Epidemic of youth nicotine addiction? What does the National Youth Tobacco Survey reveal about high school e-cigarette use in the USA? (Preprint)

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Abstract

Background: In November 2018 the US Food and Drug Administration announced restrictions on e-cigarette manufacturers in response to a perceived epidemic of e-cigarette use among high school students. The stimulus was headline figures from the 2018 National Youth Tobacco Survey (NYTS). We analyse e-cigarette use and dependence in the NYTS in relation to lifetime history of use of tobacco products.

Design and setting: Nationally representative survey of high school students in 2017 and 2018.

Participants: 10,186 students in 2017 and 10,991 in 2018.

Measurements: Any use of e-cigarettes in past 30 days, frequent e-cigarette use (≥20 of past 30 days) and indicators of dependence (craving in past 30 days; use within 30 minutes of waking and days used in lifetime) were analysed in relation to lifetime tobacco product use history, ranging from never use through to lifetime smoking of >100 cigarettes.

Findings: Past-30-day e-cigarette use increased by 78% from 11.7% in 2017 to 20.8% in 2018. In both years, use was strongly associated with lifetime tobacco use history: it was seen in 8.4% of never tobacco users in 2018, in 29.0% of those who had tried a non-combustible, but never a combustible, product (OR 4.4 (CI 2.8-7.2) by comparison with never tobacco users), and in 71.0% of those who had smoked more than 100 cigarettes in their lifetime (OR 26.8, CI 17.7-40.5). Frequent use occurred in 0.1% of never tobacco users in 2017 and 1.0% in 2018. Findings from 2014 and 2015 showed that first product tried was overwhelmingly cigarettes among those with a substantial lifetime cigarette history. Among past-30-day e-cigarette users who had never tried tobacco products in 2018, 3.8% reported craving, 3.1% reported wanting to use within 30 minutes of waking, and 61.8% said they had used e-cigarettes on ≤10 days in their life.
Conclusions: Data from the NYTS do not support claims of a new epidemic of nicotine addiction stemming from use of e-cigarettes, nor concerns that declines in youth tobacco addiction stand to be reversed after years of progress. Among current e-cigarette users who had never tried tobacco products, responses consistently pointed to minimal dependence.

Definitions

**E-cigarette**
Defined by Robert West

**Electronic Nicotine Delivery Device (ENDS)**
Defined by Robert West

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Key words: E-cigarettes; vaping; nicotine; addiction; dependence; cigarettes; smoking.

Introduction

On November 15th 2018, the US Food and Drug Administration (FDA) released preliminary findings from the National Youth Tobacco Survey (NYTS) detailing
e-cigarette use in 2018 among US high school students (1). Compared with 2017, a 78% increase in current (past-30-days) e-cigarette use was noted (1). At the same time, the FDA put out a press statement quoting HHS Secretary Alex Azar: “These new data show that America faces an epidemic of youth e-cigarette use, which threatens to engulf a new generation in nicotine addiction.” (2)

FDA Commissioner Scott Gottlieb, issued on the same day, said: “The data show that kids using e-cigarettes are going to be more likely to try combustible cigarettes later. This is a large pool of future risk. ... The data from this nationally representative survey... show astonishing increases in kids’ use of e-cigarettes and other ENDS, reversing years of favorable trends in our nation’s fight to prevent youth addiction to tobacco products. These data shock my conscience” (3). Gottlieb announced a series of regulatory initiatives to address the perceived problem of youth e-cigarette use. The FDA moves were based on their analysis of preliminary data from the 2018 NYTS, received in September 2018. Their publicly revealed analysis did not consider how e-cigarette use in high school students was related to patterns of use of combustible tobacco products, especially cigarettes.

