Published in final edited form as:

Tob Regul Sci. 2017 April ; 3(2): 151–167. doi:10.18001/TRS.3.2.3.

Texas Adolescent Tobacco and Marketing Surveillance System's Design

Adriana Pérez, PhD, MS, Melissa B. Harrell, PhD, MPH, Raja I. Malkani, BS, Christian D. Jackson, MS, Joanne Delk, MS, Prince A. Allotey, PhD, MS, Krystin J. Matthews, MPH, Pablo Martinez, BS, and Cheryl L. Perry, PhD, MA

Adriana Pérez, Associate Professor, The University of Texas Health Science Center at Houston-UTHealth, School of Public Health, Department of Biostatistics, Austin, TX. Melissa B. Harrell, Associate Professor, The University of Texas Health Science Center at Houston-UTHealth, School of Public Health, Department of Epidemiology, Human Genetics and Environmental Sciences, Austin, TX. Raja I. Malkani, Consultant, The University of Texas Health Science Center at Houston-UTHealth, Michael & Susan Dell Center for Healthy Living, Austin, TX. Christian D. Jackson, Statistician, The University of Texas Health Science Center at Houston-UTHealth, Michael & Susan Dell Center for Healthy Living, Austin, TX. Joanne Delk, Project Coordinator, The University of Texas Health Science Center at Houston-UTHealth, Michael & Susan Dell Center for Healthy Living, Austin, TX. Prince A. Allotey, Senior Statistician, The University of Texas Health Science Center at Houston-UTHealth, Michael & Susan Dell Center for Healthy Living, Austin, TX. Krystin J. Matthews, Graduate Research Assistant, The University of Texas Health Science Center at Houston-UTHealth, Michael & Susan Dell Center for Healthy Living, Austin, TX. Pablo Martinez, Programmer II, The University of Texas Health Science Center at Houston-UTHealth, Michael & Susan Dell Center for Healthy Living, Austin, TX. Cheryl L. Perry, Professor, The University of Texas Health Science Center at Houston-UTHealth, School of Public Health, Department of Health Promotion and Behavioral, Austin, TX.

Abstract

Objectives—To provide a full methodological description of the design of the wave I and II (6-month follow-up) surveys of the Texas Adolescent Tobacco and Marketing Surveillance System (TATAMS), a longitudinal surveillance study of 6th, 8th, and 10th grade students who attended schools in Bexar, Dallas, Tarrant, Harris, or Travis counties, where the 4 largest cities in Texas (San Antonio, Dallas, Fort Worth, Houston, and Austin, respectively) are located.

Methods—TATAMS used a complex probability design, yielding representative estimates of these students in these counties during the 2014–2015 academic year. Weighted prevalence of the use of tobacco products, drugs and alcohol in wave I, and the percent of: (i) bias, (ii) relative bias, and (iii) relative bias ratio, between waves I and II are estimated.

Human Subjects Statement

This study was reviewed and approved by the University of Texas Health Science Center at Houston-UTHealth Institutional Review Board: HSC-SPH-13–0377. For participating schools, district and principal approval, and where appropriate, the school's Institutional Review Board approval, was obtained.

Conflict of Interest Statement

Adriana Pérez, Melissa Blythe Harrell, Raja I. Malkani, Christian D. Jackson, Joanne Delk, Prince A. Allotey, Krystin J. Matthews, Pablo Martinez, and Cheryl L. Perry: Nothing to declare.

Results—The wave I sample included 79 schools and 3,907 students. The prevalence of current cigarette, e-cigarette and hookah use at wave I was 3.5%, 7.4%, and 2.5%, respectively. Small biases, mostly less than 3.5%, were observed for nonrespondents in wave II.

Conclusions—Even with adaptations to the sampling methodology, the resulting sample adequately represents the target population. Results from TATAMS will have important implications for future tobacco policy in Texas and federal regulation.

Keywords

Tobacco use; tobacco products; longitudinal study; adolescent; survey methodology; sampling procedures

INTRODUCTION

Adolescents are an important target population for tobacco prevention and regulation efforts because most adult tobacco users initiate tobacco use in adolescence. In 2012, 1.15 million youth smoked cigarettes for the first time.¹ In 2015, in the United States (U.S.), 25% of high school students reported past 30-day use of a tobacco product and approximately one-eighth used 2 or more tobacco products.² Despite prevention efforts and well documented health risks, from 2011 to 2015, the percent of high school students who used any tobacco product in the past 30 days did not change significantly.² However, there have been shifts in the products used, with the use of cigars and cigarettes decreasing and the use of e-cigarettes and hookah increasing.²

The Texas Adolescent Tobacco and Marketing Surveillance System (TATAMS) was designed as a longitudinal study to understand the diversity of tobacco products used by youth and the impact of tobacco product marketing on use. TATAMS was developed and conducted by the Texas Tobacco Center of Regulatory Science on Youth and Young Adults. It uses a complex sampling design to yield representative estimates of Bexar, Dallas, Tarrant, Harris, and Travis counties where the 4 largest cities in Texas (San Antonio, Dallas, Fort Worth, Houston, and Austin, respectively) are located. The study is based in Texas because of the state's diverse population and importance as a market for tobacco products^{3–8}. According to the 2010 U.S. Census data, an estimated 45.3% of the state is White, 37.6% is Hispanic, and 11.8% is African-American or Black. Approximately 9% of all youth under the age of 18 in the U.S.⁴, and around 8% of all Hispanics live in Texas³. Twenty-seven percent of the population in Texas is under 18, as compared to 24% nationally.⁵ Further, the 5 Texas counties included in this study contain 3 of the top 5 fastest-growing cities in the U.S. and about 50% of the Texas population.⁶ In 2013, Texas ranked first in the U.S. in tobacco industry expenditures on marketing, with over 630 million dollars spent⁷. This marketing amount “outspends” state prevention efforts at a ratio of 62 to 1.⁸

TATAMS is a multiple-component rapid response surveillance system.⁹ It includes: (i) repeated surveys of middle and high school students; (ii) repeated audits of tobacco advertising at point-of-sale (POS) in retail outlets surrounding schools and in print media, such as magazines with a relatively high youth readership; and (iii) analyses of tobacco product sales data, collected by A.C. Nielsen's Convenience Track System.¹⁰ These

components are unique and important because the impact of retail tobacco marketing on young people's use of new and emerging tobacco products, such as e-cigarettes and hookahs, is not known. Only 2 studies have linked objective estimates of tobacco advertising at POS with youth cigarette smoking behaviors within school neighborhoods or at the county level in the U.S.^{11,12}

Given the importance of TATAMS, the purpose of this paper is to describe: (i) the study design; (ii) how the sample is representative of the population of these 5 counties; (iii) the monitoring of students and schools; (iv) limitations of the sampling frame used for random selection and for the development of the sampling weights, including adjustment for nonresponse; (v) caps for the trimming of the sampling weights; and (vi) summary statistics of nonresponse bias for wave II, by following the recommendations of the Federal Committee on Statistical Methodology (2001).¹³ This is important to the field as a case study because complex sampling designs are known to provide imprecise standard error estimates if: (i) weighting and clustering of students within schools are not considered,^{14,15} (ii) extreme weights are present and trimming the weights are not used to reduce their sensitivity,^{16,17} or (iii) the quality of the study is not assessed in terms of sampling, nonresponse, and non-sampling errors.¹⁸

METHODS

The population for TATAMS included students from 6th, 8th, and 10th grades during the 2014–2015 academic year, within Bexar, Dallas, Tarrant, Harris, and Travis counties. The survey instrument for TATAMS measured multiple tobacco use behaviors, cognitive and affective factors, and receptivity and exposure to tobacco marketing.

