# Prevalence, frequency, age at first time tobacco usage among non-Hispanic American Indian/Alaska Native youth compared to non-Hispanic White youth – 2019 National Youth Tobacco Survey

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**Abstract**

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Introduction:

Tobacco use is a leading risk factor for death among adults in the US, and cancer remains one of the top 2 leading causes of death. There is little data on tobacco use among American Indian/Alaska Native (AI/AN) adolescents. Using a national sample of youth in middle and high school, this study will examine self-reported cigarette and e-cigarette use, frequency of current use of cigarettes and e-cigarettes and age at first-time usage of these products among non-Hispanic AI/AN youth compared with non-Hispanic White (NH-White) youth.

Methods:

Data were abstracted from the 2019 National Youth Tobacco Survey (NYTS), a publicly available dataset. The proportions of self-report of cigarette and e-cigarette use among youth respondents were compared between AI/AN and NH-White youth using chi-square tests. Frequency of use was compared between groups using rank-sum tests. The proportions of youth who started using cigarettes and e-cigarettes in elementary, middle and high school were summarized.

Results:

Two-hundred and twenty-one AI/AN and 8,536 NH-White youth participated in the survey. There was a higher proportion of AI/AN youth who used cigarettes (9 vs 5%; P=0.002). E-cigarette usage was similar in both groups 23 vs 22%; P=0.7). Small proportions of AI/AN (8-39%) provided data on frequency of use and age at start. In exploratory analysis, cigarette and e-cigarette use frequencies were similar in AI/AN vs NH-White. Proportions of AI/AN youth who started use of cigarettes and e-cigarettes in elementary vs middle school vs high school were 21%, 41% and 37%, respectively, compared with 20%, 33% and 48% in NH-White youth. For e-cigarettes, AI/AN youth who started use in elementary vs middle school vs high school were 13%, 44%, 44%, respectively, compared to 4%, 28%, and 67% in NH-White youth.

Conclusions:

Available national survey data on cigarette and e-cigarette usage in AI/AN youth is limited but suggests cause for concern. Exploratory findings suggest a need for prevention intervention at earlier stages of school level for AI/AN youth. Inclusion of culturally relevant questions in the NYTS may improve understanding of tobacco use in the AI/AN demographic.

## INTRODUCTION

In the United States, a leading risk for preventable disease, disability and death is tobacco use. Tobacco has evolved over time to come in a variety of forms whether smoked, smokeless, and electronic (Wang et al., 2019). The causes of disparities in health outcomes are complex. Poor health outcomes can be correlated not only to health risk behaviors but also to poverty, unemployment, education levels, and limited access to health care. These outcomes are common in American Indian and Alaska Native (AI/AN) communities. One in four AI/AN adults lives in poverty compared to 1 in 11 of white adults (Jones et al., 2011). In the pre-colonial era, AI/AN were healthy and lived in harmony with natural resources. However, due to colonization the AI/AN population consists of some of the poorest health disparities in infant and maternal mortality, cancer, cardiovascular disease, and depression (Echo-Hawk, 2019).

In 2017, there was an estimated 5.6 million people classified as AI/AN alone or in combination with one or more race. This makes up 1.7% of the total U.S. population with an estimated 1.2 million who are under the age of 18, almost 30% of the racial group, (NYTS, 2019). Using limited 2009 demographic estimates from the US Office of Minority Affairs and Department of Health and Human Services, an estimated half a million AI/AN youth have smoked cigarettes during their life (Yu, 2010). The last analysis of AI/AN National Youth Tobacco Survey (NYTS) data was done 10 years ago, using the 2006

NYTS dataset. There is a need to examine current data on both cigarette and e-cigarette use in AI/AN youth, particularly given that e-cigarettes were introduced in 2007.

Previous analysis using 2006 NYTS data reported high prevalence of use of different types of tobacco among AI/AN. 55% of AI/AN were tobacco users with one or more products in their entire life. 54% of these students were using cigarettes, followed by cigars (24%) and then smokeless tobacco (16%). High school students reported significantly higher prevalence of tobacco use than middle school students. Compared with other racial and ethnic minority groups, AI/AN youth showed lower levels of academic attainment. Nonusers compared to tobacco users were older, 3 times more likely to have family members who smoked, less likely to refuse cigarettes from friends, 2 times more likely to miss school, and 2 times more likely to be exposed and receptive to tobacco marketing. These factors may increase the chances for AI/AN to fail in school, and increase their chances for health risks and risk behaviors (Yu, 2010).

