>7.4 (6.5–8.5)</td>
<td>6.9 (5.6–8.4)</td>
<td>6.4 (4.8–8.5)</td>
<td>8.7 (7.5–10.1)</td>
<td>6.4 (4.6–8.9)</td>
</tr>
<tr>
<td>Smokeless tobacco</td>
<td>1.8 (1.2–2.7)</td>
<td>10.0 (8.0–12.5)</td>
<td>7.8 (5.9–10.2)</td>
<td>1.9 (1.1–3.4)</td>
<td>4.8 (3.8–6.1)</td>
<td>2.7 (1.6–4.6)</td>
</tr>
<tr>
<td>Pipe tobacco</td>
<td>0.7 (0.4–1.2)</td>
<td>1.4 (0.9–2.0)</td>
<td>1.0 (0.7–1.6)</td>
<td>—</td>
<td>1.5 (1.1–2.2)</td>
<td>—</td>
</tr>
<tr>
<td>Bidis</td>
<td>0.4 (0.2–0.6)</td>
<td>0.9 (0.6–1.4)</td>
<td>0.5 (0.3–0.9)</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Any tobacco product use</td>
<td>20.3 (18.0–22.9)</td>
<td>30.0 (27.4–32.8)</td>
<td>26.2 (23.2–29.4)</td>
<td>21.9 (18.7–25.5)</td>
<td>25.4 (22.6–28.3)</td>
<td>25.3 (16.9–36.1)</td>
</tr>
<tr>
<td>≥2 tobacco product use</td>
<td>9.6 (8.0–11.6)</td>
<td>16.2 (14.5–18.0)</td>
<td>14.2 (12.0–16.7)</td>
<td>9.5 (6.8–13.0)</td>
<td>13.0 (11.1–15.3)</td>
<td>9.4 (6.8–12.8)</td>
</tr>
</tbody>
</table>

Abbreviation: CI = confidence interval.

* Past 30-day use of cigarettes was determined by asking, “During the past 30 days, on how many days did you smoke cigarettes?” Past 30-day use of cigars was determined by asking, “During the past 30 days, on how many days did you use cigars, cigarillos, or little cigars?” Smokeless tobacco was defined as use of chewing tobacco/snuff/dip, snus, and/or dissolvable tobacco. Past 30-day use of smokeless tobacco was determined by asking the following question for use of chewing tobacco/snuff/dip: “During the past 30 days, on how many days did you use chewing tobacco, snuff, or dip?”, and the following question for use of snus and dissolvable tobacco: “In the past 30 days, which of the following products have you used on at least one day?”, and combining responses together to derive use. Past 30-day use of electronic cigarettes was determined by asking, “During the past 30 days, on how many days did you use electronic cigarettes or e-cigarettes?”, past 30-day use of hookahs, pipe tobacco (not hookah), and bidis, were determined by asking, “In the past 30 days, which of the following products have you used on at least one day?”

† Estimated total number of users is rounded down to the nearest 10,000.

§ Data are statistically unreliable because sample size <50 or relative standard error >0.3.

¶ Any tobacco product use is past 30-day use of cigarettes, cigars, smokeless tobacco, electronic cigarettes, hookahs, pipe tobacco, and/or bidis on ≥1 day in the past 30 days.

** ≥2 tobacco product use is past 30-day use of two or more of cigarettes, cigars, smokeless tobacco, electronic cigarettes, hookahs, pipe tobacco, and/or bidis on ≥1 day in the past 30 days.

Discussion

During 2011–2015, there was no change in current use of any tobacco product among middle and high school students, and in 2015, an estimated 4.7 million U.S. middle and high school students currently used any tobacco product. As in 2014, e-cigarettes were the most used tobacco product among U.S. middle and high school students in 2015. During 2011–2015, substantial increases in current e-cigarette use among middle and high school students were reported, resulting in an estimated total of 3.0 million middle school and high school e-cigarette users in 2015. Although the use of cigarettes and cigars declined during 2011–2015, there was no change in use of these products during 2014–2015, making cigarettes (1.6 million) and cigars (1.4 million) the second and third most commonly used tobacco products among youths in 2015.

Tobacco prevention and control strategies, including increasing tobacco product prices, adopting comprehensive smoke-free laws, and implementation of national public education media campaigns, likely have contributed to the reduction in use of certain tobacco products, including cigarettes, among youths in recent years. However, the lack of decline in use of cigarettes and cigars from 2014 to 2015 is concerning, as approximately 80% of adult smokers first try smoking by age 18 years. Furthermore, because of increases in the use of...
emerging tobacco products, including e-cigarettes, no decline occurred in tobacco use overall during 2011–2015.