Instrument and questions used

Race/Ethnicity was measured by responses to survey questions: What race or races do you consider yourself to be? Check all that apply (White, Black or African American, Asian, American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, Other); Are you Hispanic or Latino/a? (No; Yes, I am Mexican, Mexican American, or Chicano/a; Yes, I am some other Hispanic or Latino/a not listed here). Students who responded “Yes, I am Mexican, Mexican American, or Chicano/a” or “Yes, I am some other Hispanic or Latino/a not listed here,” were classified as Hispanic. Students who responded only “African American” to the race question and “No” to the Hispanic question were classified as Black-Non-Hispanic. Students who responded Asian, American Indian/Alaska Native, Native Hawaiian or Pacific Islander or Other and responded “No” to the Hispanic question were classified as Other. Students who responded White and responded “No” to the Hispanic question were classified as White-Non Hispanic and served as the referent category. Originally the race/ethnicity variable was collapsed as 3 response categories: Hispanic, Black-Non-Hispanic, and White/Other-Non-Hispanic because (i) approximately 6% of the students in these 5 counties and grades in the sampling frame were Asian, American Indian or Alaska Native, Native Hawaiian/Other Pacific, or 2 or more races and (ii) TATAMS did not have the resources to generate estimates by race/ethnicity with prevalence lower than 10%. In this manuscript, we used 4 categories and separated White-Non-Hispanic from the

Other category, given the known differences in tobacco use prevalence between these two groups. The exact wording of the socio-economic and tobacco related questions used in the analysis and categories of response are described in Table 1. Validation and reliability measures for these variables are described elsewhere.^{17–27}

Data collection, consent, assent and incentives

Between October 2014 and June 2015, wave I was administered electronically in either English or Spanish using tablet computers on site at the schools that had agreed to participate in the study²⁸. In wave II and in subsequent waves, students were/are provided a link via email or text message to participate in an English-only survey online. Active consent from each student's parent or guardian in wave I was obtained for all 6 waves as well as assent from each student. Each participant received a \$10 gift card for completing the survey at wave I, and school coordinators received a \$100 gift card. Respondents at wave II also received a \$10 gift card and participated in a drawing for a Samsung Tab Lite 3 tablet. TATAMS human subject's methods were approved by the University of Texas Health Science Center at Houston Institutional Review Board, number: HSC-SPH-13–0377.

Sample size estimation

During the planning of TATAMS, cohorts of students who were in the 6th, 8th, and 10th grades in September of 2014 were selected to be followed every 6 months for 3 academic years, 2014–2017, participating in up to 6 surveys in total. These cohorts represent different developmental stages: 6th grade for early adolescence, 8th grade for middle adolescence, and 10th grade for late adolescence.

The sample size for the study was determined by estimating the overall prevalence of new and emerging tobacco products (eg e-cigarettes, hookah, and smokeless tobacco) at 1.1%, 5.1%, and 5.4% for 6th, 8th, and 10th grades, respectively. The effect size for the overall prevalence of these new and emerging tobacco products varied for 6th, 8th, and 10th grades: 0.4, 0.15 and 0.17, respectively. We used a type I error level of 0.05 and a type II error level of 0.2. During the planning phase of the study, the number of schools needed for the sample was determined using a tobacco onset rate of 7.7% over 3 years.²⁹ The minimum sample size was 879 6th grade students, 423 8th grade students, and 679 10th grade students, for a total of 1,981 students.³⁰ The minimum sample size of schools was 9 schools for 6th grade, 36 schools for 8th grade, and 55 schools for 10th grade totaling 100 schools. Planned retention rates were estimated to be at least 75% at each wave³¹ and we expected 66% of the cohort to be remaining at the final wave. For these reasons, the target sample size at wave I was 100 schools and 5,340 students [=1,981/(0.75²*0.66)]. Additionally, a power analysis was performed using M-plus³² and R.³³ Using the above estimates, 1000 data sets were simulated and a growth model was fit to check the power for a proportion of significant effects.

Sampling frame

Data from 4 sources were combined to create the sampling frame: (i) the Texas Education Agency (TEA), (ii) the Texas Private School Accreditation Commission (TEPSAC), (iii) the

National Center for Education Statistics (NCES), and (iv) the Texas Comptroller of Public Accounts.

TEA provided information on all public and charter schools in Texas from the 2012–2013, 2013–2014, and 2014–2015 school years, providing 3 datasets for each school year to create the TATAMS sampling frame. The first dataset contained school-level data, such as the name of the school districts, enrollment, location, contact information for the school district and school, type of school (eg charter, magnet, special schools, etc.), and grades offered. The second dataset contained enrollment information by sex and ethnicity for each school and grade. TEA data for the 2013–2014 academic year was the most current data available at the time that the TATAMS sampling frame was created and thus was used for random selection of the public schools. The third dataset, included the number of economically disadvantaged children (ie, children whose families qualified for federal assistance programs) and the number of students with limited English proficiency.³⁴ TEA data for 2014–2015 academic year was ultimately used to estimate the sampling weights for waves I and II, in order for the surveyed population to match the sampling frame.

TEPSAC provided total school enrollment data for all private schools in Texas from 2011–2012. NCES provided further demographic information for private schools by grade, ethnicity, and sex for the 2009–2010 academic year. Private schools with unknown enrollment data were part of our sampling frame of 6th, 8th or 10th grades, and were still eligible for participation in the study.

The list of permitted tobacco retail outlets, or point of sale (POS) locations, was obtained in November 2014 from the Texas Comptroller of Public Accounts.³⁵ The number of POS outlets within a half mile radius of each school served to identify 2 strata: schools without POS (0) and schools with one or more POS(1+). The POS was used as a stratification variable to conduct audits of tobacco marketing at POS in retail outlets surrounding schools. Due to limited funding, these outlet audits only occurred before the waves II, IV, V, and future wave VI surveys were administered. This was done to examine if proximity to a POS and exposure to tobacco marketing is associated with increased youth tobacco use at waves II, IV, V and VI.

Combining these data sources, the initial TATAMS sampling frame included a total of 10,381 schools, including private schools, in all of Texas. Schools were then excluded if they: (i) were not located in Bexar, Dallas, Tarrant, Harris, or Travis counties; (ii) provided non-traditional instruction; (iii) were under construction; (iv) did not allow external research; (v) or were elementary schools. Due to high costs of field personnel, public schools with enrollment below 50 students in all selected grades were excluded. Public schools with at least 50 students enrolled in either 6th, 8th or 10th grade were included. Private and charter schools were eligible to participate regardless of enrollment given that they only represented less than 9% of the total enrollment for these 5 counties. Additional details are provided in Figure 1. The final TATAMS sampling frame consisted of 781 public schools within 77 school districts, 230 charter schools, and 353 private schools for a total of 1,364 schools (see Figure 1).

