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Dual- and Polytabacco/Nicotine Product Use Trends in a National Sample of High School Students

Ashley L. Merianos, PhD, CHES¹, Tierney F. Mancuso, MD², Judith S. Gordon, PhD³, Kelsi J. Wood, MS¹, Katherine A. Cimperman, MPH⁴, and E. Melinda Mahabee-Gittens, MD, MS^{5,6}

¹School of Human Services, University of Cincinnati, Cincinnati, OH, USA

²Pediatric Residency Training Program, Cincinnati Children's Hospital Medical Center, Cincinnati, OH, USA

³Department of Family and Community Medicine, University of Arizona, Tucson, AZ, USA

⁴Department of Environmental Health, University of Cincinnati, Cincinnati, OH, USA

⁵Division of Emergency Medicine, Cincinnati Children's Hospital Medical Center, Cincinnati, OH, USA

⁶College of Medicine, University of Cincinnati, Cincinnati, OH, USA

Abstract

Purpose: The study purpose was to examine changes in patterns of ever and current dual- and polyproduct use over time and to examine demographic and modifiable risk factors including tobacco smoke exposure (TSE).

Design: A secondary analysis of the 2013 to 2015 National Youth Tobacco Survey data.

Setting: Nationwide high schools were selected.

Subjects: A total of 31 022 high school students.

Measures: Ever and current (past 30 days) tobacco/nicotine product use, home tobacco/nicotine product use, TSE and e-cigarette vapor exposure, and demographic characteristics were measured.

Analysis: Multivariable logistic regression and multinomial logistic regression models.

Results: Of the students, 9.4% were ever dual users and 18.6% were ever poly users. Rates of ever/current use of e-cigarettes and hookah increased from 2013 to 2015 (all P s < .001). In 2015, participants were 4.8 times (95% confidence interval [CI], 4.5–5.2) and 4.0 times (95% CI, 3.5–4.4) more likely to report ever/current e-cigarette use and 1.61 times (95% CI, 1.5–1.7) and 1.48 times (95% CI, 1.3–1.7) more likely to report ever/current hookah use. Participants reporting TSE were 15.4 times (95% CI, 11.5–21.0) more likely to report current poly use, and those with e-cigarette exposure were 10.4 times (95% CI, 7.8–13.8) more likely to report current poly use.

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Corresponding Author: Ashley L. Merianos, School of Human Services, University of Cincinnati, PO Box 210068, Cincinnati, OH 45221, USA. ashley.merianos@uc.edu

Declaration of Conflicting Interests

The author(s) declared no potential conflict of interest with respect to the research, authorship, and/or publication of this article.

Conclusion: From 2013 to 2015, rates of ever and current use of e-cigarettes and hookah increased. Tobacco smoke and e-cigarette exposure were associated with higher rates of dual and poly use. Prevention efforts targeting these products are needed.

Keywords

tobacco use; tobacco control; adolescents; school; cigarette use; e-cigarette use

Purpose

Adolescent tobacco use remains a public health problem in the United States.¹ Nearly one-third (32.3%) of high school students have tried smoking, and one-tenth (10.8%) reported smoking in the past 30 days.² Current rates of cigarette smoking suggest that approximately 1 in every 13 adolescents is projected to die prematurely from smoking-related morbidity.³ Although significant decreasing trends in conventional cigarette smoking have been observed among high school students, there have been increasing trends in the use of nonconventional tobacco and nicotine delivery products such as hookah and electronic cigarettes (e-cigarettes); thus, there has actually been no overall change in nicotine product use over time.^{2,4} From 2011 to 2015, current e-cigarette use increased from 1.5% to 16.0% and hookah use increased from 4.1% to 7.2% among high school students, whereas the use of cigars, pipes, and bidis decreased.² Further, concurrent use of multiple nicotine products remains common among high school students.⁵⁻⁷ During 2000 to 2012, the rates remained steady for overall current tobacco use (20.4%), current dual tobacco product use (4.7%; ie, use of cigarettes and 1 other tobacco product), and current polytobacco product use (3.6%; ie, use of cigarettes and at least 2 other tobacco products).⁸

Awareness and use of nonconventional products are disproportionately high among students who use conventional products, contributing to increased use of dual- and polynicotine products.⁹ Use of these products is concerning due to the addictive nature of nicotine,¹⁰ its negative effects on brain development,^{11,12} and its role in early initiation and sustainability of tobacco product use.⁵ The majority (88%) of adult daily smokers start using tobacco products by 18 years of age.⁵ Dual use of cigarettes and e-cigarettes has been linked to health risk behaviors including low daily physical activity, poor dietary behavior, alcohol and other drug use, physical fighting, and suicide attempts.¹³ Negative consequences specifically associated with polyproduct use include elevated risk of becoming nicotine dependent,^{14,15} lower intentions to quit smoking,¹⁶ increased use of alcohol and illicit drugs,¹⁷ and elevated rates of substance use disorders.¹⁸

National data indicate that demographic risk factors associated with cigarette smoking, e-cigarette use, and dual- and poly-product use include being male and being in higher grade levels.^{2,19} Some prior research indicates that white adolescents are at increased risk of being polyproduct users,¹⁹ whereas other work found that students of other races are more likely to be polyproduct users.¹⁵ Prior studies revealed that living with someone who uses cigarettes or e-cigarettes increases the risk of use of these products among adolescents.^{20,21} Further, youth who are exposed to tobacco smoke in their homes and live with smokers are at excess risk for initiating smoking and becoming smokers later in life.^{22,23} However, other research

found that adolescents who live with someone who used tobacco products were at decreased risk of being polytobacco users. Adolescents who perceived breathing smoke from tobacco products as not harmful were at increased risk of engaging in polytobacco use.¹⁹

Monitoring the use of conventional and nonconventional nicotine products is essential to inform decisions on tobacco control and prevention intervention strategies for high school students. The objectives of this study were to examine the changes in patterns of ever and current use of dual- and poly-tobacco/nicotine products over time and to examine demographic and modifiable risk factors, including home use and tobacco smoke exposure (TSE)/e-cigarette vapor exposure. For the purpose of this study, dualtobacco/nicotine product use was defined as smoking cigarettes plus another tobacco/nicotine product (cigars, pipes, bidis, e-cigarettes, hookah), and poly use was defined as smoking cigarettes plus 2 or more tobacco/nicotine products. Based on prior evidence,^{2,4} we hypothesized that participants in 2014 and 2015 would report lower conventional product use and higher nonconventional product use (ie, e-cigarettes and hookah) than participants in 2013. We posited that rates of dual use and poly use would remain stagnant,⁸ with highest rates reported among males and older students. We also hypothesized that living with someone who smokes and being exposed to tobacco smoke and e-cigarette vapor would increase the risk of reporting dual- and polyproduct use.

Methods

Design

We investigated secondary data from the 2013, 2014, and 2015 National Youth Tobacco Surveys (NYTS) to examine the trends of single-, dual-, and polyproduct use among high school students from 2013 to 2015. The NYTS collects data on tobacco prevention and control outcomes using a cross-sectional, paper-based survey method.

Sample

The 2013 to 2015 NYTS samples included a total of 31 022 high school students nationwide. The NYTS uses a multistaged, stratified sampling design to generate a nationally representative sample of students, as described elsewhere.²⁴ The NYTS has been previously approved by the Centers for Disease Control and Prevention's institutional review board (IRB). Student participation was voluntary and anonymous; parental consent was obtained prior to survey completion. The University of Cincinnati's IRB exempted the present study from review based on the nature of the de-identified NYTS data.

Measures

Ever use and current use of tobacco/nicotine products.—Ever use of tobacco/nicotine products was assessed using the following questions (yes, no): (1) “Have you ever tried cigarette smoking, even 1 or 2 puffs?” (2) “Have you ever tried an electronic cigarette or e-cigarette such as Blu, 21st Century Smoke or NJOY?” and (3) “Have you ever tried smoking cigars, cigarillos, or little cigars, such as Black and Mild, Swisher Sweets, Dutch Masters, White Owl, or Phillies Blunts, even 1 or 2 puffs?” Another question asked was “Which of the following tobacco products have you ever tried, even just 1 time?” Response

options were as follows: (4) “hookah or water pipe used with tobacco,” (5) “pipe filled with tobacco (not water pipe),” and (6) “bidis (small brown cigarettes wrapped in a leaf).” Similarly, participants were asked whether they used cigarettes, e-cigarettes, cigars, hookah, pipe, or bidis in the past 30 days.