In February 2019, a further report was published (4), giving more detailed tables, and giving data on frequent use (defined as on 20 or more days in the past 30 days). “During 2017–2018, frequent e-cigarette use increased significantly by 38.5% among current e-cigarette users (from 20.0% to 27.7%); no significant change in frequent use was observed for other tobacco products”. Commissioner Gottlieb issued a further statement on the same day, in which he continued to raise serious concerns: “These data are a sobering reminder of the initial results we shared last fall indicating a rampant rise of youth e-cigarette use, which has prompted the FDA to take a series of escalating regulatory actions ....... I will not allow a generation of children to become addicted to nicotine through e-cigarettes.” “This is an exploding epidemic. We’ll continue to put the full scope of our regulatory tools against this mounting public health crisis...” (5)

In the UK use of e-cigarettes by adolescents has not attracted such concern. Commentators have noted that e-cigarette use is strongly associated with cigarette smoking in children and rare amongst never smokers (6-8). The NYTS public use data file for the 2018 survey became available in March 2019. In this paper we analyse e-cigarette use and indicators of tobacco dependence in the NYTS in relation to lifetime history of other tobacco products. We employ data from the 2014 and 2015 NYTS to examine which product was tried first in tobacco users’ careers. We also report on time trends in prevalence of e-cigarette and combustible tobacco use in the USA.
Methods

Data

The National Youth Tobacco Survey (NYTS) is designed to produce a nationally representative cross-sectional sample of students from US middle and high schools. It was developed to inform national and state tobacco prevention and control programs. Full details of the NYTS methodology are available elsewhere (9). Briefly, a three-stage cluster sampling procedure is used to generate a nationally representative sample of students in grades 6–12. Of 310 schools selected for the 2018 NYTS, 238 (76.8%) participated, with an achieved sample of 20,189 (88.8%) among 22,729 students; the overall response rate, calculated as the product of the school-level and student-level participation rates, was 63.4% (9). The NYTS employs an anonymous, self-administered questionnaire to enquire about ever and current use of cigarettes, cigars (defined as cigars, cigarillos, or little cigars), other combustible tobacco (pipes, bidis, hookahs); non-combustible tobacco (chewing tobacco, snuff, or dip, snus, and dissolvable tobacco); and e-cigarettes. Both current use (defined as any use of each product in the past 30 days) and ever-use (ever trying) are ascertained.

We derived a measure of lifetime tobacco product use history as follows: Respondents were asked “About how many cigarettes have you smoked in your entire life?” with 7 response options going from “I have never smoked cigarettes, not even one or two puffs” through “100 or more cigarettes (5 or more packs)”. We added further categories for those who reported ever-use of e-cigarettes but no other tobacco product; a non-combustible tobacco product, but never any combustible; and use of a combustible product (cigars, pipes, bidi, hookah) but never cigarettes. Thus there were 10 response categories in all for lifetime tobacco use history, ranging from never use of any tobacco product through to smoking of more than 100 cigarettes.

Statistical analysis

We used the complex survey analysis module in SPSS 24 to adjust for the sampling design of the survey and to generate estimates (±95% confidence intervals) applicable to the US population. We examined the univariate association between current use of e-cigarettes and our measure of lifetime tobacco product use history. We employed a logistic regression analysis to derive estimates of the odds ratios (±95% CIs) for current
e-cigarette use. We conducted similar analyses to examine use of e-cigarettes for 1-19 days and 20 or more days within the past 30 days. We examined responses to other questions (e.g. “During the past 30 days, have you had a strong craving or felt like you really needed to use a tobacco product of any kind?”; and “How soon after you wake up do you want to use a tobacco product?”) to provide an indication of dependence. We focused on high school students (sample size 10,186 in 2017 and 10,991 in 2018). Our report focuses primarily on data from the NYTS surveys conducted in 2017 and 2018, but we carried out similar analyses for the years 2014-2016 (results in supplementary tables available online). In order to get some pointers towards the issue of which tobacco products were used first and which subsequently in high school students’ using careers, we examined responses to the question “Which of the following tobacco products did you try first?”, asked in 2014; and in 2015 “Which of the following statements best applies to your cigarette or electronic cigarette use?” (Response options: I have never tried cigarettes or electronic cigarettes; I have only tried cigarettes; I have only tried electronic cigarettes; I tried cigarettes before I ever tried electronic cigarettes; I tried electronic cigarettes before I ever tried cigarettes). Neither of these questions were asked in the 2017 or 2018 surveys.