This sampling frame was composed of 705 schools with 148,465 6th grade students, 737 schools with 160,080 8th grade students, and 527 schools with 152,524 10th grade students enrolled in the 2014–2015 academic year. Therefore, the sampling frame represents a total of 461,069 students enrolled in 6th, 8th, and 10th grades. For these grades, the sampling frame represented 99.8% of the enrollment for the 5 counties and 40.5% of the enrollment for the entire state (not including private schools with unknown enrollment).

The students in the 2014–2015 TATAMS sampling frame were: 48.8% girls; 20.9% White, 18.2% Black-Non-Hispanic or African American, 54.6% Hispanic, and 6.3% Other (ie Asian/American Indian or Alaska Native/Native Hawaiian/Other Pacific/2 or more races). In addition, 59.8% of students in public or charter schools qualified to receive free lunch every day, and 13.7% were classified as having limited English proficiency.

Sampling strata and complex design

Before data collection, public schools in the sampling frame were stratified by county and POS (0 vs 1+) resulting in 8 unique strata. Dallas and Tarrant counties were combined to capture the entire Dallas/Fort Worth metropolitan area as a whole. Before data collection, a random cluster sample of public schools was drawn using a probability proportional to each grade's enrollment within each one of the 8 strata. The school districts from the randomly chosen public schools were contacted to obtain approval for participation in the study. The enumeration units were students in each of the grades. The charter and private schools were not considered for random selection at the beginning because of their lower overall student enrollment (~10%) in comparison with the public schools (~90%).

Students were invited to participate in the study via consent form sent home, and the school coordinator was instructed to target a minimum of 55 consent forms per grade at each school. The reasons for targeting only 55 students within each grade and school were fourfold: (i) we did not expect to receive 100% of active consent forms from parents or assent from the students; (ii) the sample size estimation took into consideration the selection of an adequate sample of enumeration units within each school;¹⁴ (iii) incentives for participation were limited; and (iv) homogeneous sample sizes within each cluster provide better precision on estimates than cluster samples with heterogeneous sizes.¹⁴ The distribution of the sampling frame with school enrollment by POS and school type is shown in Table 2.

Lack of response in a timely matter by school districts, despite multiple approaches and attempts, made it impossible to achieve the sample size indicated for the 8 strata even after replacements were generated. If a school district did not agree to participate or did not respond, then schools within the school district could not be contacted to participate. When TATAMS staff became aware of the challenges recruiting public schools and noted that about 10% of the students in the counties were otherwise enrolled in private and charter schools, these other 2 school types were included in recruitment efforts. Charter schools were contacted between June 2014 and February 2015 and private schools were contacted between May 2014 and February 2015.

Due to time constraints, 7% of all private and charter schools in these counties were not invited to participate, nor were data collected at these schools. However, 93% of private and charter schools were invited to participate resulting in a near census at these types of schools. All the school districts and schools in the sampling frame were monitored with regard to their participation (agree, decline or no-response), random selection, or waitlist status. The number and percentage of school districts and schools per grade by monitoring status at the end of wave I are reported.

Statistical aspects

Basic sampling weights, nonresponse and trimming adjustments at wave I—

Basic sampling weights were developed using enrollment data from TEA for the 2014–2015 academic year. Although a random cluster sample of public schools was drawn using probability proportional to each grade's enrollment within each of the 8 strata, during the development of the basic sampling weights, there were not enough schools per each of the 8 strata by grade. At wave I, there was sufficient sample size to develop the basic sampling weights for representation of the overall estimates of these 5 counties as well as at the POS strata by grade. In other words, the basic weights for the public schools that were used involved the probability proportional to the enrollment by grade within 2 POS categories, with adjustment for nonresponse at both school/school district, as well as control totals¹⁴ by sex and race/ethnicity. The basic weights for the private schools assumed equal probability of selection using enrollment by grade. The basic weights for the charter schools assumed equal probability of selection by grade and were adjusted for control totals¹⁴ by race/ethnicity and sex. Sampling weights from students in private schools could not be adjusted for control totals on demographic characteristics because that information was not available. The original adjustment of the sampling weights by race/ethnicity was collapsed as three response categories: Hispanic, Black-Non-Hispanic, and White/Other-Non-Hispanic (summary statistics using the sampling weights for these categories are available upon request from the authors). In previous publications, we used those original sampling weights.^{36–39} In this manuscript, new sampling weights were estimated adjusting by race/ethnicity in 4 categories instead, as White-Non-Hispanic, Black-Non-Hispanic, Hispanic and Other-Non-Hispanic category. There were minor differences at the first or second decimal places in the results when using either approach to generate the sampling weights. As expected, the variability around these estimates was slightly larger for the Other category due to smaller sample size.

Some of the resulting sampling weights were extremely large in grades 6 and 8 at wave I. Sampling weights were trimmed if they exceeded the 99th percentile for each grade.⁴⁰ The trim points of 804 and 811 were used for 6th and 8th grades, respectively. Any weight that exceeded the trim point was redistributed to other surveys in their strata.¹⁴ The sampling weights for 10th grade were not trimmed because none of them were extremely large.

Data collection, nonresponse bias and sampling weight adjustments for wave

II—Online data collection of wave II occurred between May and September 2015, approximately 6 months after wave I, for each student. Unweighted response rate (URR) and weighted response rate (WRR) (ie using the sampling weights) were estimated using

standard methods.¹³ Students from wave I to wave II were classified into 4 response categories: completed wave II(C), never opened the link provided via email/text (NOL), opened the link provided via email/text but did not complete wave II (OL), or parent of participant decided to withdraw their child from future waves of the study (W). Using wave I sampling weights, the unweighted response rate was estimated using Equation 1.

$$URR = \frac{C}{C+NOL+OL+W} \quad (1)$$

Bias is associated with both low response and strong differences in the estimates between respondents and nonrespondents.¹⁴ If bias existed, one potential solution was to adjust the sampling weights to compensate for nonresponse. For this reason, we evaluated whether there was bias as a result of nonresponse at wave II.¹³ The weighted percentage of response and nonresponse for both waves were calculated by demographic, drug, alcohol, and tobacco use variables. The proportion biases (ie, proportion of the difference in survey estimates between respondents and nonrespondents), relative bias (proportion of the bias relative to the proportion among respondents), and bias ratio (comparing the magnitude of the bias to the standard error among respondents) due to nonresponse were estimated using the guidelines from the Council of American Survey Research Organizations (CASRO)¹³ using equations 2–4.

$$\%Bias = \frac{N_{NR}}{N} (P_R - P_{NR}) \quad (2)$$

$$\%Relative \text{ bias} = \frac{\%Bias}{P_R} \quad (3)$$

$$\%Bias \text{ ratio} = \frac{\%Bias}{SE_{P_R}} \quad (4)$$

Where:

P_R : weighted proportion of the characteristic at wave I among respondents in both waves I and II, using trimmed sampling weights at wave I

P_{NR} : weighted proportion of the characteristic at wave I among nonrespondents in wave II, using trimmed sampling weights at wave I

N_{NR} : number of nonrespondents in Wave II, using trimmed sampling weights

N : total population (all students) using trimmed sampling weights

SE: standard error for the weighted proportion of the characteristic at wave I among respondents

Because biases were observed in the demographic characteristics and tobacco use variables, time-invariant sampling weights to account for nonresponse for wave II were developed similar to wave I.¹³

Statistical analysis—Wave I data were analyzed using trimmed sampling weights for the correction of its complex design. For any of the tobacco use variables, the referent group was *never users* for ever use of the tobacco product. The referent group for use in the current use (past 30- days) analyses was *no current use (no past 30-days use)*, and the referent group for susceptible to use was *not susceptible to use*. Weighted multinomial regression models with generalized logit links were used to evaluate if there were statistically significant differences between the estimated proportions of the demographic, marijuana, alcohol and tobacco use variables (24 total parameters) between respondents versus nonrespondents: (i) who never clicked the link at wave II and (ii) who opened the link but did not complete the survey at wave II. For these analyses, we excluded 6 students who withdrew from the study at wave II and who contacted study personnel due to non-survey content related reasons. Adjustment for multiple comparisons on the 24 parameters for NOL versus C and OL versus C was conducted using Bonferroni correction⁴¹ with a type I error level of 0.001042(=0.05/(24*2)). Odds ratios (OR) and 99.8958% (=1–0.001042) confidence intervals (CI) are reported.