Dual- and polytobacco/nicotine product use.—Participants who smoked cigarettes plus another tobacco product (cigars, hookah, pipes, bidis) or e-cigarettes were defined as having engaged in dualproduct use. Participants who smoked cigarettes plus 2 or more tobacco products or e-cigarettes were defined as having engaged in polyproduct use.

Home tobacco/nicotine product use.—Home tobacco/nicotine product use was assessed with the following question: “Does anyone who lives with you now ...? (CHECK ALL THAT APPLY.)” Response options were as follows: (1) “smoke cigarettes,” (2) “use electronic cigarettes or e-cigarettes” (2014 and 2015 NYTS only), (3) “smoke cigars, cigarillos, or little cigars,” (4) “smoke tobacco out of a hookah or water pipe,” (5) “smoke pipes filled with tobacco (not a water pipe),” and (6) “smoke bidis.”

TSE and e-cigarette vapor exposure.—Only the 2015 NYTS asked questions on TSE. Participants were asked how many days during the past 7 days did someone smoke tobacco products in their home or in a car they rode in and how many days during the past 30 days were they (1) exposed to tobacco smoke in an indoor or outdoor public place (eg, school building, store, and restaurant) and (2) exposed to vapor from an e-cigarette in an indoor or outdoor public place. Participants who reported exposure on at least 1 day were defined as being exposed to tobacco smoke/e-cigarette vapor.

Demographic characteristics.—Participants reported sex, race/ethnicity, and high school grade level (9th-12th grade). Racial/ethnic categories were as follows: non-Hispanic white, non-Hispanic black, Hispanic, and other race (ie, Asian, American Indian or Alaska Native, and Native Hawaiian or Other Pacific Islander).

Analysis

Descriptive statistics including frequencies were calculated to describe the characteristics of students who smoked tobacco/nicotine products by each survey year. We conducted multivariable logistic regression and multinomial logistic regression analyses adjusted for covariates of sex, race/ethnicity, and grade to examine changes in patterns of using tobacco or other nicotine products and home tobacco/nicotine product use between 2013 and 2015 and between 2014 and 2015. To examine the factors associated with cigarette use, e-cigarette use, dual-, and polyproduct use, we built logistic regression models with survey year included as an exposure variable while adjusting for covariates. We also built logistic regression models to assess the relationship between TSE in the home, car, public places, and e-cigarette vapor in public places (only included in 2015) and dual- and polyproduct use while adjusting for the covariates. Analyses were performed using SPSS version 23.0. Weights provided by the NYTS were used to account for the complex survey design. The α level was 0.05.

Results

Single, Dual-, and Polyproduct Use and Demographic Characteristics

Of participants, 50.7% (n = 15 814) were male; over half were white (58.1%, n = 14 975), 21.7% (n = 8084) were Hispanic, 15.2% (n = 5166) were black, and 5.0% (n = 1845) were other races. High school grade level was near equal distribution, with 27.3% enrolled in the 9th grade (n = 8021), 25.7% in the 10th grade (n = 8028), 23.9% in the 11th grade (n = 7598), and 23.1% in the 12th grade (n = 7375). In 2015, 30.6 % of high school students reported ever using cigarettes, 26.2% used cigars, 3.8% used pipes, and 2.0% used bidis. In all, 9.3% of high school students reported current use of cigarettes, 8.6% used cigars, 1.0% used pipes, and 0.7% used bidis. Regarding nonconventional product use, 37.7% of students reported ever use of e-cigarettes and 19.8% used hookah, and 16.0% reported current use of e-cigarettes and 7.2% used hookah. Prevalence rates of single product use by demographic characteristics and living with someone who uses tobacco/nicotine products are presented in Table 1.

Table 2 presents prevalence rates of dual- and polyproduct users by demographics and home tobacco/nicotine product use. In 2015, 9.4% (n = 711) of high school students were ever dual users, 3.3% (n = 301) were current dual users, 18.6% (n = 1748) were ever poly users, and 3.7% (n = 371) were current poly users. Males and females had similar prevalence rates of reporting ever dual use, whereas ever poly use rates were higher among males. Ever and current dual users and poly users had high rates of use of e-cigarettes, cigars, and hookah (see Table 2).

Single Product Use Trends

Associations between patterns of product use were found between 2013 and 2015 and between 2014 and 2015 while adjusting for the covariates (Table 3). In 2014 and 2015, students were significantly more likely to report ever use (adjusted odds ratio [aOR] = 1.60, 95% confidence interval [CI], 1.50–1.70; aOR = 4.83, 95% CI, 4.47–5.21, respectively) and current use (aOR = 1.18, 95% CI, 1.09–1.28; aOR = 3.95, 95% CI, 3.53–4.43) of e-cigarettes than in 2013. Further, participants in 2015 were significantly more likely to report ever use and current use of hookah (aOR = 1.61, 95% CI, 1.49–1.74; aOR = 1.48, 95% CI, 1.31–1.67) than in 2013.

Dual- and Polyproduct Use Trends

Significant differences were found between patterns of dual-and polyproduct use. In 2015, participants were at decreased risk of reporting ever dual use (aOR = 0.66, 95% CI, 0.59–0.72) but were at increased risk of reporting ever poly use (aOR = 1.35, 95% CI, 1.25–1.47) compared to 2013, independent of the covariates (Table 3).

Cigarette and E-Cigarette Use Trends and Risk Factors

Although the likelihood of ever and current cigarette use decreased, participants were significantly more likely to have ever used or currently used e-cigarettes in 2014 (aOR = 3.01, 95% CI, 2.79–3.25; aOR = 3.34, 95% CI, 2.99–3.74) and 2015 (aOR = 4.83, 95% CI, 4.47–5.21; aOR = 3.95, 95% CI, 3.53–4.43) than in 2013 (Table 4). Males and those in

higher grade levels (10th, 11th, or 12th grade) were at increased risk of using cigarettes and e-cigarettes.

Dual- and Polyproduct Use Trends and Risk Factors

Compared to 2013, participants in 2014 and 2015 were at significantly decreased odds of reporting ever or current dual-product use. However, compared to 2013, participants were at significantly increased likelihood of reporting ever (aOR = 1.33, 95% CI, 1.23–1.43) and current (aOR = 1.17, 95% CI, 1.01–1.34) polyproduct use in 2014 and ever poly use in 2015 (aOR = 1.35, 95% CI, 1.25–1.46; see Table 4). Students in 10th to 12th grades were more likely than 9th grade students to report ever and current dual and poly use.

Home Tobacco/Nicotine Use, TSE, E-Cigarette Exposure, and Dual- and Polyproduct Use

Although the likelihood of home use of tobacco/nicotine products among people who lived with participants significantly decreased from 2013 to 2015 and from 2014 to 2015 (Table 3), TSE increased the likelihood of reporting dual use and poly use among 2015 participants (Table 5). Specifically, participants who lived with someone who smoked tobacco in their home were at significantly increased risk of reporting ever dual use (aOR = 2.97, 95% CI, 2.50–3.52), current dual use (aOR = 4.10, 95% CI, 3.20–5.26), ever poly use (aOR = 3.18, 95% CI, 2.82–3.58), and current poly use (aOR = 5.29, 95% CI, 4.20–6.65). Those exposed to tobacco smoke in a car were significantly more likely to report ever dual use (aOR = 3.88, 95% CI, 3.27–4.60), current dual use (aOR = 6.88, 95% CI, 5.28–8.95), ever poly use (aOR = 5.01, 95% CI, 4.45–5.64), and current poly use (aOR = 15.43, 95% CI, 11.53–20.65).

Participants exposed to TSE in an indoor or outdoor public place were at significantly increased risk of reporting ever dual use (aOR = 1.68, 95% CI, 1.41–1.99), current dual use (aOR = 3.60, 95% CI, 2.62–4.93), ever poly use (aOR = 2.58, 95% CI, 2.28–2.92), and current poly use (aOR = 7.20, 95% CI, 5.02–10.34; Table 5). Similarly, participants exposed to e-cigarette vapor were significantly more likely to report ever (aOR = 1.91, 95% CI, 1.61–2.26) and current (aOR = 2.71, 95% CI, 2.12–3.48) dual use and ever (aOR = 3.22, 95% CI, 2.87–3.62) and current (aOR = 10.38, 95% CI, 7.82–13.79) poly use.