Results

The overall prevalence of past-30-days e-cigarette use among high school students in 2018 was 20.8%, an increase of 78% from the observed figure of 11.7% in 2017 (Table 1). Prevalence was strongly associated with lifetime tobacco use history in both years: among never tobacco users, 2.9% in 2017 and 8.4% in 2018 were past-30-days e-cigarette users, whilst among those who had smoked more than 100 cigarettes in their lifetime, the corresponding figures were 57.2% in 2017 and 71.0% in 2018. By comparison with never tobacco users, the odds of current e-cigarette use rose steeply and in a graded fashion with extent of tobacco experience. In 2018, the odds ratio among those who had minimal tobacco experience (had tried a non-combustible but never a combustible product) were already significantly raised, (OR 4.4), while in those who had smoked just one cigarette the odds ratio was 7.1, rising to 26.8 in those who had smoked more than 100 cigarettes in their lifetime. Similar associations with lifetime tobacco use history were observed in 2017. Past-30-days cigarette smoking was strongly associated with cigarette use history in both years, and reached 88.4% in 2017 and 84.5% in 2018 in students who had smoked 100+ cigarettes in their lifetime.
In both 2017 and 2018, about one quarter of past-30-days e-cigarette users reported having used them on 20 or more days (19.9%, 210/1,051 and 28.4%, 627/2207). This heavier use was strongly associated with lifetime tobacco use history: it was seen in only 0.1% of never tobacco users in 2017 and 1.0% in 2018. The observed frequency of 20+ days use increased with the extent of lifetime tobacco use, and reached 26.8% in 2017 and 37.2% in 2018 among students who had smoked more than 100 cigarettes.

Indicators of dependence in e-cigarette users

Table 2 shows responses to questions indicating aspects of dependence and tobacco use behaviour by lifetime tobacco use history. Among students who were past-30-day e-cigarette users but had never tried any non-combustible or combustible tobacco product, responses consistently pointed to minimal or absent dependence. In 2018, in response to the question “Are you seriously thinking about quitting the use of all tobacco products?” 49.4% of e-cigarette users with no history of ever trying other tobacco products selected the response option “I do not use tobacco products”, and similarly, asked “During the past 30 days, on how many days did you use any tobacco product(s)?” 55.4% chose the 0 days option. Only 3.8% reported any experience of craving for tobacco products, and 3.1% reported wanting to use within 30 minutes. Nearly 90% of responses to the question “How soon after you wake up do you want to use a tobacco product?” were comprised by “I do not want to use tobacco” (60.4%) and “I rarely want to use tobacco” (28.1%). 12.7% said they had used e-cigarettes on only one day in their life, and a further 49.1% had used them on between 1 and 10 days. This pattern of responding contrasted markedly with that seen in e-cigarette users with a lifetime history of smoking more than 100 cigarettes: 74.5% of these reported experiencing craving; 51.4% wanted to use within 30 minutes of waking, and only 8.8% said “I do not want to use tobacco” and 6.4% that they rarely wanted to use. The pattern of responses to these dependence indicators by lifetime tobacco use history was similar in 2017 (Table 2, top).

Which product used first by tobacco use history

Table 3 shows, by lifetime tobacco use history, which product respondents reported using first in their tobacco career. The more cigarettes students reported having smoked in their lifetime, the higher the chances were that cigarettes were the first product used: in 2014, just over three quarters (75.6%) of current e-cigarette users who had smoked more than 100 cigarettes named cigarettes as the first tobacco product they had used, while just 2.2% had used e-cigarettes first. Among those who had smoked a few puffs but never a whole cigarette in their lifetime, 49.3% reported the
cigarette as first product used and 18.8% had first used e-cigarettes. In 2015, 87.7% of current e-cigarette smokers who had smoked more than 100 cigarettes said cigarettes were the first product they had tried, while 7.6% identified e-cigarettes as the first product tried. Among those who had had just a few puffs of a cigarette in their lifetime, 53.1% had tried cigarettes first, and 25.4% had tried e-cigarettes first.