RESULTS

The number of schools where both the school district and the schools agreed to participate was: 26 for 6th grade with 1,122 surveys, representing 148,465 students; 30 for 8th grade with 1,322 surveys, representing 160,080 students; and 39 for 10th grade with 1,463 surveys, representing 152,524 students. This is a total of 3,907 surveys representing 461,069 students in grades 6, 8 and 10 from the 5 Texas counties. Overall, respondents at wave I were: 48.9% girls; 21.4% White, 17.6% Black Non-Hispanic or African American, 54.5% Hispanic, 6.6% Other; 18.3% “just getting by” or “poor”; 76.4% located in areas with one or more POS around their school; 91% located in public schools, 6.5% in charter schools and 2.5% in private schools. The median age for the students in 6th, 8th and 10th grades were 11, 13 and 15 years old, respectively.

Table 2 presents the details of the URR and WRR for TATAMS in wave II. Approximately 61% of the students in wave I completed wave II online (WRR). A large percentage of students that completed wave I never started wave II (36.5%) and very few opened the link to the online survey but did not complete wave II (2.5%). Less than 1% of students withdrew from the study at wave II (Table 3).

Over half of the school districts did not respond to recruitment efforts (n=119, 51.5%) between February 2014 and May 2015, with details by grade provided in Table 4. Also, a large number of school districts declined to participate (n=52; 22.5% overall grades), which prevented large numbers of schools from being contacted for recruitment. Proposing to

conduct TATAMS in schools with 8th grade was associated with the largest decline in participation by the school districts.

Table 5 describes sociodemographic, drug, alcohol, and tobacco use characteristics of TATAMS students in wave I, the estimated proportions of respondents and nonrespondents in wave II and the % bias, % relative bias and % bias ratio. Negative % bias means nonrespondents were higher in the listed variable. All variables had less than 3.7%, 1%, and 3.1% bias, relative bias and bias ratio in absolute value, respectively.

Table 6 shows the differences between the response rates to the 24 parameters comparing respondents versus nonrespondents who never clicked the link at wave II as well as respondents versus nonrespondents who opened the link but did not complete the survey at wave II. Students who indicated ever e-cigarette use at wave I were more likely to be nonrespondents who opened the link but never completed the online survey at wave II (OR=2.54, 99.8958%: 1.09–5.92).

There were no statistically significant differences between respondents and nonrespondents by sex, grade level or self-reported family standard of living. Similarly, there were no statistically significant differences between respondents and nonrespondents by students who reported being ever or current users of marijuana, alcohol, cigarettes, e-cigarettes, cigars, hookah or smokeless tobacco.

DISCUSSION

Results from TATAMS are important, given TATAMS focus on studying new and emerging tobacco products, and will contribute substantially to the extensive literature on tobacco use initiation and maintenance in this population. We described the study design; the monitoring process; the limitations of the sampling frame used for random selection and for the development of the sampling weights; the demographic characteristics of the sample which are extremely similar to the sampling frame; and the bias, relative bias and relative ratio of nonrespondents in wave II in comparison with respondents in wave I. Importantly, few differences were noted between respondents and nonrespondents in wave II, especially in regards to their tobacco use.

TATAMS has several strengths, including the large sample size and a full description of the data, methods, assumptions, and quality measures, all of which are provided in this paper. In spite of the complexity of the design, TATAMS was able to select a random sample from the 91% of the enrolled public schools and conducted a near census of private and charter schools in the 5 counties in Texas. We believe the lack of response to our invitation to participate in TATAMS at the school district level is independent of the response to participate by individual schools, parents or students in those school districts. Further research will be needed to overcome the barriers to initial review and approval at the school district level.

TATAMS estimated a minimum sample size of 1,981 students at wave I (before attrition). We ended up with 3,907 students at wave I and we have a large sample size to estimate the overall prevalence of new and emerging tobacco products in these grades and by POS as

well as by sex or by race/ethnicity at wave I. Unfortunately, TATAMS does not have the statistical power to generate estimates for the American Indian and Alaska Native groups which previous studies had reported have higher prevalence of tobacco use among adolescents.¹ Large sample sizes would be needed for capturing those subpopulations, which are not common in Texas.

Longitudinal studies are challenging given the need to retain subjects across time. We would therefore expect wider confidence intervals in estimates from wave II due to the retention rate of 61%. However, TATAMS will provide data on a cohort of students over 3 years that are representative of 5 counties with the 4 largest urban areas in Texas.

Bias and relative bias were small in magnitude for nearly all the parameters studied. There were a few estimates that had bias significantly different from zero. Consequently, the differences in measurements between nonrespondents and respondents at wave II are most likely due to random variation, and thus do not reflect appreciable nonresponse bias for tobacco use.

The Population Assessment of Tobacco and Health (PATH) study at wave I measured a representative sample of youth, 12–17 years old, in the U.S in 2013.⁴² PATH reported that 13.4%, 10.7%, 7.5%, 7.4% and 4.4% were ever users of cigarettes, e-cigarettes, cigars, hookah, and smokeless tobacco, respectively. Also, PATH reported that 4.6%, 3.1%, 2.5%, 1.7%, and 1.4% were past 30-day users of cigarettes, e-cigarettes, cigars, hookahs, and smokeless tobacco, respectively. Therefore, the prevalence of ever using cigarettes, cigars, smokeless tobacco as well as past 30-day use of cigars and smokeless tobacco were lower in these 5 counties in Texas than the national sample. This could be because of the differences in the ages of subjects between both studies. Conversely, the prevalence of ever and past 30-day use of e-cigarette were higher in these 5 Texas counties than the national sample. The prevalence of ever use and past 30-day use of hookah as well as past 30-day use of cigarettes were similar between the national sample and these 5 Texas counties. Further analyses will be needed to explore whether the prevalence of the use of multiple tobacco products are different between these 2 studies, as well as exploring whether there is a shift from cigarettes to new and emerging tobacco products. However, it is worth noting that the use of e-cigarettes seems to be higher than national estimates in urban Texas¹.

TATAMS has several limitations. First, subpopulation analyses by type of school (public, private or charter) are not recommended because of the limited demographic data in the sampling frame for private schools, and none of the 8th grade charter schools that agreed to participate in our study had White or Other students enrolled (they only had Hispanics and African American students enrolled in grade 8).