Discussion

This study found high rates of conventional and nonconventional tobacco/nicotine product use among a national sample of high school students. From 2013 to 2015, the likelihood of ever use and current use of cigarettes, cigars, and pipes decreased, although these downward trends slowed from 2014 to 2015. As hypothesized, compared to 2013, participants in 2015 were more likely to report ever and current use of e-cigarettes and hookah. In 2015, over one-third (37.7%) of students reported ever use of e-cigarettes and 16.0% reported current use of e-cigarettes. These figures are higher than ever and current cigarette use (30.6% and 9.3%, respectively). Similar to prior work,^{25,26} we found that in 2015, students were at nearly 5 times the risk of reporting ever use of e-cigarettes and 4 times the risk of reporting current use compared to 2013. This is concerning given research suggests that e-cigarette use may be predictive of initiation of conventional cigarette use due to low perceived harm

and the potential of renormalization and social acceptance of smoking behavior among this population.^{20,21,27}

Dual and poly use of nonconventional tobacco product and e-cigarette use is increasing over time.^{2,4} We found that 9.4% of high school students were ever dual users and 18.6% were ever poly users. The rates of current dual use (3.3%) and poly use (3.7%) were similar. Although the risk of reporting dual use decreased from 2013 to 2015, no declines were seen from 2014 to 2015. Notably, we found an increase in participants' risk of reporting ever poly use from 2013 to 2015, rejecting our hypothesis. This finding expands on prior literature that indicates rates of poly use are stable among this population,⁸ potentially due to increasing use of nonconventional tobacco products (eg, hookah) and e-cigarettes that are highly marketed and have flavors that appeal to adolescents.²⁸⁻³¹ Nearly all poly users reported that they ever used (95.6%) and currently used (91.3%) e-cigarettes; the majority also reported ever use and current use of cigars and hookah, which emphasizes the need for the expansion of current prevention initiatives to include nonconventional tobacco products such as e-cigarettes.

We found several risk factors for cigarette use, e-cigarette use, and dual- and polyproduct use. Similar to previous research,² male and those in higher grade levels (10th-12th grades) were at increased risk of ever and current use of cigarettes and e-cigarettes. Hispanic students were more likely to report ever cigarette use but less likely to report current cigarette use. No difference in e-cigarette use was found between white and Hispanic students. Ever dual users were more likely to be black, Hispanic, or in 10th to 12th grades. Current dual users were more likely to be male, white, or in 10th to 12th grades, which aligned with prior studies, with the exception of race.^{19,32} Specifically, Lee et al¹⁹ found no differences in current dual use based on race after adjusting for the covariates, whereas other research³² indicated that dual users were more likely to be white. Students at increased risk of poly use were males, white, or in 10th to 12th grades.¹⁹

In this study, we found high rates of home tobacco/nicotine product use and high rates of TSE and e-cigarette vapor exposure. Despite decreases over time, over half of participants in 2015 still lived with someone who used tobacco/nicotine products in their home, comparable to other research.³³ This finding underscores the importance of educating family members on the role TSE has on increasing risk of initiating tobacco/nicotine product use.^{20,21,34} As hypothesized, we found that TSE in the home, car, and public places significantly increased students' likelihood of reporting dual use and poly use compared to those who were not exposed to tobacco smoke. TSE is a modifiable risk factor that can be included in prevention and cessation interventions as an additional method to decrease the likelihood of dual and poly use. Similarly, exposure to vapor from e-cigarettes in public places significantly increased the risk of dual and poly use. E-cigarette vapor exposes nonsmokers to nicotine, particulates, and hydrocarbons.³⁵⁻³⁷ Although a review of the literature suggests that health risks associated with e-cigarette vapor are lower compared to exposure from tobacco products,³⁸ research on the risk behaviors, including initiation of tobacco/nicotine product use associated with e-cigarette vapor exposure, needs to be further explored.

Despite the many strengths of this study including the use of nationally representative data, this study is not without limitations. The NYTS is a cross-sectional survey, and causal or longitudinal relationships could not be observed. Thus, our findings cannot be used to add support to the debate concerning e-cigarettes as a gateway drug or smoking cessation tool. Second, participants' report of ever and current use of tobacco/nicotine products may have been underreported or overreported. Third, self-reported TSE may have been influenced by social desirability bias. Validating these results by using cotinine, an objective measure of TSE,³⁹ would provide a more accurate measure of exposure. Although we accounted for potential demographic confounders in analyses, results may have been biased due to residual confounding.

This study found high rates of concurrent use of tobacco and nicotine products among high school students in the United States. It is important to note that conventional tobacco product use has declined since the early 1990s, which provides solid evidence that prevention interventions and policies for adolescent smoking can be effective.⁵ However, with the growing popularity of nonconventional tobacco products including e-cigarettes, efforts are critically needed to address the use of these products among this student population. For example, prevention and intervention programs should include information on nonconventional tobacco/nicotine products to increase high school students' knowledge of these products, including potential harms associated with nicotine and addiction, in order for them to make informed decisions about use. Thus, current tobacco prevention and control efforts should expand the focus of conventional products to include all tobacco/nicotine products. Programs should aim to teach high school students about actual versus perceived rates of all tobacco/nicotine product use and socially acceptable refusal skills that would apply to all tobacco/nicotine products. Little decline in risk of tobacco use from 2014 to 2015, combined with no recent change in overall tobacco use,⁴ suggests the need for the development and testing of novel prevention intervention strategies to reduce overall tobacco use among adolescents. This is especially important as nicotine dependence typically begins in adolescence. Further, despite numerous prevention efforts, the present study revealed a substantial proportion of high school students are exposed to tobacco smoke.⁴⁰ Given the American Academy of Pediatrics'^{41,42} view that tobacco use is a pediatric disease, this finding underscores that TSE and its known risk factors should be a key component of prevention programming. High school students should be taught that there is no risk-free level of TSE and how to avoid it, when possible. It is of importance to include families and communities in TSE reduction initiatives to educate them on the risks associated with TSE and the importance of having home/car/school/work/other public area smoking bans to protect students. Continued monitoring of tobacco/nicotine product usage is necessary to provide information on tobacco/nicotine product use patterns, the risk factors associated with use, and the effectiveness of efforts to prevent tobacco initiation among high school students.

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SO WHAT? Implications for Health Promotion Practitioners and Researchers

What is already known on this topic?

Tobacco smoke exposure (TSE) increases the risk of tobacco/nicotine product initiation. It is not known whether TSE and e-cigarette exposure increase the risk of dual and poly use of tobacco/nicotine products.

What does this article add?

Trends of ever/current poly use of cigarettes plus non-conventional tobacco/nicotine products from sequential, cross-sectional studies increased over time. The rates of dual and poly use were highest in those with home, car, and public place TSE and e-cigarette vapor exposure. Decreasing TSE and e-cigarette vapor exposure may decrease current trends.

What are the implications for health promotion practice or research?

There is a need for the development and testing of novel prevention intervention strategies to reduce overall tobacco use and TSE among adolescents. Current tobacco prevention and control efforts should expand the focus of conventional products to include all tobacco/nicotine products and include TSE and e-cigarette vapor exposure reduction efforts.

Table 1.