Age-appropriate tools that address the context of adolescents with regard to design, implementation, and evaluation of tobacco prevention campaigns are needed (Unger et al., 2008). The tobacco industry has used American Indian culture as a marketing ploy and this practice may affect tobacco use among AI/AN youth (Silva et al., 2017). Moreover, programs to address youth tobacco use should be culturally competent in order to address the unique social and economic inequities faced by this group.

**American Indian and Alaska Native (AI/AN) Context**

While there are 574 tribes federally recognized in the U.S., many more tribes are recognized only by the state and some tribes not recognized by either. Tribal communities range from densely to remotely populated in geographical locations rooted to their ancestral connections. However, because of displacement and the era of relocation, there are many reservations that are not actually defined on their ancestral lands (Walls et al., 2017). Approximately 70% the AI/AN live off federally defined tribal lands and reside in urban areas. There is also a significant amount of AI/AN who are very mobile and go back and forth between rural and urban areas (UIHI, 2020). AI/AN have experienced group marginalization and discrimination as well as large-scale misappropriation of culture and identity. AI/ANs are more likely to experience overcrowded households, lower educational attainment, poverty, unemployment, stress, and trauma than any other U.S. communities. Thus, their health disparities are influenced by social and historical determinants of health (Walls et al., 2017). This can make it hard to understand and highlight a concrete perception and consensus relative to the impacts and tobacco usage. Similarly, the social determinants on different types of tobacco use in this context is limited (Yu, 2010).

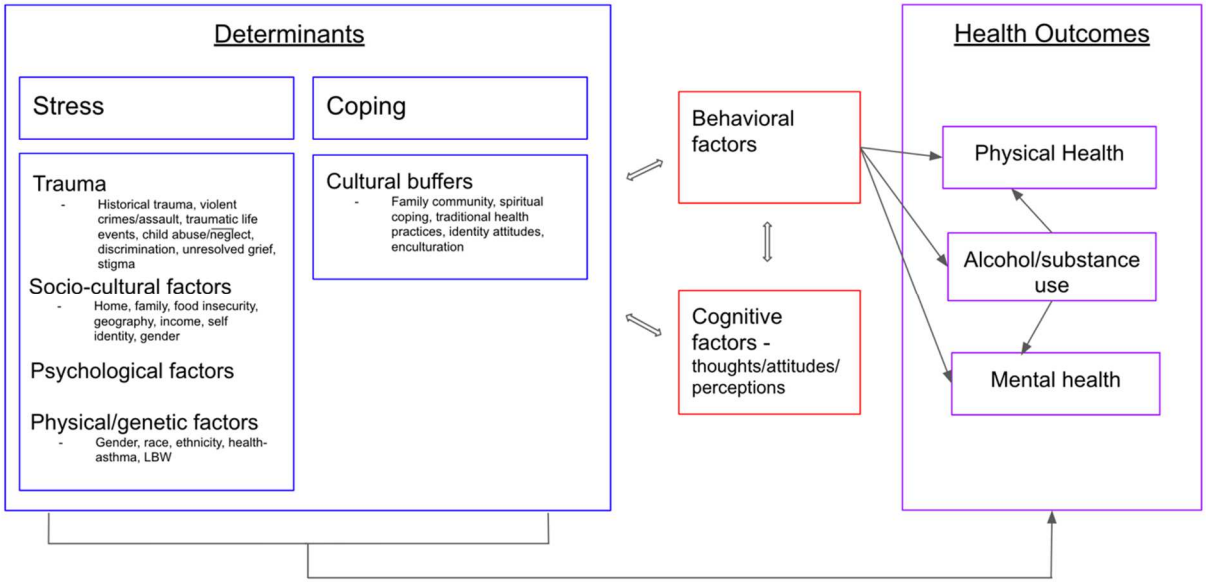
In research, AI/AN are often overlooked because this group is inappropriately perceived as small (Haozous et al., 2014). This population is often regarded as not big enough of a population for statistical analysis and is commonly excluded or combined with other groups, thereby minimizing visibility of AI/AN disparities in published literature. In western science, the practice of dismissing AI/AN data as insignificant explicitly and implicitly leads to less consideration for the health needs and affects decisions about resources. Omission of AI/AN population health information also limits opportunities for the academic advancement required for independent research. Exclusion of the key population data due to related data sets compromises the interpretation of studies (Echo-Hawk, 2019). There are also limited AI/AN related data sets that are provided at the public health and state level, and if so, contain limited

data sets in regard to geographic data. The sources are also known to be difficult to identify variability in these contexts (Dominguez, 2019).