Second, TATAMS may underestimate the prevalence of use of tobacco products in 10th grade students. Some of the 10th grade courses contained students that self-reported being 9th graders. Those 9th grade students are expected to be younger and, because of their age, less likely to have started to use tobacco products than their 10th grade peers. However, those 9th grade students were not excluded from the results under the assumption that those

students were socially and developmentally similar to the 10th grade students, and peer norms are an important risk factor for tobacco use at this age.

Third, over half of the school districts in our study neither rejected nor approved participation in this study despite multiple contacts and approaches. We could not find any other reports in the literature to evaluate if this proportion is higher or lower than other studies. Approximately 23% of the school districts refused to participate in TATAMS, which is less than 33% of school districts' refusal in another study with a similar design that sought to estimate the prevalence of substance use and delinquent behavior in Washington State among 5th, 7th and 9th grade students in 2006.⁴³

IMPLICATIONS FOR TOBACCO REGULATION

TATAMS is important because of its contributions to our understanding of the diversity of tobacco products used by youth and the impact of tobacco product marketing on use behaviors, especially when the tobacco product marketplace is becoming increasingly diversified.⁴⁴ Its contributions will be even more important when TATAMS generates longitudinal estimates of the impact of tobacco product marketing on youth tobacco use behaviors. Although TATAMS focuses mainly on new and emerging tobacco products, and flavored tobacco products of all kinds in the 5 Texas counties with the largest and fastest growing cities⁶ and with 40% of same-age students in Texas, results from analyses of TATAMS should have essential implications for tobacco policy in Texas and future regulation at the federal level.

Acknowledgments

This work was supported by The National Cancer Institute of the National Institutes of Health (NIH); and the Center for Tobacco Products of the Food and Drug Administration (FDA) of the United States Department of Health and Human Services [grant number P50 CA180906]. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health or the Food and Drug Administration. The authors wish to thank Mary Klingensmith, Meg O. Denning, Nicole Nicksic, Erin Peterson, Oluwatobi Adegboyega, Oscar Pena, Bethany Dawson, Ashley Kelley and Kelly Klaas for their data collection efforts. We are also grateful to the school districts, schools, children and parents who participated in the study. We are grateful to all supporting staff at the Michael and Susan Dell Center of Healthy Living, the University of Texas Health Science Center at Houston-UTHealth, School of Public Health, Austin Campus for their indirect help with this project.

References

1. US Department of Health and Human Services. Preventing Tobacco Use Among Youth and Young Adults: A Report of the Surgeon General (on-line). Atlanta, GA: USDHHS, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; Available at: <http://www.surgeongeneral.gov/library/reports/preventing-youth-tobacco-use/full-report.pdf> [Accessed June 14, 2016]
2. Singh T, Arrazola RA, Corey CG, et al. Tobacco use among middle and high school students—United States, 2011–2015. *MMWR Morb Mort Wkly Rep*. 2016; 65(14):361–367.
3. Ennis, SR., Rios-Vargas, M., Albert, NG. The Hispanic population: 2010. 2010 Census Briefs (on-line). US Department of Commerce, Economics, and Statistics Administration. US Census Bureau; Available at: <https://www.census.gov/prod/cen2010/briefs/c2010br-04.pdf> [Accessed June 14, 2016]
4. Howden, LM., Meyer, JA. Age and Sex Composition 2010: 2010 Census Briefs (on-line). US Department of Commerce, Economics and Statistics Administration. US Census Bureau; Available at: <https://www.census.gov/prod/cen2010/briefs/c2010br-03.pdf> [Accessed June 14, 2016]

5. US Census Bureau. [Accessed June 14, 2016] QuickFacts 2016 (on-line). Available at: <http://www.census.gov/quickfacts/table/PST045215/00>
6. US Census Bureau. [Accessed June 14, 2016] Four Texas Metro Areas Collectively Add More Than 400,000 People in the Last Year. Census Bureau Reports, press release number: CB16-43 (on-line). Available at: <https://www.census.gov/newsroom/press-releases/2016/cb16-43.html>
7. Tobacco Free Kids. [Accessed June 14, 2016] State-Specific Estimates of Tobacco Company Marketing Expenditures 1998 to 2013 (on-line). Available at: <http://www.tobaccofreekids.org/research/factsheets/pdf/0271.pdf>
8. Tobacco Free Kids. [Accessed June 14, 2016] Campaign for tobacco-free kids: State Tobacco Prevention Spending vs. Tobacco Company Marketing (on-line). Available at: http://www.tobaccofreekids.org/content/what_we_do/state_local_issues/settlement/FY2016/State%20Tobacco%20Prevention%20Spending%20vs%20Tob%20Co%20Marketing%202012-4-15.pdf
9. Koh HK, Sebelius KG. Ending the tobacco epidemic. JAMA. 2012; 308(8):767–768. [PubMed: 22910750]
10. Delnevo CD, Wackowski OA, Giovenco DP, et al. Examining market trends in the United States smokeless tobacco use: 2005–2011. Tob Control. 2014; 23(2):107–112. [PubMed: 23117999]
11. Henriksen L, Feighery EC, Schleicher NC, et al. Is adolescent smoking related to the density and proximity of tobacco outlets and retail cigarette advertising near schools? Prev Med. 2008; 47:210–214. [PubMed: 18544462]
12. Kim AE, Loomis BR, Busey AH, et al. Influence of retail cigarette advertising, price promotions, and retailer compliance on youth smoking-related attitudes and behaviors. J Public Health Manag Pract. 2013; 19:E1–E9.
13. Federal Committee on Statistical Methodology. [Accessed June 14, 2016] Subcommittee on Measuring and Reporting the Quality of Survey Data. Statistical Policy Office. Office of Information and Regulatory Affairs. Office of Management and Budget. Statistical Policy Working paper 31: Measuring and Reporting Sources of Error in Survey (on-line). Available at <http://sites.usa.gov/fcsm/files/2014/04/spwp31.pdf>
14. Särndal, CE., Swensson, B., Wretman, J. Model assisted survey sampling. New York: Springer Science and Business Media; 2003.
15. Wolter, K. Introduction to variance estimation. New York: Springer Science and Business Media; 2007.
16. Kessler RC, Berglund P, Chiu WT, et al. The US National Comorbidity Survey Replication (NCS-R): Design and field procedures. Int J Meth Psych Res. 2004; 13(2):69–92.
17. Kessler RC, Heeringa SG, Colpe LJ, et al. Response bias, weighting adjustments, and design effects in the Army Study to Assess Risk and Resilience in Service members (Army STARRS). Int J Methods Psychiatr Res. 2013; 22(4):288–302. [PubMed: 24318218]
18. Gonzalez ME, Ogus JL, Shapiro G, Tepping BJ. Standards for discussion and presentation of errors in survey and census data. J Am Stat Assoc. 1975; 70(351b):5–23.
19. Gore S, Aseltine RH, Colton ME. Social structure, life stress and depressive symptoms in a high school-aged population. J Health Soc Behav. 1992; 33(2):97–113. [PubMed: 1619266]
20. Romero AJ, Cuellar I, Roberts RE. Ethnocultural variables and attitudes toward cultural socialization of children. J Community Psychol. 2000; 28(1):79–89.
21. Springer AE, Selwyn BJ, Kelder SH. A descriptive study of youth risk behavior in urban and rural secondary school students in El Salvador. BMC Int Health Hum Rights. 2006; 6:3. [PubMed: 16608519]
22. Centers for Disease Control and Prevention. [Accessed Sep 6, 2015] Youth Risk Behavior Survey Questionnaire 2013 (on-line). Available at: www.cdc.gov/yrbs
23. United States Department of Health and Human Services, National Institutes of Health, National Institute on Drug Abuse, Food and Drug Administration. Center for Tobacco Products. Population Assessment of Tobacco and Health (PATH) Study [United States] Restricted-Use Files. ICPSR36231-v6. Ann Arbor, MI: Inter-university Consortium for Political and Social Research [distributor]; 2016. Available at <http://doi.org/10.3886/ICPSR36231.v6> [Accessed June 14, 2016]
24. Pierce JP, Choi WS, Gilpin EA, et al. Validation of susceptibility as a predictor of which adolescents take up smoking in the United States. Health Psychology. 2013; 15(5):355–361.