Characteristics of Ever and Current Use of Tobacco/Nicotine Products, National Youth Tobacco Survey 2013 to 2015.

| Variable | Cigarettes | | | | | E-Cigarettes | | | | | Cigars | | | | | Hookah | | | | | Pipes | | | | | Bids | | | | | | | | |
|---------------------------|-------------|-------------|-------------|-------------|-------------|--------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-----------|-------------|-------------|-------------|---|-------------|-------------|-------------|---|-------------|-------------|-------------|---|-------------|-------------|--|--|--|--|--|
| | 2013, n (%) | d | 2014, n (%) | 2015, n (%) | 2013, n (%) | 2014, n (%) | 2015, n (%) | 2013, n (%) | 2014, n (%) | 2015, n (%) | 2013, n (%) | 2014, n (%) | 2015, n (%) | 2013, n (%) | d | 2014, n (%) | 2015, n (%) | 2013, n (%) | d | 2014, n (%) | 2015, n (%) | 2013, n (%) | d | 2014, n (%) | 2015, n (%) | 2013, n (%) | d | 2014, n (%) | 2015, n (%) | | | | | |
| Ever use | 3515 (34.7) | 3630 (30.8) | 2841 (30.6) | 1093 (11.9) | 3059 (27.3) | 3484 (37.7) | 3071 (30.5) | 3010 (26.2) | 2451 (26.2) | 1319 (14.3) | 2396 (22.0) | 1827 (19.8) | 938 (9.7) | 557 (5.1) | 326 (3.8) | 257 (2.6) | 189 (2.0) | | | | | | | | | | | | | | | | | |
| Sex | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Male | 1820 (36.3) | 2001 (33.2) | 1591 (33.0) | 635 (13.8) | 1740 (30.1) | 1943 (40.7) | 1801 (36.4) | 1815 (31.6) | 1488 (30.9) | 702 (15.1) | 1231 (22.1) | 934 (19.7) | 580 (12.0) | 399 (7.3) | 239 (5.4) | 185 (3.8) | 122 (2.5) | | | | | | | | | | | | | | | | | |
| Female | 1694 (33.0) | 1621 (28.4) | 1237 (28.0) | 457 (9.9) | 1308 (24.5) | 1531 (34.6) | 1269 (24.5) | 1186 (20.9) | 937 (21.3) | 616 (13.5) | 1154 (21.9) | 889 (19.9) | 357 (7.4) | 155 (2.8) | 86 (2.1) | 72 (1.4) | 65 (1.4) | | | | | | | | | | | | | | | | | |
| Race/ethnicity | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| White | 1682 (33.9) | 1799 (31.2) | 1399 (29.8) | 683 (14.7) | 1638 (29.7) | 1770 (38.0) | 1486 (30.4) | 1502 (26.5) | 1188 (26.2) | 702 (15.5) | 1168 (22.3) | 908 (19.6) | 494 (10.5) | 357 (6.4) | 209 (4.5) | 139 (2.8) | 99 (2.0) | | | | | | | | | | | | | | | | | |
| Black | 606 (33.8) | 563 (26.6) | 375 (28.1) | 89 (4.9) | 332 (17.6) | 375 (28.5) | 644 (34.9) | 577 (29.2) | 475 (35.5) | 140 (7.4) | 246 (14.7) | 219 (16.6) | 116 (6.1) | 30 (1.5) | 12 (1.1) | 37 (2.1) | 18 (1.3) | | | | | | | | | | | | | | | | | |
| Hispanic | 972 (40.2) | 964 (33.2) | 855 (33.7) | 251 (10.4) | 849 (29.9) | 1089 (43.0) | 732 (30.4) | 730 (25.8) | 607 (22.3) | 386 (17.4) | 778 (27.8) | 577 (22.6) | 258 (11.1) | 130 (4.3) | 82 (3.7) | 65 (2.8) | 58 (2.3) | | | | | | | | | | | | | | | | | |
| Other | 168 (24.6) | 156 (20.6) | 113 (28.7) | 45 (6.3) | 140 (18.7) | 154 (37.4) | 125 (20.3) | 90 (11.6) | 79 (17.5) | 66 (11.0) | 124 (16.6) | 76 (18.3) | 44 (6.3) | 20 (2.8) | 16 (3.8) | 10 (1.5) | 6 (1.4) | | | | | | | | | | | | | | | | | |
| Grade level | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9th grade | 705 (27.6) | 688 (23.0) | 526 (22.3) | 215 (8.7) | 646 (21.5) | 711 (29.0) | 524 (19.9) | 478 (15.9) | 352 (15.0) | 197 (7.4) | 374 (12.7) | 296 (11.8) | 191 (7.4) | 93 (3.1) | 53 (2.1) | 53 (2.1) | 35 (1.4) | | | | | | | | | | | | | | | | | |
| 10th grade | 852 (32.5) | 879 (29.3) | 698 (28.9) | 246 (10.7) | 770 (26.0) | 930 (37.9) | 714 (28.2) | 700 (24.0) | 546 (23.0) | 264 (11.5) | 543 (19.1) | 441 (17.9) | 209 (8.4) | 129 (4.6) | 82 (4.0) | 62 (2.6) | 56 (2.5) | | | | | | | | | | | | | | | | | |
| 11th grade | 916 (37.1) | 1008 (35.0) | 747 (32.9) | 269 (12.6) | 831 (31.8) | 883 (40.3) | 847 (35.1) | 849 (30.7) | 673 (28.6) | 328 (15.3) | 672 (26.5) | 476 (21.4) | 247 (11.0) | 147 (5.7) | 78 (3.7) | 62 (2.7) | 42 (1.8) | | | | | | | | | | | | | | | | | |
| 12th grade | 1042 (42.8) | 1055 (37.1) | 870 (39.7) | 363 (16.4) | 812 (31.0) | 960 (45.0) | 986 (40.9) | 983 (36.1) | 860 (40.6) | 530 (24.5) | 807 (31.2) | 614 (29.7) | 291 (12.7) | 188 (7.2) | 113 (5.6) | 80 (3.1) | 56 (2.2) | | | | | | | | | | | | | | | | | |
| Home tobacco/nicotine use | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| None | 1310 (23.1) | 1399 (21.0) | 1086 (20.9) | 364 (7.1) | 1197 (19.2) | 1519 (28.8) | 1210 (21.5) | 1193 (18.9) | 997 (18.9) | 518 (10.0) | 1052 (17.0) | 822 (15.5) | 298 (5.7) | 182 (3.0) | 102 (2.2) | 81 (1.4) | 63 (1.3) | | | | | | | | | | | | | | | | | |
| Cigarettes | 1625 (51.2) | 1572 (46.6) | 1156 (45.1) | 548 (19.0) | 1306 (40.4) | 1243 (49.3) | 1294 (41.4) | 1194 (35.4) | 869 (34.4) | 555 (19.4) | 899 (28.6) | 627 (25.2) | 414 (14.1) | 260 (8.1) | 141 (5.9) | 123 (4.2) | 72 (2.5) | | | | | | | | | | | | | | | | | |
| E-cigarettes | - | 599 (56.1) | 410 (51.9) | - | 675 (62.7) | 532 (66.0) | - | 464 (42.1) | 319 (40.8) | - | 403 (39.3) | 275 (33.8) | - | 124 (12.9) | 77 (10.9) | - | 35 (3.7) | | | | | | | | | | | | | | | | | |
| Cigars | 453 (53.3) | 492 (47.5) | 297 (45.2) | 185 (24.1) | 403 (40.9) | 316 (48.5) | 491 (55.7) | 546 (54.1) | 342 (51.4) | 200 (24.9) | 332 (37.8) | 186 (26.0) | 169 (21.3) | 119 (12.8) | 47 (8.0) | 51 (5.9) | 31 (4.3) | | | | | | | | | | | | | | | | | |
| Hookah | 180 (63.1) | 280 (56.2) | 154 (56.6) | 90 (33.8) | 281 (56.4) | 181 (66.1) | 170 (58.9) | 268 (52.1) | 131 (48.5) | 167 (59.4) | 326 (69.5) | 161 (56.4) | 105 (37.2) | 80 (15.9) | 35 (13.7) | 37 (10.9) | 20 (5.7) | | | | | | | | | | | | | | | | | |
| Pipes | 149 (65.4) | 121 (66.5) | 64 (62.5) | 82 (38.9) | 111 (60.0) | 72 (66.5) | 132 (58.9) | 121 (58.9) | 61 (57.0) | 106 (49.8) | 90 (51.2) | 47 (42.0) | 94 (41.1) | 76 (44.4) | 26 (22.2) | 31 (12.0) | 13 (9.8) | | | | | | | | | | | | | | | | | |
| Bids | 57 (69.1) | 62 (69.0) | 30 (66.5) | 27 (35.2) | 57 (63.5) | 31 (71.5) | 61 (71.0) | 59 (64.1) | 23 (51.0) | 34 (40.8) | 48 (60.9) | 20 (46.9) | 39 (51.1) | 30 (34.9) | 8 (18.0) | 26 (27.3) | 11 (24.2) | | | | | | | | | | | | | | | | | |
| Current use | 1262 (12.7) | 1104 (9.2) | 873 (9.3) | 430 (4.5) | 1505 (13.4) | 1469 (16.0) | 1243 (11.9) | 956 (8.2) | 850 (8.6) | 490 (5.2) | 1052 (9.4) | 670 (7.2) | 390 (4.1) | 175 (1.5) | 103 (1.0) | 71 (0.6) | 65 (0.6) | | | | | | | | | | | | | | | | | |
| Sex | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Male | 695 (14.1) | 666 (10.6) | 531 (10.7) | 635 (13.8) | 870 (15.0) | 911 (19.0) | 788 (15.4) | 621 (10.8) | 568 (11.5) | 268 (5.6) | 518 (8.9) | 355 (7.4) | 242 (5.0) | 116 (2.1) | 71 (1.4) | 47 (0.8) | 48 (0.9) | | | | | | | | | | | | | | | | | |
| Female | 566 (11.2) | 434 (7.9) | 338 (7.7) | 457 (9.9) | 628 (11.9) | 553 (12.8) | 454 (8.3) | 330 (5.5) | 281 (5.6) | 222 (4.8) | 527 (9.8) | 312 (6.9) | 148 (3.3) | 56 (0.9) | 32 (0.7) | 24 (0.5) | 17 (0.4) | | | | | | | | | | | | | | | | | |
| Race/ethnicity | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| White | 696 (14.0) | 654 (10.8) | 495 (10.2) | 683 (14.7) | 847 (15.3) | 813 (17.2) | 586 (11.4) | 474 (8.3) | 424 (8.4) | 244 (5.3) | 507 (9.4) | 324 (6.9) | 168 (3.7) | 102 (1.9) | 57 (1.0) | 32 (0.6) | 26 (0.5) | | | | | | | | | | | | | | | | | |
| Black | 162 (9.0) | 107 (4.5) | 82 (5.7) | 89 (4.9) | 111 (5.6) | 119 (8.9) | 268 (14.7) | 200 (8.8) | 172 (12.8) | 44 (2.4) | 96 (5.6) | 80 (6.4) | 60 (3.5) | 12 (0.6) | 7 (0.5) | 13 (0.9) | 8 (0.6) | | | | | | | | | | | | | | | | | |
| Hispanic | 320 (13.4) | 258 (8.8) | 228 (9.0) | 251 (10.4) | 442 (15.3) | 416 (16.4) | 307 (12.1) | 223 (8.0) | 201 (7.3) | 156 (7.1) | 369 (13.0) | 218 (8.7) | 138 (6.5) | 46 (1.5) | 32 (1.5) | 20 (0.7) | 25 (0.9) | | | | | | | | | | | | | | | | | |
| Other | 54 (7.6) | 40 (5.3) | 31 (7.5) | 45 (6.3) | 66 (9.4) | 75 (18.9) | 49 (8.5) | 23 (2.6) | 23 (5.9) | 38 (6.4) | 49 (6.0) | 32 (6.4) | 20 (2.8) | 8 (1.0) | 5 (0.9) | 5 (0.7) | 2 (0.3) | | | | | | | | | | | | | | | | | |
| Grade level | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9th grade | 208 (8.0) | 179 (5.7) | 137 (5.9) | 215 (8.7) | 343 (11.0) | 297 (12.3) | 200 (7.2) | 151 (4.7) | 110 (4.5) | 79 (2.8) | 180 (6.0) | 130 (5.4) | 87 (3.5) | 36 (1.1) | 27 (1.0) | 13 (0.4) | 23 (0.9) | | | | | | | | | | | | | | | | | |