Misclassification or overall exclusion of AI/AN populations is a current standard data collection practice at the federal, state, and local levels (UIHI, 2020). Racial misclassification is a widespread problem. It is also safe to assume estimates of these misclassifications are even higher than found in recent studies (UIHI, 2020).

Reporting and determining errors due to misclassification is complex. These errors may stem from social constructs, race and ethnicity, perceptions, relations, behaviors, terminology, and biases. Reasons for racial misclassification related to data on health disparities arise from individual, policy and system levels (Haozous et al., 2014).

**Conceptual Model**




This conceptual model is derived from two theories. The first theory is from the overall concept of the social cognitive theory. This is a behavioral theory referenced by Albert Bandura, who continued building his theory from the social learning theory. This idea supports the figure in that there are three reciprocal causations from: cognitive, environmental, and behavioral factors. There is emphasis that the factors are happening dynamically and simultaneously to one another, and that people are influenced by everything around them (HC3, 2014; Bandura, 1999).

The AI/AN youth are influenced by these same factors, but also have unique aspects to consider. The Indigenist stress-coping model provides a useful framework. This model emphasizes the stress and coping determinants shown in this figure as the environmental factors. The Indigenous stress-coping model is important because it excludes Eurocentric values and methodologies but includes the effects of trauma and cultural buffers that contribute and influence behavior, cognitive factors and health outcomes for this specific population. Cultural moderators have contributed to the improvement and resilience in health outcomes over the last decade among AI/AN. This model also delineates the health outcomes and shows there are a number of experiences to consider. Cultural buffers are identity, family, community, spirituality and traditional healing practices. Another capacity of this model

emphasizes on health outcomes, that include physical health, mental health which are branched from alcohol/substance use (Walters et al., 2002).

There is a large population of AI/AN people (70%) that live in urban areas as opposed to popular belief. Due to urbanization, there has been and an increase in vulnerability to biopsychosocial problems, and a decrease of affordable health care access. Consequently, there is more potential for misclassification and more so for multi-race AI/AN. Racial misclassification also affects other subpopulations complicating how data is reported (Jim et al., 2014). Women specifically are more prone to interpersonal violence. These acts of domestic violence, lifetime sexual assault, and childhood abuse take a toll and can impact well-being, risk behaviors and help-seeking.

AI/AN history includes child removal from their families, and pillage of land and resources. Many AI/AN were torn from their identity, stripped of their language, culture, tradition and beliefs, communities, families, and livelihood. These cruel injustices have burdened AI/AN present and future generations physically, emotionally, socially, and spiritually. Impacts include poverty and educational attainment—both factors that particularly impact AI/AN youth. Twenty-seven percent of AI/AN live at or below federal poverty level and, in part due to poverty, AI/AN are less likely to finish high school and attend higher education. Health, education and legal services and representation are also lacking in these communities because of underfunding and high burden of need.

Access to proper nutritious food, housing, and physical activity is limited in AI/AN rural and urban communities. While these barriers and challenges are contextual to the need for this population, it is also important to note that this population is still thriving after centuries of mistreatment and trauma. Trauma is linked to historical distress, substance use, suicide and accidental injury and death, violence and adverse childhood experiences. AI/AN men and adolescent boys seem to experience more health disparities compared to the women that relate to poverty and structural disadvantages due to colonization and historical atrocities experienced by generations of AI/AN (Sarche et al., 2017).

There is minimal research examining prevalence rates, frequency of tobacco usage, and age at first time usage of tobacco use among AI/AN. This study will fill this gap by addressing a project aim with three objectives comparing Non-Hispanic AI/AN to NH-White youth. The first objective is to determine the prevalence of cigarette and e-cigarette usage among non-Hispanic AI/AN compared to NH-White youth. The second objective is to determine the summarized frequency of usage of cigarette and e-cigarette comparing non-Hispanic AI/AN to NH-White youth. Third, to compare non-Hispanic AI/AN and NH-White youth age at first time usage of cigarette and e-cigarette.