Trends in use of cigarettes, combustibles and e-cigarettes in NYTS 1999-2018

There has been a continuing decline in current cigarette smoking in high school students, from 28.5% in 1999 to 8.1% in 2018 (see Figure). The proportion who have ever tried a combustible product has likewise declined from 66.9% in 1999 to 33.4% in 2018. The advent of e-cigarettes, first monitored in the 2011 NYTS, appears to have had little if any impact on this declining trend. Prevalence of past-30-day e-cigarette use rose from 1.4% in 2011 to 20.8% in 2018. The increase in the proportion who have ever tried an e-cigarette has been even more marked, going from 4.5% in 2011 to 36.6% in 2018. This has occurred without any discernible impact on the slope of declining cigarette and combustible use.

Discussion

Our analysis of data from the NYTS confirms the headline sharp uptick in past-30-day use of e-cigarettes which prompted the FDA’s urgent regulatory initiatives in November 2018. In bringing forward proposals for regulatory action, the FDA did not place e-cigarette use in the context of use of other tobacco products. Our analysis of NYTS data from 2018 and earlier years shows a strong association between lifetime history of use of tobacco products and use of e-cigarettes: in 2018, high school students who had smoked more than 100 cigarettes in their lifetime were some 27 times more likely to have used e-cigarettes in the past 30 days than students who had never tried any tobacco product. Use of e-cigarettes on 20 or more days in the past month was seen in only 1.0% of those who had never tried any tobacco product in 2018.

It is notoriously problematic to draw inferences about direction of causality from cross-sectional data. In principle, the strong and graded association observed between likelihood of using e-cigarettes in the past 30 days and lifetime history of use of tobacco products could point to an effect of using e-cigarettes on subsequent uptake and use of cigarettes and other combustible products. This appears to be the view adopted by the FDA. While it may well be the case that in some individual instances initial trying of an e-
cigarette led on to trying and using cigarettes, the data strongly suggest that this is not
the dominant pattern observed at the level of the whole population. Among high school
students we found that, for the great majority of those with any substantial cigarette
smoking history, cigarettes were the first tobacco product tried, prior to any use of e-
cigarettes. Clearly, for these students their use of cigarettes and the development of
characteristic nicotine dependence must be attributed to cigarettes as the uptake
product, rather than to e-cigarettes. Similarly, the observed rapid decline in trying
combustible products and in the prevalence of cigarette smoking since 1999 has not yet
given any sign of being reversed through the upsurge of e-cigarette use since 2011
(10). At the population level, therefore, the NYTS fails to give evidence of e-cigarettes
acting as a gateway to smoking in adolescents. In these circumstances, there is
plausibility to the suggestion that e-cigarettes are likely to reduce the disease burden in
the US by helping adult smokers to quit (11).

We found little evidence of substantial nicotine addiction attributable to the use of e-
cigarettes. Among all students who were past-30-day-cigarette users but had never
tried tobacco products, responses consistently pointed to minimal dependence with only
3.8% reporting any craving for tobacco products, and 3.1% reporting wanting to use
within 30 minutes of waking. Over 60% reporting using a cigarette on 10 or fewer days in
their lifetime. Only 3.4% were classified as frequent users of e-cigarettes on 20 or more
days in the past month. This contrasted markedly with students who had smoked more
than 100 cigarettes (so meeting the US definition for regular cigarette smoking), where
74.5% reported craving, 51.4% wanted to use within 30 minutes of waking, 52.4% used
e-cigarettes on 20 or more days in the past month, and 64.0% had used e-cigs on more
than 100 days in their lifetime. This group had mostly started their tobacco careers with
cigarettes, and their pattern of dependence typifies that attributable to cigarette use.

In 2014, the FDA deemed e-cigarettes to be a tobacco product and so brought them
within their regulatory competence. It appears that high school students in the US
disagree with the FDA’s classificatory scheme, as close to half of past-30-day e-cigarette
users who had never tried any other tobacco products denied using a tobacco product in
the past month. At the very least, this suggests their self-concept is not that of being a
tobacco product user. This perception of e-cigarettes as something different and
separate from tobacco could serve to reduce their chances of progression to using
conventional tobacco products.