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| Variable | Cigarettes | | | E-Cigarettes | | | Cigars | | | Hookah | | | Pipes | | | Bids | | |
|---------------------------|--------------------------|-------------|-------------|--------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|--------------------------|-------------|-------------|--------------------------|-------------|-------------|
| | 2013, n (%) ^a | 2014, n (%) | 2015, n (%) | 2013, n (%) | 2014, n (%) | 2015, n (%) | 2013, n (%) | 2014, n (%) | 2015, n (%) | 2013, n (%) | 2014, n (%) | 2015, n (%) | 2013, n (%) ^a | 2014, n (%) | 2015, n (%) | 2013, n (%) ^a | 2014, n (%) | 2015, n (%) |
| 10th grade | 274 (10.9) | 255 (8.4) | 183 (8.3) | 246 (10.7) | 387 (13.2) | 371 (15.3) | 281 (10.5) | 200 (6.8) | 166 (6.7) | 99 (4.1) | 245 (8.3) | 164 (6.6) | 83 (3.5) | 40 (1.4) | 25 (1.0) | 18 (0.5) | 23 (1.0) | 21 (1.0) |
| 11th grade | 342 (14.4) | 308 (10.8) | 254 (10.2) | 269 (12.6) | 387 (14.9) | 380 (17.2) | 345 (14.1) | 260 (9.5) | 248 (9.7) | 118 (5.5) | 275 (10.7) | 169 (7.6) | 100 (4.5) | 38 (1.7) | 25 (1.1) | 20 (0.9) | 24 (0.8) | 15 (0.6) |
| 12th grade | 438 (18.4) | 362 (12.6) | 299 (13.4) | 365 (16.4) | 388 (15.2) | 421 (19.7) | 417 (16.8) | 345 (12.3) | 326 (14.5) | 199 (9.1) | 352 (13.0) | 207 (9.4) | 120 (5.2) | 61 (2.1) | 26 (1.1) | 20 (0.7) | 18 (0.8) | 16 (0.5) |
| Home tobacco/nicotine use | | | | | | | | | | | | | | | | | | |
| None | 321 (5.5) | 330 (4.9) | 256 (4.9) | 364 (7.1) | 556 (8.9) | 929 (10.5) | 406 (7.3) | 321 (5.0) | 295 (5.6) | 177 (3.3) | 417 (6.5) | 233 (4.5) | 100 (2.0) | 55 (0.9) | 24 (0.5) | 22 (0.4) | 26 (0.5) | 16 (0.3) |
| Cigarettes | 682 (22.4) | 567 (17.0) | 409 (16.2) | 548 (19.0) | 648 (20.0) | 572 (22.3) | 554 (16.7) | 407 (12.4) | 320 (11.5) | 213 (7.4) | 416 (13.1) | 250 (9.8) | 174 (6.0) | 81 (2.4) | 51 (1.6) | 32 (0.9) | 34 (1.2) | 27 (0.9) |
| E-cigarettes | - | 229 (22.4) | 164 (20.0) | - | 419 (39.7) | 326 (40.7) | - | 182 (17.5) | 134 (15.2) | - | 204 (19.9) | 141 (17.2) | - | 48 (4.8) | 27 (3.1) | - | 24 (2.4) | 11 (1.2) |
| Cigars | 201 (24.1) | 199 (19.3) | 126 (19.9) | 185 (24.1) | 213 (22.2) | 146 (21.8) | 267 (28.1) | 274 (28.1) | 176 (23.1) | 76 (8.7) | 178 (18.9) | 89 (13.4) | 81 (9.8) | 55 (5.3) | 23 (3.2) | 22 (2.3) | 23 (2.9) | 15 (2.1) |
| Hookah | 95 (31.5) | 127 (25.9) | 62 (23.0) | 90 (33.8) | 161 (31.0) | 104 (39.4) | 91 (26.4) | 126 (25.3) | 64 (21.5) | 107 (35.4) | 206 (44.1) | 103 (36.5) | 63 (21.6) | 43 (9.1) | 23 (9.0) | 18 (4.8) | 20 (3.8) | 13 (4.0) |
| Pipes | 94 (39.0) | 67 (37.8) | 31 (24.6) | 82 (38.9) | 77 (41.4) | 53 (52.2) | 76 (30.6) | 74 (43.0) | 37 (28.5) | 66 (30.1) | 60 (36.5) | 31 (30.4) | 64 (27.1) | 41 (24.1) | 19 (16.5) | 17 (6.0) | 19 (12.5) | 11 (7.8) |
| Bids | 43 (50.6) | 38 (41.5) | 13 (25.7) | 27 (35.2) | 38 (39.8) | 21 (48.8) | 44 (51.4) | 36 (42.6) | 18 (37.3) | 22 (24.4) | 32 (37.4) | 15 (38.2) | 33 (44.1) | 19 (21.0) | 7 (15.7) | 15 (16.4) | 18 (21.7) | 10 (21.9) |

Abbreviation: e-cigarettes, electronic cigarettes.