## METHODS

### Participants

The National Youth Tobacco Survey (NYTS) survey collects data that is nationally representative of all middle and high school students in the U.S., including the District of Columbia, in a three-stage cluster sample design. The survey is implemented by individual State Departments of Health, the Centers for Disease Control and Prevention (CDC), Office on Smoking and Health (OSH), and the Food and Drug Administration. The data collected is intended to be used in the design, implementation, and evaluation of tobacco prevention and control of programs led by state agencies and organizations. This survey has been accessible to the public yearly since 2011 and available biennial since 1999 (NYTS, 2019). For first time, in 2019, the survey was self-administered in schools through a tablet collection method, as opposed to its usual paper and pencil questionnaires. Data was collected offline, synced safely and

securely through encrypted transmissions. Participation was fully voluntary at both school and student levels. The NYTS was administered between February-May 2019 (NYTS, 2019).

The sample consisted of 251 participating schools, a response rate of 77.2%. The response rate from students was 66.3%. The design of eligibility was made so that each student had only one chance of being selected. There was a total of 19,018 completed surveys (1,821 web-based). To adjust for nonresponse and probabilities of selection, a weighting factor was applied, and used for this analysis. The 2019 NYTS underwent three reviews of approval: The Office of Management and Budget (OMB), ICF's Institutional Review Board (IRB) and CDC's Institutional Review Board (IRB). The survey had a total of 104 questions. It was designed to follow a skip-pattern logic in response to the student's answer to questions on ever and current tobacco product use behaviors.

This study focused on two groups of students. A subset of non-Hispanic AI/AN middle and high school students and NH-White middle and high school students who answered questions on key study variables. AI/AN are defined as a non-Hispanic person who has origins in any for the original peoples of North and South America (including Central America) and who maintains cultural identification through tribal affiliation or community recognition. Non-Hispanic White refers to a person having origins in any of the original peoples of Europe, North Africa or the Middle East. Both definitions are taken from the common core of data race/ethnicity definitions used consistently in the NYTS (PEP, 2020). NH-White was chosen as the comparison group, as it has significance in the previous surveillance summaries of the NYTS, consistently having a large sample size, and has closely related prevalence and frequency rates to the national averages of the NYTS. Multi-race was disaggregated from this data, as to not lose any person through misclassification. Non-Hispanic ethnicity was used because the data and survey questions were designed this way.

**Measures**

**Dependent variables:**

*Prevalence, past 30-day usage of the two types of tobacco* products, cigarettes and e-cigarettes. To assess prevalence, youth were first asked lifetime use of the tobacco type, if ever using that product. Then asked to specify in the past 30 days, how many times they smoked that product with a range from 0-30.

*Frequency of tobacco use* is measured on a continuous scale, for cigarettes and e-cigarette usage. It is summarized for the number of days used in the past month. Frequency of tobacco product use is assessed by the response from students, to the question of how many times in the past 30 days did they use cigarettes and/or e-cigarettes with an integer ranged from, 1-30.

*Cigarettes and e-cigarettes* are used in this study as they are the top two most prevalent tobacco products shown in recent surveillance summaries. A smoking cigarette is described in the survey as one that has to be lit and burned. E-cigarettes were distinguished in the survey as electronic cigarettes or e-cigarette that are battery operated devices that contain a nicotine-based liquid that is vaporized and inhaled. They are also known as e-cigs, vape-pens, e-hookahs, vapes, or mods. Some e-cigarette brands are JUUL, Vuse, MarkTen, and blu.

**Independent variables**

*Age at first-time usage of cigarettes and e-cigarettes* is measured by asking students how old when they first tried cigarette/e-cigarette smoking, even one or two puffs. Responses included a 12-point scale, with ages ranging from 8 years old or younger to 19 years old or older. For the purpose of this study, the responses are categorized into 3 age groups based on school level, elementary- (<8-10 years old), middle- (11-13 years old), and high-school (14-18 years old). It is difficult to understand and conceptualize if age at first time usage of tobacco products is independent or dependent of age.