In summary, data from the NYTS survey do not provide support for claims of a new
epidemic of nicotine addiction stemming from use of e-cigarettes, nor for concerns that
declines in youth tobacco addiction stand to be reversed after years of progress. Symptoms of dependence were rare among students who use e-cigarettes without having used any other tobacco products.

This paper is not intended as a challenge to the current direction of FDA policy on the regulation of e-cigarettes. That would be presumptuous on our part. Rather, we have sought to examine the evidence brought forward to support new regulatory initiatives. We find a gaping chasm between the vision of an epidemic of e-cigarette use threatening to engulf a new generation in nicotine addiction and the reality of the evidence contained in the NYTS. As patterns of youth nicotine and tobacco use continue to evolve, careful surveillance of survey findings will remain of critical importance.

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**Table 1**: NYTS-ever use of any tobacco product, by lifetime tobacco use history in high school students: top, NYTS 2017; bottom, NYTS 2018

| Lifetime tobacco use history | Never used any tobacco product | Used tobacco, but not cigarettes | Tried combustible, but not cigarettes | 1 or more puffs, but not whole cigarette | 1 cigarette | 2 or more cigarettes | 3 or more cigarettes | NYTS 2018 | NYTS 2017 |
|-----------------------------|--------------------------------|---------------------------------|------------------------------------|------------------------------------------|-------------|---------------------|---------------------|----------|----------|
| Total                       | 29.0 (19.0-39.3)               | 23.6 (16.4-33.7)                | 20.4 (15.8-25.4)                   | 24.7 (18.6-31.6)                         | 23.4 (18.6-28.5) | 22.6 (17.8-27.9) | 20.4 (15.8-25.4) | 28.0 (19.0-39.3) | 23.6 (16.4-33.7) |
| N                           | 385                            | 317                             | 247                                | 247                                      | 247          | 247                 | 247                 | 385      | 317      |
| Any past 30 days use (%)    | 2.7 (1.1-5.5)                  | 1.7 (0.4-5.7)                   | 2.2 (0.9-5.3)                      | 2.5 (1.1-5.4)                            | 4.4 (1.6-8.0)| 2.5 (1.1-5.4)      | 4.4 (1.6-8.0)       | 2.7 (1.1-5.5) | 1.7 (0.4-5.7) |
| N                           | 385                            | 317                             | 247                                | 247                                      | 247          | 247                 | 247                 | 385      | 317      |

**NYTS 2017**

| Lifetime tobacco use history | Never used any tobacco product | Used tobacco, but not cigarettes | Tried combustible, but not cigarettes | 1 or more puffs, but not whole cigarette | 1 cigarette | 2 or more cigarettes | 3 or more cigarettes | NYTS 2018 | NYTS 2017 |
|-----------------------------|--------------------------------|---------------------------------|------------------------------------|------------------------------------------|-------------|---------------------|---------------------|----------|----------|
| Total                       | 29.0 (19.0-39.3)               | 23.6 (16.4-33.7)                | 20.4 (15.8-25.4)                   | 24.7 (18.6-31.6)                         | 23.4 (18.6-28.5) | 22.6 (17.8-27.9) | 20.4 (15.8-25.4) | 28.0 (19.0-39.3) | 23.6 (16.4-33.7) |
| N                           | 385                            | 317                             | 247                                | 247                                      | 247          | 247                 | 247                 | 385      | 317      |
| Any past 30 days use (%)    | 2.7 (1.1-5.5)                  | 1.7 (0.4-5.7)                   | 2.2 (0.9-5.3)                      | 2.5 (1.1-5.4)                            | 4.4 (1.6-8.0)| 2.5 (1.1-5.4)      | 4.4 (1.6-8.0)       | 2.7 (1.1-5.5) | 1.7 (0.4-5.7) |
| N                           | 385                            | 317                             | 247                                | 247                                      | 247          | 247                 | 247                 | 385      | 317      |
Table 2: Indicators of dependence in current e-cigarette users by lifetime tobacco use history, high school students NYTS 2017 (top) and 2018 (bottom)