^a n is raw sample size and percentage is the weighted valid percentage. Missing values excluded.

Characteristics of Ever and Current Dual- and Polybacco/Nicotine Product Users, National Youth Tobacco Survey 2011 to 2015.

Table 2.

| Variable | Dual Use | | | | Poly Use | |
|--|-------------------------|------------|------------|-------------|-------------|-------------|
| | 2013, n(%) ^a | 2014, n(%) | 2015, n(%) | 2013, n(%) | 2014, n(%) | 2015, n(%) |
| Ever use | 1200 (12.7) | 959 (9.5) | 711 (9.4) | 1426 (14.6) | 2058 (17.8) | 1748 (18.6) |
| Sex | | | | | | |
| Male | 598 (13.2) | 475 (9.3) | 361 (9.7) | 842 (16.8) | 1212 (20.3) | 1047 (21.2) |
| Female | 602 (12.2) | 481 (9.6) | 345 (9.2) | 583 (12.3) | 841 (15.2) | 698 (15.8) |
| Race/ethnicity | | | | | | |
| White | 508 (11.5) | 397 (8.5) | 316 (8.2) | 796 (16.5) | 1130 (19.7) | 932 (20.0) |
| Black | 289 (16.2) | 237 (11.6) | 127 (11.4) | 147 (7.8) | 207 (10.5) | 178 (12.7) |
| Hispanic | 320 (14.9) | 228 (9.6) | 224 (11.3) | 387 (16.0) | 575 (19.7) | 511 (19.1) |
| Other | 44 (5.8) | 50 (7.0) | 27 (10.2) | 67 (10.0) | 73 (9.6) | 66 (14.5) |
| Grade level | | | | | | |
| 9th grade | 223 (8.6) | 221 (8.7) | 165 (8.2) | 254 (9.7) | 346 (10.9) | 270 (11.0) |
| 10th grade | 304 (12.5) | 244 (9.2) | 197 (9.8) | 306 (12.3) | 483 (16.4) | 406 (17.0) |
| 11th grade | 322 (14.2) | 268 (10.9) | 160 (8.5) | 368 (15.7) | 557 (20.4) | 475 (20.6) |
| 12th grade | 351 (16.8) | 226 (9.2) | 189 (12.0) | 498 (21.8) | 672 (24.4) | 597(27.1) |
| Ever tobacco/nicotine product use ^b | | | | | | |
| E-cigarettes | 108 (10.4) | 370 (42.7) | 424 (62.2) | 855 (62.3) | 1775 (87.5) | 1657 (95.6) |
| Cigars | 924 (78.8) | 424 (42.9) | 231 (35.1) | 1317 (93.1) | 1775 (87.0) | 1486 (85.9) |
| Hookah | 100 (9.7) | 152 (17.1) | 49 (8.5) | 890 (65.8) | 1460 (73.9) | 1133 (66.6) |
| Pipes | 56 (5.3) | 9 (1.0) | 3 (0.4) | 696 (49.7) | 485 (24.5) | 300 (18.0) |
| Bidis | 12 (0.9) | 4 (1.1) | 4 (0.7) | 219 (14.8) | 228 (11.6) | 1698 (8.9) |
| Home tobacco/nicotine use | | | | | | |
| None | 453 (8.0) | 393 (6.3) | 271 (6.2) | 462 (8.5) | 731 (11.4) | 642(12.2) |
| Cigarettes | 536 (20.2) | 389 (15.6) | 301 (15.8) | 706 (23.4) | 953 (28.7) | 707 (27.5) |
| E-cigarettes | - | 118 (16.8) | 92 (18.6) | - | 438 (40.8) | 298 (37.2) |
| Cigars | 154 (23.1) | 107 (13.9) | 75 (16.8) | 242 (29.5) | 345 (34.3) | 207 (30.8) |
| Hookah | 34 (16.5) | 34 (11.8) | 25 (16.9) | 137 (48.9) | 236 (47.1) | 118 (41.3) |
| Pipe | 28 (21.1) | 14 (14.4) | 9 (16.9) | 107 (46.9) | 100 (53.8) | 52 (48.7) |

| Variable | Dual Use | | | Poly Use | | |
|---|-------------------------|------------|------------|------------|------------|------------|
| | 2013, n(%) ^a | 2014, n(%) | 2015, n(%) | 2013, n(%) | 2014, n(%) | 2015, n(%) |
| Bidis | 15 (23.7) | 8 (14.4) | 8 (28.8) | 39 (41.8) | 49 (52.6) | 20 (45.3) |
| Current use | 479 (4.8) | 359 (2.9) | 301 (3.3) | 355 (3.6) | 476 (4.2) | 371 (3.7) |
| Sex | | | | | | |
| Male | 278 (5.7) | 211 (3.2) | 185 (3.8) | 223 (4.5) | 296 (4.9) | 247 (4.6) |
| Female | 200 (3.9) | 148 (2.6) | 115 (2.8) | 132 (2.7) | 176 (3.5) | 122 (2.6) |
| Race/ethnicity | | | | | | |
| White | 269 (5.4) | 229 (3.7) | 173 (3.6) | 182 (3.7) | 276 (4.9) | 215 (4.1) |
| Black | 60 (2.5) | 39 (1.4) | 31 (2.4) | 43 (2.5) | 34 (1.7) | 28 (2.0) |
| Hispanic | 116 (5.0) | 66 (2.0) | 74 (2.8) | 107 (4.6) | 134 (4.8) | 94 (3.5) |
| Other | 20 (2.5) | 12 (1.7) | 9 (3.3) | 17 (2.9) | 17 (2.0) | 16 (3.3) |
| Grade level | | | | | | |
| 9th grade | 66 (2.4) | 51 (1.8) | 54 (2.3) | 67 (2.5) | 83 (2.5) | 51 (2.1) |
| 10th grade | 105 (4.6) | 70 (2.1) | 44 (2.0) | 78 (2.8) | 114 (3.7) | 85 (3.6) |
| 11th grade | 131 (5.6) | 108 (3.5) | 86 (3.7) | 92 (4.3) | 127 (5.1) | 111 (4.0) |
| 12th grade | 177 (7.2) | 130 (4.5) | 117 (5.4) | 118 (5.2) | 152 (5.8) | 124 (5.1) |
| Current tobacco/nicotine product use ^b | | | | | | |
| E-cigarettes | 88 (19.3) | 175 (53.7) | 149 (51.5) | 203 (59.6) | 401 (85.2) | 331 (91.3) |
| Cigars | 314 (65.8) | 111 (27.3) | 112 (38.7) | 302 (84.2) | 360 (79.5) | 287 (79.0) |
| Hookah | 42 (9.3) | 66 (20.3) | 28 (13.2) | 191 (55.5) | 313 (67.8) | 202 (58.4) |
| Pipes | 34 (9.2) | 5 (1.3) | 7 (2.2) | 198 (57.7) | 116 (23.9) | 65 (16.7) |
| Bidis | 1 (0.1) | 2 (0.9) | 5 (1.0) | 44 (12.2) | 53 (11.4) | 39 (10.8) |
| Home tobacco/nicotine use | | | | | | |
| None | 114 (1.8) | 107 (1.4) | 94 (1.7) | 86 (1.7) | 143 (2.4) | 95 (1.9) |
| Cigarettes | 258 (8.7) | 189 (5.9) | 143 (5.8) | 196 (6.5) | 246 (7.5) | 171 (6.2) |
| E-cigarettes | - | 64 (7.5) | 55 (7.0) | - | 138 (12.9) | 94 (11.2) |
| Cigars | 81 (10.1) | 43 (4.0) | 38 (6.6) | 75 (8.4) | 128 (13.1) | 72 (9.8) |
| Hookah | 25 (9.5) | 32 (7.6) | 16 (6.3) | 57 (16.9) | 89 (17.3) | 39 (14.8) |
| Pipes | 22 (12.5) | 11 (8.1) | 6 (4.6) | 54 (21.3) | 48 (25.9) | 25 (19.0) |
| Bidis | 8 (8.2) | 4 (4.7) | 2 (2.8) | 31 (34.7) | 27 (27.6) | 11 (23.0) |

Abbreviation: e-cigarettes, electronic cigarettes.

n_i is raw sample size and percentage is the weighted valid percentage. Missing values excluded.

q All dual users and poly users used cigarettes.