*Race, and ethnicity* will be measured in two questions. The race variable used in this dataset is considered single race, non-Hispanic as defined in the Common Core of Data. Race response rate measures on a 5-point scale (0=American Indian or Alaska Native, 1=Asian, 2=Black or African American, 3=Native Hawaiian or Other Pacific Islander, 4=White). Ethnicity response consists of a dichotomous scale (0=yes, 1=no). A yes would be for Hispanic, Latino, Latina, or of Spanish origin including Mexican, Mexican American, Chicano, Chicana, Puerto Rican, Cuban, Another Hispanic, Latino, Latina, or Spanish origin. For the purpose of this study comparison, American Indian and Alaska Native and Non-Hispanic White youth will be assessed as the independent variables.

**Statistical Analysis**

All analyses were conducted using R software for statistical computing. Prevalence of self-report of cigarette and e-cigarette usage was estimated using proportions and 95% confidence intervals (Cis) for AI/AN and NH-White youth. Proportions were compared between racial/ethnic groups using chi-square tests. Frequency of cigarette and e-cigarette use was summarized as medians and the interquartile range (IQR). Frequencies of use of each product between groups were compared using rank-sum tests. Among respondents who provided age at first time use, the proportions of respondents who started use of cigarettes or e-cigarettes at <8-10 years of age (elementary), 11-13 years of age (middle) and 14-18 years of age (high school) were described.

## RESULTS

A total of 19,018 youth aged 9-19 years old participated in the survey. Two-hundred twenty-one self-reported as being AI/AN and 8,536 self-reported as being NH-White. The remaining 9,815 were NH-Black (2,288), Hispanic (5,564), NH-Asian (861), NH-Native Hawaiian or Other Pacific Islander (104), multiple races (998) and 446 had data missing for race/ethnicity.

Among 219 AI/AN youth, 9% reported using cigarettes in the past 30-days compared to 5% among NH-White youth (P=0.002) (Table 1). The proportions of AI/AN and NH-White youth using e-cigarettes were 24% and 23% respectively (p=0.7).

Among 17 (8%) AI/AN and 344 (4%) NH-White youth who provided data on their frequency of cigarette use, the median number days of cigarette use in the past 30 was 3 (IQR, 2-10) compared with 5 days (IQR, 2-20) for NH-White youth (p=0.4) (Table 2). Among 41 AI/AN and 1480 NH-White youth who provided data on their frequency of e-cigarette use, the median number days of e-cigarette use in the past 30 was 5 (IQR, 2-20) for AI/AN and 10 days (IQR, 2-26) for NH-White youth (p=0.3).

A total of 51 (23%) AI/AN and 1,472 (17%) NH-White youth reported their age at first time cigarette usage (Table 3). Among AI/AN, 22% tried cigarettes in elementary, 41% in middle school, and 19% in high school. Among NH-White, 20% tried cigarettes in elementary, 33% in middle school, and 48% in

high school. A total of 71 AI/AN youth and 3,153 NH-White youth reported their age at first time e-cigarette use (Table 3). Among AI/AN youth, 13% tried e-cigarettes in elementary, and 44% in middle and high school. Among NH-White youth, 4% first tried e-cigarettes in elementary, 28% in middle school and 68% in high school.

## DISCUSSION

In the 2019 NYTS, a higher proportion of AI/AN vs NH-White youth reported cigarette use, whereas the prevalence of e-cigarette use was similar in both groups. In addition, the proportion of e-cigarette users was high in both groups and approached one-quarter of survey respondents. Although the numbers of survey respondents providing data on age at start was minimal, available data suggests the need for more focus on e-cigarette use in elementary and middle school students in both groups.

Many AI/AN youth captured in this data set do not use cigarettes or e-cigarettes. In addition, use of e-cigarettes was similar in AI/AN vs NH-White youth. These findings are contrary stereotypes about AI/AN youth and people. However, it is difficult to determine if this dataset shows an accurate interpretation of the AI/AN demographic because of the small sample size, high diversity of this population, potential for misclassification, and poor cultural appropriateness of the survey.

First, there is potential for limited access to the survey by AI/AN youth. The data was collected only from middle and high school students from private and public schools and does not include youth who are receiving their education at home, detention centers, Bureau of Indian Affairs (BIA) schools, alternative schools or have dropped out altogether. These missing groups may represent a significant proportion of the AI/AN youth population. In future studies, oversampling may be one approach to overcome both small numbers and high diversity.