| Lifetime tobacco use history | Never used any tobacco | Used tobacco, but not combustible | Total combustible, but not e-cigarettes | 1 or more pupils, but never whole cigarettes | E-cigarettes within past 30 days | Total | No. of pupils | % of pupils | Total combustible | % of pupils |
|-----------------------------|------------------------|----------------------------------|----------------------------------------|--------------------------------------------|-----------------------------|-------|--------------|------------|----------------|------------|
|                             | 11/10 (5)              | 11/10 (5)                         | 11/10 (5)                              | 11/10 (5)                                  | 11/10 (5)                   | 11/10 | 11/10        | 11/10 (5)  | 11/10 (5)      | 11/10 (5)  |
| Only tried cigarettes       | 11/10 (5)              | 11/10 (5)                         | 11/10 (5)                              | 11/10 (5)                                  | 11/10 (5)                   | 11/10 | 11/10        | 11/10 (5)  | 11/10 (5)      | 11/10 (5)  |
| Only tried cigars           | 87/10 (9)              | 87/10 (9)                         | 87/10 (9)                              | 87/10 (9)                                  | 87/10 (9)                   | 87/10 | 87/10        | 87/10 (9)  | 87/10 (9)      | 87/10 (9)  |
| Only tried pipes            | 11/10 (5)              | 11/10 (5)                         | 11/10 (5)                              | 11/10 (5)                                  | 11/10 (5)                   | 11/10 | 11/10        | 11/10 (5)  | 11/10 (5)      | 11/10 (5)  |
| Only tried snuff            | 11/10 (5)              | 11/10 (5)                         | 11/10 (5)                              | 11/10 (5)                                  | 11/10 (5)                   | 11/10 | 11/10        | 11/10 (5)  | 11/10 (5)      | 11/10 (5)  |
| Only tried smokeless tobacco| 11/10 (5)              | 11/10 (5)                         | 11/10 (5)                              | 11/10 (5)                                  | 11/10 (5)                   | 11/10 | 11/10        | 11/10 (5)  | 11/10 (5)      | 11/10 (5)  |
| Not tried cigarettes        | 11/10 (5)              | 11/10 (5)                         | 11/10 (5)                              | 11/10 (5)                                  | 11/10 (5)                   | 11/10 | 11/10        | 11/10 (5)  | 11/10 (5)      | 11/10 (5)  |
| Not tried cigars            | 11/10 (5)              | 11/10 (5)                         | 11/10 (5)                              | 11/10 (5)                                  | 11/10 (5)                   | 11/10 | 11/10        | 11/10 (5)  | 11/10 (5)      | 11/10 (5)  |
| Not tried pipes             | 11/10 (5)              | 11/10 (5)                         | 11/10 (5)                              | 11/10 (5)                                  | 11/10 (5)                   | 11/10 | 11/10        | 11/10 (5)  | 11/10 (5)      | 11/10 (5)  |
| Not tried snuff             | 11/10 (5)              | 11/10 (5)                         | 11/10 (5)                              | 11/10 (5)                                  | 11/10 (5)                   | 11/10 | 11/10        | 11/10 (5)  | 11/10 (5)      | 11/10 (5)  |
| Not tried smokeless tobacco | 11/10 (5)              | 11/10 (5)                         | 11/10 (5)                              | 11/10 (5)                                  | 11/10 (5)                   | 11/10 | 11/10        | 11/10 (5)  | 11/10 (5)      | 11/10 (5)  |