25. Pierce JP, Distefan JM, Kaplan RM, et al. The role of curiosity in smoking initiation. *Addict Behav.* 2005; 30(4):685–696. [PubMed: 15833574]
26. Bunnell RE, Agaku IT, Arrazola R, et al. Intentions to smoke cigarettes among never-smoking US middle and high school electronic cigarette users, National Youth Tobacco Survey, 2011–2013. *Nicotine Tob Res.* 2015; 17(2):228–235. [PubMed: 25143298]
27. Strong DR, Hartman SJ, Nodora J, et al. Predictive Validity of the Enhanced Susceptibility to Smoke Index. *Nicotine Tob Res.* 2014; 17(7):862–869. [PubMed: 25481915]
28. Delk J, Harrell MB, Fakhouri T, Muir K, Perry CL. Implementation of a computerized tablet-survey in adolescent large-scale, school-based, study. *J Sch Health.* 2016 (in-press).
29. Henriksen L, Schleicher NC, Feighery EC, Fortmann SP. A longitudinal study of exposure to retail cigarette advertising and smoking initiation. *Pediatrics.* 2010; 126(2):232–238. [PubMed: 20643725]
30. Pérez A, Rodríguez N, Gil JFA, Ramírez GA. Tamaño de la Muestra V 1.1. [A computer program to estimate the required sample size and power in clinical research] Programa sistematizado para el cálculo del tamaño de la muestra y el poder en diseños de investigación; Patented in book 13, volume 7, item 063, Pontificia Universidad Javeriana. Bogotá, Colombia. Government Ministry. Distributed by Tienda Javeriana. 2001
31. Esbensen FA, Miller MH, Taylor T, et al. Differential attrition rates and active parental consent. *Eval Rev.* 1999; 23(3):316–335. [PubMed: 10538786]
32. Muthén, LK., Muthén, BO. *Mplus User's Guide.* 7. Los Angeles: 1998–2014.
33. R Core Team. *R: A language and environment for statistical computing* (on-line). R Foundation for Statistical Computing; Vienna, Austria: 2013. Available at: <http://www.R-project.org/>
34. Texas Education Agency. [Accessed November 15, 2016] 19 Texas Administrative Code (TAC) Part II: Texas Education Agency. Chapter 89. Adaptations for Special Populations. Subchapter BB. Commissioner's Rules Concerning State Plan for Educating English Language Learners. <http://ritter.tea.state.tx.us/rules/tac/chapter089/ch089bb.html>
35. Texas Comptroller of Public Accounts. [Accessed June 14, 2016] Window on State Government (on-line). Available at: <http://www.window.state.tx.us/>
36. Cooper M, Harrell MB, Pérez A, et al. Flavorings and perceived harm and addictiveness of e-cigarettes among youth. *Tob Regul Sci.* 2016; 2(3):278–289. [PubMed: 27722185]
37. Cooper M, Creamer M, Crook B, et al. Social norms, perceptions, and dual/poly tobacco use among Texas youth. *Am J Health Behav.* 2016; 40(6):761–770. [PubMed: 27779944]
38. Harrell MB, Weaver SR, Loukas A, et al. Flavored e-cigarette use: characterizing youth, young adults, and adults. *Prev Med Rep.* 2016 (in-press).
39. Harrell MB, Loukas A, Delk J, et al. Flavored tobacco product use among youth and young adults: what if flavors didn't exist? *Tob Regul Sci.* 2016 (in-press).
40. Lee BK, Lessler J, Stuart EA. Weight trimming and propensity score weighting. *PLoS ONE.* 2011; 6(3):e18174. <http://doi.org/10.1371/journal.pone.0018174>. [PubMed: 21483818]
41. Wright G. An empirical examination of the relationship between nonresponse rate and nonresponse bias. *Stat J IAOS.* 2015; 31:305–315.
42. [Accessed June 14, 2016] Overview of the Population Assessment of Tobacco and Health (PATH) Study and Highlighted Findings From Wave 1 (on-line). Available at: <http://www.apascience.org/pdf/NIDA-council-05-2016-conway.pdf>
43. McMorris BJ, Hemphill SA, Toumbourou JW, et al. Prevalence of substance use and delinquent behavior in adolescents from Victoria, Australia and Washington State, United States. *Health Educ Behav.* 2007; 34(4):634–650. [PubMed: 16740513]
44. US Department of Health and Human Services. The health consequences of smoking—50 years of progress: a report of the Surgeon General. Atlanta, GA: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 2014. p. 17

Figure 1.

TATAMS sampling frame for academic year 2014–2015

^aAlternative instruction includes: Schools with a college or university charter (n=7); Disciplinary Alternative Education Program or Juvenile Justice Alternative Education Program (n=13); Boarding school (n=1); MD Anderson (n=1); Independent district or campus charter (n=40); Single sex (n=6); Special needs education (n=12); Tennis school (n=1); Online school (n=1).

Table 1**TATAMS questions and categories of response**

Construct	Question asked and response categories provided
Family's Standard of Living ^{17–19}	In terms of income, what best describes your family' standard of living in the home where you live most of the time? Would you say your family is: Very well off, Living comfortably, Just getting by, Nearly poor, Poor. Family's standard of living was collapsed as:(i) living comfortably, (ii) very well off, and (iii) just getting by-poor(just getting by, nearly poor, poor).
Current marijuana use ²⁰	During the past 30 days, how many occasions, or times, if any, have you used marijuana (other names for marijuana are pot and weed)? I have never used marijuana, 1–2 times, 3–5 times, 6–9 times, 10–19 times, 20–39 times and 40 or more times. One to 30 days of reported use was considered current marijuana use. Otherwise no current marijuana use.
Current alcohol use ²⁰	During the past 30 days, on how many days did you have at least one alcoholic drink? A drink of alcohol is 1 can or bottle of beer, 1 glass of wine, 1 can or bottle of wine cooler, 1 cocktail or 1 shot of liquor: 0 days, 1 or 2, 3 or 5, 6 to 9, 10 to 19, 20 to 29, 30 days. One to 30 days of reported use was considered current alcohol use. Otherwise no current alcohol use.
Ever use of cigarette ²¹	Have you ever tried cigarette smoking, even one or two puffs? No, Yes
Current use of cigarette ²¹	During the past 30 days, on how many days did you smoke cigarettes? Please enter the number of days (from 0 to 30 days). 0 versus any days.
Ever use of e-cigarette ²¹	Have you ever used an electronic cigarette, vape pen, or hookah, even one or two puffs? No, Yes
Current e-cigarette use ²¹	During the past 30 days, on how many days did you use an electronic cigarette, vape pen, or hookah? Please enter the number of days (from 0 to 30 days). 0 versus any days.
Ever use of smokeless tobacco ²¹	Have you ever used smokeless tobacco, like chewing tobacco, moist snuff, dip, or snus? No, Yes
Current use of smokeless tobacco ²¹	During the past 30 days, on how many days did you use smokeless tobacco? Please enter the number of days (from 0 to 30 days). 0 versus any days.
Ever hookah use ²¹	Have you ever smoked a hookah, even one or two puffs? No, Yes
Current hookah use ²¹	During the past 30 days, on how many days did you smoke hookah? Please enter the number of days (from 0 to 30 days). 0 versus any days.
Ever cigar use ²¹	Have you ever smoked a tobacco-filled large cigar or cigarillo or a little filtered cigar, even one or two puffs? No, Yes
Current cigar use ²¹	During the past 30 days, on how many days did you smoke a little filtered cigar, a large cigar or cigarillo? Please enter the number of days (from 0 to 30 days). 0 versus any days.
Susceptibility to [tobacco product is replaced for cigarette, e-cigarette, hookah or cigars, or smokeless tobacco] ^{22–25}	Only among never users of each tobacco product. Do you think you will use the following products [Tobacco Product] in the next 12 months?. If one of your close friends were to offer you one of the following products [tobacco product], would you use it?. Have you ever been curious about using [tobacco product]?. Response options for these were: definitely not, probably not, probably yes, definitely yes. Students who responded definitely not to all three of the questions were classified as non-susceptible to [Tobacco product]. Otherwise students were classified as susceptible.