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Table 3. Tobacco/Nicotine Product Use Trends and Home Tobacco/Nicotine Product Use Trends, National Youth Tobacco Survey 2013 to 2015.

| Variable | NYTS Survey Year | | | | Change During 2013 and 2015, aOR (95% CI) ^d | P Value | Change During 2014 and 2015, aOR (95% CI) ^d | P Value |
|---------------------------|-------------------------------|-------------------------------|-----------------------------|------------------|--|------------------|--|---------|
| | 2013 (n = 10 190), % (95% CI) | 2014 (n = 11 399), % (95% CI) | 2015 (n = 9433), % (95% CI) | | | | | |
| Ever use | | | | | | | | |
| Cigarettes | 34.7 (33.7–35.6) | 30.8 (29.9–31.7) | 30.6 (29.7–31.5) | 0.78 (0.73–0.83) | <.001 | 0.92 (0.87–0.98) | .01 | |
| E-cigarettes | 11.9 (11.3–12.5) | 27.3 (26.5–28.1) | 37.7 (36.7–38.7) | 4.83 (4.47–5.21) | <.001 | 1.60 (1.50–1.70) | <.001 | |
| Cigars | 30.5 (29.6–31.4) | 26.2 (25.4–27.0) | 26.2 (25.3–27.1) | 0.78 (0.73–0.84) | <.001 | 0.98 (0.92–1.05) | NS | |
| Hookah | 14.3 (13.6–15.0) | 22.0 (21.2–22.8) | 19.8 (19.0–20.6) | 1.61 (1.49–1.74) | <.001 | 0.90 (0.84–0.97) | .005 | |
| Pipes | 9.7 (9.1–10.3) | 5.1 (4.7–5.5) | 3.8 (3.4–4.2) | 0.34 (0.30–0.39) | <.001 | 0.69 (0.60–0.80) | <.001 | |
| Bidis | 2.6 (2.3–2.9) | 2.5 (2.2–2.8) | 2.0 (1.7–2.3) | 0.74 (0.61–0.90) | .003 | 0.85 (0.70–1.03) | NS | |
| Dual use | 12.7 (12.0–13.4) | 9.5 (8.9–10.1) | 9.4 (8.7–10.1) | 0.66 (0.59–0.72) | <.001 | 0.92 (0.83–1.02) | NS | |
| Poly use | 14.6 (13.9–15.3) | 17.8 (17.1–18.5) | 18.6 (17.8–19.4) | 1.35 (1.25–1.47) | <.001 | 1.02 (0.95–1.10) | NS | |
| Current use | | | | | | | | |
| Cigarettes | 12.7 (12.0–13.4) | 9.2 (8.7–9.7) | 9.3 (8.7–9.9) | 0.68 (0.62–0.75) | <.001 | 0.94 (0.85–1.03) | NS | |
| E-cigarettes | 4.5 (4.1–4.9) | 13.4 (12.8–14.0) | 16.0 (15.2–16.7) | 3.95 (3.53–4.43) | <.001 | 1.18 (1.09–1.28) | <.001 | |
| Cigars | 11.9 (11.3–12.5) | 8.2 (7.7–8.7) | 8.6 (8.0–9.2) | 0.72 (0.66–0.80) | <.001 | 1.10 (1.00–1.22) | NS | |
| Hookah | 5.2 (4.8–5.6) | 9.4 (8.9–9.9) | 7.2 (6.7–7.7) | 1.48 (1.31–1.67) | <.001 | 0.76 (0.68–0.84) | .001 | |
| Pipes | 4.1 (3.7–4.5) | 1.5 (1.3–1.7) | 1.0 (0.8–1.2) | 0.27 (0.22–0.34) | <.001 | 0.73 (0.57–0.94) | .01 | |
| Bidis | 0.6 (0.4–0.8) | 0.9 (0.7–1.0) | 0.6 (0.4–0.8) | 0.92 (0.65–1.30) | NS | 0.87 (0.63–1.22) | NS | |
| Dual use | 4.8 (4.4–5.2) | 2.9 (2.6–3.2) | 3.3 (2.9–3.7) | 0.65 (0.56–0.76) | <.001 | 0.99 (0.84–1.16) | NS | |
| Poly use | 3.6 (3.2–4.0) | 4.2 (3.8–4.6) | 3.7 (3.3–4.1) | 1.06 (0.91–1.23) | NS | 0.91 (0.79–1.05) | NS | |
| Home tobacco/nicotine use | | | | | | | | |
| None | 54.7 (53.7–55.7) | 55.5 (54.6–56.4) | 56.4 (55.4–57.4) | 1.09 (1.02–1.15) | .006 | 1.04 (0.99–1.10) | NS | |
| Cigarettes | 31.8 (30.9–32.7) | 29.4 (28.6–30.2) | 27.6 (26.7–28.5) | 0.81 (0.76–0.87) | <.001 | 0.91 (0.85–0.96) | .002 | |
| E-cigarettes | - | 9.6 (9.1–10.1) | 8.6 (8.0–9.2) | - | - | 0.86 (0.78–0.95) | .003 | |
| Cigars | 8.6 (8.1–9.1) | 8.5 (8.0–9.0) | 7.0 (6.5–7.5) | 0.82 (0.74–0.91) | <.001 | 0.82 (0.74–0.91) | <.001 | |
| Hookah | 3.0 (2.7–3.3) | 4.5 (4.1–4.8) | 3.0 (2.7–3.3) | 1.00 (0.85–1.19) | NS | 0.67 (0.57–0.77) | <.001 | |
| Pipes | 2.3 (2.0–2.6) | 1.6 (1.4–1.8) | 1.2 (0.9–1.4) | 0.48 (0.38–0.61) | <.001 | 0.69 (0.54–0.88) | .002 | |
| Bidis | 0.9 (0.7–1.0) | 0.9 (0.7–1.0) | 0.5 (0.4–0.6) | 0.50 (0.34–0.73) | <.001 | 0.53 (0.37–0.78) | .001 | |

Abbreviations: e-cigarettes, electronic cigarettes; aOR, adjusted odds ratio; CI, confidence interval; NS, not significant.

^aAdjusted for sex, race/ethnicity, and grade level. The α level set to $P < .05$.

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Cigarette, E-Cigarette, Dual-, and Polytobacco/Nicotine Product Use Trends and Risk Factors, National Youth Tobacco Survey 2013 to 2015.

Table 4.