Table 3: Temporal order of first use of e-cigarettes and cigarettes by lifetime tobacco use history among current (past 30 days) e-cigarette users

| Lifetime tobacco use history | Never used any tobacco product | Used tobacco, but not combustible | Total combustible, but not e-cigarettes | Total | No. of pupils | % of pupils | Total | No. of pupils | % of pupils |
|------------------------------|---------------------------------|----------------------------------|----------------------------------------|-------|--------------|------------|-------|--------------|------------|
| Never used any tobacco      | 11/10 (5)                       | 11/10 (5)                        | 11/10 (5)                              | 11/10 | 11/10        | 11/10 (5)  | 11/10 | 11/10 (5)    | 11/10 (5)  |
| Used tobacco, but not        | 11/10 (5)                       | 11/10 (5)                        | 11/10 (5)                              | 11/10 | 11/10        | 11/10 (5)  | 11/10 | 11/10 (5)    | 11/10 (5)  |
| Total combustible, but not   | 11/10 (5)                       | 11/10 (5)                        | 11/10 (5)                              | 11/10 | 11/10        | 11/10 (5)  | 11/10 | 11/10 (5)    | 11/10 (5)  |
| e-cigarettes                 | 11/10 (5)                       | 11/10 (5)                        | 11/10 (5)                              | 11/10 | 11/10        | 11/10 (5)  | 11/10 | 11/10 (5)    | 11/10 (5)  |
| 1 or more pupils, but never | 11/10 (5)                       | 11/10 (5)                        | 11/10 (5)                              | 11/10 | 11/10        | 11/10 (5)  | 11/10 | 11/10 (5)    | 11/10 (5)  |
| whole cigarettes             | 11/10 (5)                       | 11/10 (5)                        | 11/10 (5)                              | 11/10 | 11/10        | 11/10 (5)  | 11/10 | 11/10 (5)    | 11/10 (5)  |
| E-cigarettes within past     | 11/10 (5)                       | 11/10 (5)                        | 11/10 (5)                              | 11/10 | 11/10        | 11/10 (5)  | 11/10 | 11/10 (5)    | 11/10 (5)  |
| 30 days                      | 11/10 (5)                       | 11/10 (5)                        | 11/10 (5)                              | 11/10 | 11/10        | 11/10 (5)  | 11/10 | 11/10 (5)    | 11/10 (5)  |

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Supplementary Tables

| Source | Rown | Used 1-19 days% | Used 20+ days% | 1 or more puffs but not cigarette | 1 cigarette | 2 to 5 cigarettes | 6 to 15 cigarettes | 16 to 25 cigarettes | 26 to 59 cigarettes | 100+ cigarettes | Total |
|--------|------|----------------|---------------|----------------------------------|------------|-----------------|-------------------|--------------------|-------------------|------------------|-------|
| Never used e-cigarette | 2.3 | [0.5-5.0] | 3.0 [2.5-3.5] | 51.3 [50.3-51.4] | 36.5 [35.0-36.9] | 24.0 [23.9-24.1] | 25.8 [25.3-26.8] | 31.8 [30.9-32.7] | 35.8 [35.5-36.2] | 36.4 [35.6-37.3] | 10.4 [10.3-10.5] |
| Ever used electronic cigarette | 9.0 | [8.0-9.0] | 29.5 [28.0-31.0] | 50.0 [49.0-51.0] | 36.5 [35.0-38.0] | 25.0 [23.9-26.1] | 26.8 [25.3-28.3] | 32.8 [31.0-34.7] | 37.8 [36.5-39.1] | 36.8 [35.5-37.3] | 11.2 [11.0-11.3] |