Sampling frame of the schools for TATAMS and enrollment by point of sale and school type for students in 6th, 8th and 10th grade, the academic year 2014–2015

Table 2

	Grade 6			Grade 8			Grade 10		
	Schools	Enrollment	%	Schools	Enrollment	%	Schools	Enrollment	%
Total	705	148,465	100	737	160,080	100	527	152,524	100
Number of point of sale (POS)									
0 POS	149	36,156	24.4	156	38,931	24.3	93	29,643	19.4
Public	99	33,458	22.5	107	36,413	22.7	55	27,805	18.2
Charter	29	1,959	1.3	27	1,796	1.1	21	1,160	0.8
Private	21	739	0.5	22	722	0.5	17	678	0.4
1+ POS	556	112,309	75.6	581	121,149	75.7	434	122,881	80.6
Public	309	99,208	66.8	331	109,271	68.3	224	113,962	74.7
Charter	146	10,070	6.8	144	8,793	5.5	135	6,276	4.1
Private	101	3,031	2.0	106	3,085	1.9	75	2,643	1.7
School Type									
Public	408	132,666	89.4	438	145,684	91.0	279	141,767	92.9
Charter	175	12,029	9.1	171	10,589	6.6	156	7,436	4.9
Private	122	3,770	2.5	128	3,807	2.4	92	3,321	2.2

Table 3

Unweighted (URR) and weighted response rate (WRR) for TATAMS Wave II

Response Category Definition	n	URR	WRR
Students who completed wave II (C)	2,488	63.68	60.93
Students who opened the link but did not complete wave II (OL)	112	2.87	2.54
Withdrawals from wave II (W)	6	0.15	0.04
Students in wave I who never started wave II (NOL)	1,301	33.30	36.49
Total	3,907	100	100

Table 4

Monitoring of recruitment of schools for TATAMS by grade at wave I

District Status	School Status	Grade 6			Grade 8			Grade 10			
		District	School		District	School		District	School		
		N	%	N	%	N	%	N	%	N	%
No response ^a	School not contacted	109	50.7	222	31.5	109	49.1	226	30.7	109	50.2
Declined participation	School not contacted	51	23.7	311	44.1	53	23.9	333	45.2	50	23.0
Agreed to Participate	Agreed to Participate	14	6.5	26	3.7	17	7.7	30	4.1	22	10.1
	Declined participation	3	1.4	8	1.1	6	2.7	13	1.8	9	4.1
	No Response	3	1.4	9	1.3	5	2.3	11	1.5	6	2.8
Not selected at random ^b		20	9.3	50	7.1	19	8.6	48	6.5	19	8.8
Waitlisted (never contacted)		15	7.0	79	11.2	13	5.9	76	10.3	2	0.9
Total		215	100	705	100	222	100	737	100	217	100

^aNo response to recruitment efforts between May 2014 and May 2015^bPublic schools within school districts that were previously randomly chosen were not eligible for randomization again because, without the approval of the school districts, the schools could not be contacted; these will be referred to as schools “not selected at random”.

Socio-demographic characteristics, prevalence and standard error (SE) of drug, alcohol and use of tobacco products in wave I, proportion of respondents, nonrespondents in wave II, % bias, %relative of bias and %bias ratio in TATAMS

Table 5

Characteristics	Unweighted (weighted) n=3,907 (N=461,069)	% wave I (SE)	% Respondents wave I and II(SE) n=2,488 (N=279,369) ^a	%Nonrespondents in wave II(SE) n=1,413 (N=181,514) ^a	Nonrespondents in wave II n=1,413 (N=181,514) ^a	% Bias	% Relative Bias	% Bias Ratio
Sex								
Boys	235,678(1,715)	51.1(2.6)	49.2(2.9)	54.1(3.4)	98,186	-2.03	-0.04	-0.71
Girls	225,391(2,192)	48.9(2.6)	50.8(2.9)	45.9(3.4)	83,328	1.81	0.04	0.63
Grade Level								
6 th	148,465(1,122)	32.2(5.5)	32.0(5.9)	32.5(6.3)	58,928	-0.17	-0.01	-0.03
8 th	160,080(1,322)	34.7(6.1)	31.9(5.7)	39.1(7.1)	70,989	-3.21	-0.10	-0.56
10 th	152,524(1,463)	33.1(6.1)	36.1(6.4)	28.4(6.1)	51,598	2.60	0.07	0.41
POS								
0	108,550(1,896)	23.5(4.9)	25.0(5.2)	21.2(5.1)	38,510	1.35	0.05	0.26
1+	352,519(2,011)	76.4(4.9)	75.0(5.2)	78.8(5.1)	143,005	-1.54	-0.02	-0.30
Race/Ethnicity								
White-Non-Hispanic	98,799(1,214)	21.4(3.6)	23.7(3.5)	17.9(4.0)	32,502	1.90	0.08	0.55
Black-Non-Hispanic	79,499(625)	17.2(2.2)	16.1(1.9)	19.0(3.0)	34,448	-1.24	-0.08	-0.66
Hispanic	252,513(1,498)	54.8(3.7)	51.9(3.5)	59.3(4.4)	107,572	-3.13	-0.06	-0.88
Other ^b	30,258(570)	6.6(0.6)	8.3(0.7)	3.9(0.6)	6,992	1.03	0.12	1.41
Family's standard of living ^c								
Living comfortably	284,772(2,414)	61.8(1.3)	61.0(1.8)	62.9(2.7)	114,165	-0.74	0.01	-0.41
Very well off	91,705(878)	19.7(1.8)	20.3(2.2)	19.2(1.9)	34,807	0.43	0.02	0.19
Just getting by-poor ^c	84,592(615)	18.3(1.2)	18.6(1.8)	17.9(2.1)	32,542	0.27	0.01	0.15
Current marijuana use	76,113(536)	16.7(1.5)	13.9(1.6)	21.2(2.3)	37,664	-3.62	-0.26	-2.25
Current alcohol use	62,977(503)	13.9(1.3)	12.8(1.6)	15.5(1.8)	27,563	-1.18	-0.09	-0.72
Cigarette use								
Ever user	49,595(340)	10.8(1.2)	10.2(1.4)	11.6(1.6)	21,110	-0.62	-0.06	-0.45
Current use	16,462(89)	3.6(0.7)	3.2(0.9)	4.1(0.9)	7,398	-0.38	-0.12	-0.43
Susceptible to use	74,387(636)	19.1(1.5)	19.4(1.8)	18.8(1.7)	28,430	0.24	0.01	0.13