Self-report of AI/AN identity may also be challenging in the context of a broad survey. AI/AN experience high rates of misclassification, confusion between race and ethnicity identity. Race is based on physical appearances and stems from history, ongoing colonization, and racism. Ethnicity stems from cultural factors. Misclassification can cause psychological duress, blur the definition of AI/AN and mask the actual AI/AN population in data. AI/AN have specific identities that are unique to their tribe and culture. AI/AN share another layer of societal misclassification related to colonization and marginalization (Haozous et al., 2014), all of which contribute to the complexity of self-reporting AI/AN identity.

Another limitation is that this survey is not culturally attuned to this specific population. There was no distinction between ceremonial use and recreational use, which could have impeded the interpretation of the types of tobacco use questioned. The American Indian Adult Tobacco Survey Implementation Manual (AIATSWG, 2008) provides surveillance and evaluation tools that are deemed as culturally appropriate and provide a wide variety of chapters, questionnaires, scripts and resources on implementation training and data collection with supplemental questions to consider pertaining to purchase patterns, ceremonial or sacred use, brand smoked, and chronic disease. However, these tools are yet to be implemented and designed to accommodate AI/AN youth. In addition, methods to overcome small sample size, include oversampling, and methods to reduce misclassification of is needed to capture the very diverse and unique data of AI/AN youth.

There is also additional mistrust between AI/AN and the government especially concerning health. There was a time when there were federal laws in place that banned ceremonies and spiritual rituals and were

considered criminal and punishable. As a result, additional distrust and an increase in imbalance of health were created among AI/AN people. The youth are especially vulnerable to health disparities. AI/AN have a history of displacement, and boarding schools, from this, there are still rates of out-of-home placement of children (Sarche et al., 2017). This could have an effect on being truthful and completing the questionnaire.

In summary, tobacco use among American Indian and Alaska Native youths is likely a complicated picture that cannot be showcased using survey methods developed for use in other demographic groups. This analysis is a preliminary step towards understanding tobacco use in AI/AN youth. Future research should work to encompass questions that are culturally relevant and appropriate for the AI/AN demographic. Poor quality of existing data on tobacco use in AI/AN youth limits the ability to design appropriate health promotion and communication campaigns.

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## TABLES

Table 1: Prevalence of tobacco usage among non-Hispanic AI/AN compared to NH-White

| | Race and Ethnicity | | | | |
|---|---|---|---|---|---|
| | Non-Hispanic American Indian or Alaska Native | | Non-Hispanic White | | |
| Tobacco Type | n | % (95% CI) | n | % (95% CI) | p-value |
| Cigarettes | 219 | | 8525 | | |
| | 20 | 9 (6-14) | 386 | 5 (4-5) | 0.002 |
| E-cigarettes | 218 | | 8505 | | |
| | 52 | 24 (18-30) | 1920 | 23 (22-24) | 0.7 |

Table 2: Frequency of tobacco usage, summarized as number of days in the past month, among non-Hispanic AI/AN compared to NH-White

| | Race and Ethnicity | | | | | | |
|---|---|---|---|---|---|---|---|
| | Non-Hispanic American Indian or Alaska Native | | | Non-Hispanic White | | | |
| Tobacco Type | n | Median, (IQR) | 95% CI | n | Median, (IQR) | 95% CI | P-value |
| Cigarettes | 17 | 3 (2-10) | 3-14 | 344 | 5 (2-20) | 10-12 | 0.4 |
| E-cigarettes | 41 | 5 (2-20) | 8-14 | 1480 | 10 (2-26) | 13-14 | 0.3 |

Table 3: Age at first time usage of tobacco use among non-Hispanic AI/AN compared to NH-White

| | | Race and Ethnicity | | | |
|---|---|---|---|---|---|
| | | Non-Hispanic American Indian or Alaska Native | | Non-Hispanic White | |
| Tobacco Type | School Level (Age) | n | % (95% CI) | n | % (95% CI) |
| Cigarettes | | 51 | | 1472 | |
| | Elementary (<8-10) | 11 | 22 (12-36) | 291 | 20 (18-22) |
| | Middle (11-13) | 21 | 41 (28-56) | 478 | 33 (30-35) |
| | High (14-18) | 19 | 37 (24-52) | 703 | 48 (45-50) |
| E-Cigarettes | | 71 | | 3153 | |
| | Elementary (<8-10) | 9 | 13 (6-23) | 130 | 4 (3-5) |
| | Middle (11-13) | 31 | 44 (32-56) | 893 | 28 (27-30) |
| | High (14-18) | 31 | 44 (32-56) | 2130 | 68 (66-69) |