The findings in this report are subject to at least four limitations. First, NYTS only recruited middle and high school students from public and private schools in the United States; therefore, the findings might not be generalizable to youths who are being home-schooled, have dropped out of school, or are in detention centers. Second, data were self-reported; thus, the findings are subject to recall and response bias. Third, current tobacco use was estimated among students reporting their use status for at least one of the seven tobacco products included in the survey, whereas students with missing responses were considered nonusers of that product, which would result in conservative estimates. Finally, changes in the wording and placement of survey questions about the use of certain products (e.g., e-cigarettes, hookahs, and pipe tobacco) within the 2011–2015 period might have had an impact on reported use of these products; however, this possibility is difficult to assess because usage patterns were changing during this time period. Despite these limitations, overall trends are generally similar to other nationally representative surveys of tobacco use among youths (6,7).

Sustained efforts to implement proven tobacco control policies and strategies are necessary to prevent youth use of all tobacco products. In April 2014, FDA issued a proposed rule, which when finalized, would give FDA jurisdiction over products made or derived from tobacco, including e-cigarettes, some or all cigars, pipe tobacco, and hookah tobacco (8). Regulation of the manufacturing, distribution, and marketing of tobacco products by FDA, coupled with full implementation of comprehensive tobacco control and prevention strategies at CDC-recommended funding levels (9) could reduce youth tobacco

**FIGURE 1. Estimated percentage of high school students who currently use any tobacco products, a ≥2 tobacco products, b and select tobacco products§— National Youth Tobacco Survey 2011–2015**

<table>
<thead>
<tr>
<th>Tobacco product</th>
<th>Any</th>
<th>≥2 types</th>
<th>E-cigarettes</th>
<th>Cigarettes</th>
<th>Cigars</th>
<th>Hookahs</th>
<th>Smokeless tobacco</th>
<th>Pipe tobacco</th>
<th>Bidis</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td></td>
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<td></td>
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</tbody>
</table>

* Any tobacco product use is defined as past 30-day use of cigarettes, cigars, smokeless tobacco, e-cigarettes, hookahs, pipe tobacco, and/or bidis.

† ≥2 tobacco product use is defined as past 30-day use of two or more of the following product types: cigarettes, cigars, smokeless tobacco, e-cigarettes, hookahs, pipe tobacco, and/or bidis.

§ E-cigarettes and hookahs demonstrated a nonlinear increase (p<0.05). Cigarettes and smokeless tobacco demonstrated a linear decrease (p<0.05). Cigars, pipe tobacco, and bidis demonstrated a nonlinear decrease (p<0.05).
FIGURE 2. Estimated percentage of middle school students who currently use any tobacco products, ≥2 tobacco products, and select tobacco products in the past 30 days — National Youth Tobacco Survey, 2011–2015

* Any tobacco product use is defined as past 30-day use of cigarettes, cigars, smokeless tobacco, e-cigarettes, hookahs, pipe tobacco, and/or bidis.
† ≥2 tobacco product use is defined as past 30-day use of two or more of the following product types: cigarettes, cigars, smokeless tobacco, e-cigarettes, hookahs, pipe tobacco, and/or bidis.
§ ≥2 tobacco product use demonstrated a nonlinear change (p<0.05).
¶ E-cigarettes and hookahs demonstrated a linear increase (p<0.05). Cigarettes, cigars, and smokeless tobacco demonstrated a linear decrease (p<0.05). Pipe tobacco and bidis demonstrated a nonlinear decrease (p<0.05).

initiation and use (1,2,9). Given that the use of e-cigarettes is on the rise among middle and high school students and nicotine exposure from any source is dangerous for youths (2), it is critical that comprehensive tobacco control and prevention strategies for youths address all tobacco products and not just cigarettes. In addition, rapid changes in use of conventional and emerging tobacco products among youths, and varying prevalence of certain tobacco products by population groups underscore the importance of enhanced surveillance of all forms of tobacco product use among U.S. youths.

1Office on Smoking and Health, National Center for Chronic Disease Prevention and Health Promotion, CDC; 2 Epidemic Intelligence Service, CDC; 3 Center for Tobacco Products, Food and Drug Administration.

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References