Characteristics	Unweighted (weighted) n=3,907 (N=461,069)	% wave I (SE)	% Respondents wave I and II(SE) n=2,488 (N=279,369) ^a	%Nonrespondents in wave II(SE) n=1,413 (N=181,514) ^a	Nonrespondents in wave II n=1,413 (N=181,514) ^a	% Bias	% Relative Bias	% Bias Ratio
E-Cigarette use								
Ever user	89,915(688)	19.5(2.0)	17.9(2.2)	22.0(2.4)	39,901	-1.82	-0.10	-0.83
Current use	34,029(261)	7.6(0.9)	6.7(1.0)	9.0(1.1)	16,189	-1.03	-0.15	-1.00
Susceptible to use	111,444(956)	31.1(1.8)	31.8(2.5)	30.1(1.8)	40,705	0.62	0.02	0.25
Cigar product use								
Ever user	20,118(147)	4.4(0.7)	3.7(0.6)	5.4(1.1)	9,764	-0.82	-0.22	-1.46
Current use	6,989(49)	1.5(0.4)	1.2(0.4)	2.0(0.5)	3,566	-0.38	-0.31	-1.02
Susceptible to use	71,964(573)	17.3(1.5)	18.2(1.9)	16.0(1.5)	25,328	0.80	0.04	0.43
Hookah use								
Ever user	28,784(207)	6.3(1.0)	4.7(0.9)	8.6(1.5)	15,546	-2.08	-0.44	-2.33
Current use	11,376(70)	2.5(0.5)	1.6(0.5)	3.9(0.9)	6,979	-1.40	-0.89	-3.05
Susceptible to use	108,853(886)	26.5(2.0)	27.1(2.3)	25.6(2.3)	39,753	0.54	0.02	0.23
Smokeless tobacco use								
Ever user	8,757(95)	1.9(0.4)	1.6(0.4)	2.4(0.8)	4,276	-0.38	-0.24	-0.95
Current use	3,594(35)	0.8(0.3)	0.6(0.3)	1.0(0.4)	1,890	-0.23	-0.39	-0.76
Susceptible to use	68,023(519)	15.7(1.3)	14.7(1.4)	17.4(1.4)	29,208	-1.18	-0.08	-0.82

^aThe sum of respondents and nonrespondents is 3,901 which is the difference of 3907- 6 students who withdrew at wave II

^b Other includes: Asian, American Indian or Alaska Native, Native Hawaiian/Other Pacific, 2 or more races.

^c Family's standard of living as "just getting by", "nearly poor," or "poor."

Table 6

Weighted multinomial regression for nonrespondents in wave II

Characteristic	n(N) ^a	Never clicked OR(99.8958% CI) ^b	Opened link or Withdrew OR(99.8958% CI) ^b
Sex	3,901(460,883)		
Boys		1	1
Girls		0.84 (0.52–1.37)	0.61 (0.28–1.34)
Grade ^d	3,901(460,883)		
6th		1	1
8th		1.21 (0.51–2.88)	1.18 (0.18–7.88)
10th		0.73 (0.33–1.66)	1.56(0.43–5.69)
Race/Ethnicity	3,901(460,883)		
White-Non-Hispanic		1	1
Black-Non-Hispanic		1.67 (0.85–3.28)	0.67 (0.17–2.56)
Hispanic		1.61 (0.90–2.89)	0.73 (0.23–2.39)
Other ^c		0.61 (0.34–1.12)	0.61 (0.18–2.06)
Family's standard of living	3,901(460,883)		
Living comfortably		1	1
Very well off		0.85(0.49–1.48)	1.98(0.81–4.81)
Just getting by-poor ^d		0.97(0.46–2.01)	0.43(0.11–1.77)
Current marijuana use	3,858(455,071)		
No		1	1
Yes		1.65(0.89, 3.05)	2.00(0.74, 5.39)
Current alcohol use	3,847(453,533)		
No		1	1
Yes		1.21(0.66, 2.23)	1.88(0.53, 6.60)
Ever cigarette use	3,892(460,557)		
No		1	1
Yes		1.14(0.60–2.17)	1.46(0.40–5.30)
Current cigarette use	3,893(459,591)		
No		1	1
Yes		1.24(0.38–4.13)	2.01(0.26–15.77)
Susceptible to use cigarette	3,392(388,332)		
No		1	1
Yes		0.97(0.66–1.44)	0.79(0.13–4.77)
Ever E-cigarette use	3,896(460,686)		
No		1	1
Yes		1.22(0.77, 1.95)	2.54(1.09–5.92)
Current E-cigarette use	3,895(459,760)		
No		1	1
Yes		1.36(0.78, 2.40)	1.52(0.42,5.57)

Characteristic	n(N) ^a	Never clicked OR(99.8958% CI) ^b	Opened link or Withdrew OR(99.8958% CI) ^b
Susceptible to use E-cigarette	3,116(357,671)		
No		1	1
Yes		0.97(0.60, 1.57)	0.27(0.09, 0.88)
Cigar product use	3,893(460,549)		
No		1	1
Yes		1.50(0.75, 3.00)	1.24(0.19, 7.94)
Current cigar product use	3,901(460,883)		
No		1	1
Yes		1.65(0.73, 3.73)	2.45(0.20, 29.70)
Susceptible to use cigars			
No		1	1
Yes	3,555(414,871)	0.85(0.54, 1.33)	0.87(0.16, 4.81)
Ever Hookah use	3,893(460,459)		
No		1	1
Yes		1.85(0.97, 3.55)	2.35(0.60, 9.28)
Current Hookah use	3,901(460,883)		
No		1	1
Yes		2.53(0.94, 6.84)	3.77(0.60, 23.66)
Susceptible to Hookah use	3,524(409,965)		
No		1	1
Yes		0.92(0.58, 1.45)	1.06(0.37, 3.02)
Smokeless tobacco ever use	3,891(460,140)		
No		1	1
Yes		1.44(0.37, 5.64)	2.21(0.32, 15.13)
Current smokeless tobacco use	3,901(460,883)		
No		1	1
Yes		2.21(0.31, 15.78)	2.21(0.05, 103.01)
Susceptible to use smokeless tobacco	3,662(432,038)		
No		1	1
Yes		1.25(0.89, 1.76)	0.90(0.13, 6.25)

^a Any difference with n=3,901(460,879) is due to missing data.

^b OR, odds ratio; CI, confidence interval; bold = p-value < .001.

^c Other includes: Asian, American Indian or Alaska Native, Native Hawaiian/Other Pacific, 2 or more races.

^d Self-reported family's standard of living as "just getting by", "nearly poor," or "poor."