| Variable | Cigarette Use | | | E-Cigarette Use | | | Dual Use | | | Poly Use | | |
|----------------|---------------|-----------------------|---------|-----------------|-----------------------|---------|----------|-----------------------|---------|----------|-----------------------|---------|
| | aOR | (95% CI) ^d | P Value | aOR | (95% CI) ^d | P Value | aOR | (95% CI) ^d | P Value | aOR | (95% CI) ^d | P Value |
| Ever use | | | | | | | | | | | | |
| Survey year | | (Ref) | | | (Ref) | | | (Ref) | | | (Ref) | |
| 2013 | | | | | | | | | | | | |
| 2014 | 0.85 | (0.80–0.90) | <.001 | 3.01 | (2.79–3.25) | <.001 | 0.71 | (0.65–0.78) | <.001 | 1.33 | (1.23–1.43) | <.001 |
| 2015 | 0.78 | (0.73–0.83) | <.001 | 4.83 | (4.47–5.21) | <.001 | 0.65 | (0.59–0.72) | <.001 | 1.35 | (1.25–1.46) | <.001 |
| Sex | | | | | | | | | | | | |
| Male | | (Ref) | | | (Ref) | | | (Ref) | | | (Ref) | |
| Female | 0.81 | (0.77–0.85) | <.001 | 0.73 | (0.70–0.78) | <.001 | 0.95 | (0.88–1.03) | NS | 0.68 | (0.64–0.72) | <.001 |
| Race/ethnicity | | | | | | | | | | | | |
| White | | (Ref) | | | (Ref) | | | (Ref) | | | (Ref) | |
| Black | 0.88 | (0.82–0.94) | <.001 | 0.51 | (0.47–0.56) | <.001 | 1.41 | (1.28–1.57) | <.001 | 0.49 | (0.44–0.54) | <.001 |
| Hispanic | 1.13 | (1.07–1.20) | <.001 | 0.99 | (0.93–1.05) | NS | 1.19 | (1.09–1.32) | <.001 | 0.95 | (0.88–1.02) | NS |
| Other | 0.63 | (0.57–0.71) | <.001 | 0.63 | (0.56–0.72) | <.001 | 0.69 | (0.57–0.84) | <.001 | 0.53 | (0.45–0.61) | <.001 |
| Grade level | | | | | | | | | | | | |
| 9th grade | | (Ref) | | | (Ref) | | | (Ref) | | | (Ref) | |
| 10th grade | 1.40 | (1.30–1.50) | <.001 | 1.35 | (1.25–1.46) | <.001 | 1.32 | (1.17–1.48) | <.001 | 1.46 | (1.33–1.61) | <.001 |
| 11th grade | 1.75 | (1.63–1.88) | <.001 | 1.52 | (1.41–1.65) | <.001 | 1.47 | (1.31–1.65) | <.001 | 1.91 | (1.74–2.09) | <.001 |
| 12th grade | 2.15 | (2.00–2.31) | <.001 | 1.80 | (1.66–1.95) | <.001 | 1.66 | (1.48–1.89) | <.001 | 2.65 | (2.42–2.90) | <.001 |
| Current use | | | | | | | | | | | | |
| Survey year | | (Ref) | | | (Ref) | | | (Ref) | | | (Ref) | |
| 2013 | | | | | | | | | | | | |
| 2014 | 0.73 | (0.67–0.80) | <.001 | 3.34 | (2.99–3.74) | <.001 | 0.66 | (0.57–0.76) | <.001 | 1.17 | (1.01–1.34) | .04 |
| 2015 | 0.68 | (0.62–0.75) | <.001 | 3.95 | (3.53–4.43) | <.001 | 0.65 | (0.56–0.76) | <.001 | 1.06 | (0.91–1.23) | NS |
| Sex | | | | | | | | | | | | |
| Male | | (Ref) | | | (Ref) | | | (Ref) | | | (Ref) | |
| Female | 0.71 | (0.66–0.77) | <.001 | 0.66 | (0.62–0.72) | <.001 | 0.70 | (0.62–0.79) | <.001 | 0.58 | (0.52–0.66) | <.001 |
| Race/ethnicity | | | | | | | | | | | | |

| Variable | Cigarette Use | | E-Cigarette Use | | Dual Use | | Poly Use | |
|-------------|---------------------------|---------|---------------------------|---------|---------------------------|---------|---------------------------|---------|
| | aOR (95% CI) ^d | P Value | aOR (95% CI) ^d | P Value | aOR (95% CI) ^d | P Value | aOR (95% CI) ^d | P Value |
| White | (Ref) | | | | (Ref) | | (Ref) | |
| Black | 0.51 (0.45–0.58) | <.001 | 0.41 (0.36–0.46) | <.001 | 0.53 (0.43–0.64) | <.001 | 0.45 (0.36–0.55) | <.001 |
| Hispanic | 0.81 (0.74–0.89) | <.001 | 0.95 (0.87–1.03) | NS | 0.71 (0.61–0.82) | <.001 | 0.92 (0.80–1.05) | NS |
| Other | 0.50 (0.41–0.60) | <.001 | 0.70 (0.59–0.83) | <.001 | 0.46 (0.33–0.63) | <.001 | 0.58 (0.43–0.77) | <.001 |
| Grade level | | | | | | | | |
| 9th grade | (Ref) | | | | (Ref) | | (Ref) | |
| 10th grade | 1.41 (1.25–1.59) | <.001 | 1.22 (1.09–1.35) | <.001 | 1.32 (1.08–1.63) | .008 | 1.40 (1.16–1.69) | <.001 |
| 11th grade | 1.98 (1.76–2.22) | <.001 | 1.35 (1.21–1.50) | <.001 | 2.17 (1.79–2.63) | <.001 | 1.78 (1.48–2.13) | <.001 |
| 12th grade | 2.50 (2.23–2.79) | <.001 | 1.53 (1.38–1.71) | <.001 | 2.89 (2.40–3.48) | <.001 | 2.17 (1.82–2.59) | <.001 |

Abbreviations: e-cigarette, electronic cigarette; aOR, adjusted odds ratio; CI, confidence interval; NS, not significant.

^dAdjusted for sex, race/ethnicity, and grade level. The α level set to $P < .05$.

Table 5.

Home Tobacco/Nicotine Product Use, Tobacco Smoke Exposure, and E-Cigarette Vapor Exposure Based on Dual- and Polytobacco/Nicotine Product Use, National Youth Tobacco Survey 2015.

| TSE variable | Dual Use | | | Poly Use | | | P Value |
|--------------------------------|------------------------|------------|---------------------------|------------------------|-------------|---------------------------|---------|
| | No, n (%) ^a | Yes, n (%) | aOR (95% CI) ^b | No, n (%) ^a | Yes, n (%) | aOR (95% CI) ^b | |
| Ever use | | | | | | | |
| Home TSE | | | | | | | |
| 0 days | 5533 (93.0) | 406 (7.0) | (Ref) | 5936 (86.0) | 947 (14.0) | (Ref) | |
| 1–7 days | 1214 (82.2) | 262 (17.8) | 2.97 (2.50–3.52) | 1476 (67.9) | 699 (32.1) | 3.18 (2.82–3.58) | <.001 |
| Car TSE | | | | | | | |
| 0 days | 5580 (93.4) | 378 (6.6) | (Ref) | 5958 (88.7) | 764 (11.3) | (Ref) | |
| 1–7 days | 1173 (79.9) | 295 (20.1) | 3.88 (3.27–4.60) | 1468 (62.1) | 880 (37.9) | 5.01 (4.45–5.64) | <.001 |
| Public TSE | | | | | | | |
| 0 days | 3222 (92.4) | 240 (7.6) | (Ref) | 3462 (89.0) | 434 (11.0) | (Ref) | |
| 1–30 days | 3511 (89.4) | 429 (10.6) | 1.68 (1.41–1.99) | 3940 (76.4) | 1205 (23.6) | 2.58 (2.28–2.92) | <.001 |
| Public vapor from e-cigarettes | | | | | | | |
| 0 days | 5140 (92.4) | 421 (7.6) | (Ref) | 5561 (87.7) | 776 (12.3) | (Ref) | |
| 1–30 days | 1596 (86.1) | 248 (13.9) | 1.91 (1.61–2.26) | 1844 (68.4) | 861 (31.6) | 3.22 (2.87–3.62) | <.001 |
| Current use | | | | | | | |
| Home TSE | | | | | | | |
| 0 days | 6613 (98.1) | 133 (1.9) | (Ref) | 6746 (98.0) | 137 (2.0) | (Ref) | |
| 1–7 days | 1828 (93.1) | 142 (6.9) | 4.10 (3.20–5.26) | 1970 (91.5) | 205 (8.5) | 5.29 (4.20–6.65) | <.001 |
| Car TSE | | | | | | | |
| 0 days | 6565 (98.7) | 94 (1.3) | (Ref) | 6659 (99.1) | 62 (0.9) | (Ref) | |
| 1–7 days | 1885 (91.3) | 182 (8.7) | 6.88 (5.28–8.95) | 2067 (88.8) | 281 (11.2) | 15.43 (11.53–20.65) | <.001 |
| Public TSE | | | | | | | |
| 0 days | 3801 (98.9) | 53 (1.1) | (Ref) | 3854 (99.0) | 39 (1.0) | (Ref) | |
| 1–30 days | 4623 (95.5) | 220 (94.5) | 3.60 (2.62–4.93) | 4843 (94.5) | 302 (5.5) | 7.20 (5.02–10.34) | <.001 |
| Public vapor from e-cigarettes | | | | | | | |
| 0 days | 6133 (98.1) | 131 (1.9) | (Ref) | 6264 (98.9) | 69 (1.1) | (Ref) | |
| 1–30 days | 2288 (93.8) | 146 (6.2) | 2.71 (2.12–3.48) | 2434 (90.8) | 272 (9.2) | 10.38 (7.82–13.79) | <.001 |

Abbreviations: aOR, adjusted odds ratio; CI, confidence interval; TSE, tobacco smoke exposure.

^a n refers to raw score and percentage is the weighted percentage.

^b Adjusted for sex, race/ethnicity, and grade level. The α level set to $P < .05$.

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