Past-30 days use of e-cigarettes by lifetime tobacco use history among high school students. NYS 2014
| Lifetime tobacco use history | Never used any tobacco product | Used tobacco, but not combustible | Tried combustible, but not cigarette | 1 or more puffs, but never whole cigarette | 1 cigarette | 2 to 5 cigarettes | 6 to 15 cigarettes | 16 to 25 cigarettes | 26 to 99 cigarettes | 100+ cigarettes | Total |
|-----------------------------|-------------------------------|----------------------------------|-------------------------------------|-------------------------------------------|-------------|------------------|------------------|------------------|------------------|------------------|-------|
| **Used 1-19 days (%)**      | 2.9                           | 2.3-3.8                          | 15.6                                | 13.8-16.4                                 | 21.4        | 19.9-22.7        | 21.0             | 19.4-22.7        | 33.2             | 28.8-40.4        | 32.5             | 29.5-35.5       | 1.8   |
| n                           | 143                           | 11                           | 263                                | 225                                      | 584        | 45               | 559              | 544              | 176              | 150             | 74               | 67               | 129  |
| **Used 20+ days (%)**       | 0.2                           | 0.1-0.4                         | 0.9                                | 0.5-1.7                                   | 1.7         | 1.2-2.5          | 1.5               | 1.0-2.0          | 2.3               | 1.7-3.4         | 4.2              | 3.4-6.0         | 2.5   |
| n                           | 229                           | 20                           | 525                                | 49                                      | 112        | 20               | 139              | 136              | 49               | 38              | 27               | 25               | 90   |
| Any past 30 days use (%)    | 5.1                           | 4.7-5.7                         | 16.5                                | 15.8-17.2                                 | 22.0        | 18.9-25.7        | 28.1              | 19.5-33.5        | 30.4              | 26.1-34.9       | 19.4              | 15.8-23.6       | 8.1   |
| Base                        | 576                           | 48                           | 1277                               | 115                                      | 393        | 201              | 506              | 436              | 381              | 239             | 470              | 386              | 926  |
| OR                           | 1.02                          | 0.97-1.07                       | 6.2                                | 5.9-6.7                                   | 9.5        | 7.9-11.4         | 9.6               | 6.9-13.7         | 9.5               | 6.1-17.2        | 20.6              | 14.2-25.0       | 2.0   |
| Smoked 10+ p.30 days (%)    | -                             | -                              | -                                  | -                                        | -           | -                | -                | -                | -                | -               | -                | -                | 9.3   |

Current (past 30 days) use of e-cigarette by lifetime tobacco use history among high school students

NYS 2015

| Lifetime tobacco use history | Never used any tobacco product | Used tobacco, but not combustible | Tried combustible, but not cigarette | 1 or more puffs, but never whole cigarette | 1 cigarette | 2 to 5 cigarettes | 6 to 15 cigarettes | 16 to 25 cigarettes | 26 to 99 cigarettes | 100+ cigarettes | Total |
|-----------------------------|-------------------------------|----------------------------------|-------------------------------------|-------------------------------------------|-------------|------------------|------------------|------------------|------------------|------------------|-------|
| **Used 1-19 days (%)**      | 2.5                           | 2.1-3.1                          | 12.9                                | 11.6-13.6                                 | 25.7        | 24.4-26.9        | 24.7              | 21.8-27.8        | 34.5             | 32.3-37.2       | 32.2             | 28.9-35.3       | 9.6   |
| n                           | 153                           | 12                           | 346                                | 308                                      | 36         | 34               | 35               | 33               | 23               | 19               | 17               | 13               | 195  |
| **Used 20+ days (%)**       | 0.4                           | 0.3-0.6                         | 0.6                                | 0.5-1.1                                   | 3.0        | 2.5-3.5          | 3.5               | 2.6-4.5          | 5.0              | 3.6-7.3         | 2.7              | 1.9-4.0         | 1.9   |
| n                           | 250                           | 20                           | 550                                | 425                                      | 36         | 35               | 35               | 33               | 23               | 19               | 17               | 13               | 536  |
| Any past 30 days use (%)    | 5.1                           | 4.7-5.7                         | 17.2                                | 16.0-18.9                                 | 29.8        | 24.5-35.2        | 31.2              | 25.8-36.3        | 37.2             | 27.6-46.5       | 39.6             | 33.7-45.5       | 3.1   |
| Base                        | 576                           | 50                           | 1277                               | 115                                      | 393        | 201              | 506              | 436              | 381              | 239             | 470              | 386              | 926  |
| OR                           | 1.03                          | 1.01-1.05                       | 7.0                                | 5.9-8.5                                   | 9.5        | 8.4-10.8         | 9.6               | 7.9-13.7         | 9.5               | 6.1-17.2        | 20.6              | 14.2-25.0       | 1.9   |
| Smoked 10+ p.30 days (%)    | -                             | -                              | -                                  | -                                        | -           | -                | -                | -                | -                | -               | -                | -                | 9.3   |

Current (past 30 days) use of e-cigarette by lifetime tobacco use history among high school students

NYS 2016