Trends in Abstaining From Substance Use in Adolescents: 1975–2014

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abstract

BACKGROUND AND OBJECTIVES: Adolescent substance use is a prevalent modifiable health behavior; understanding long-term trends is essential to inform prevention efforts and public health policy. We investigated changes in the proportion of substance nonuse among adolescents over a 40-year period and associations between abstinence and individual risk and protective factors.

METHODS: Data from the nationally representative Monitoring the Future survey, administered 1975–2014, were analyzed to determine the annual proportion of abstinent students. The 2014 Monitoring the Future cohort was analyzed to determine associations between nonuse and risk and protective factors.

RESULTS: The prevalence of abstaining seniors between 1976 and 2014 increased fivefold for lifetime abstinence and more than doubled for past 30 days; similar increases were reported by younger students between 1991 and 2014. Trend lines were distinct for alcohol, which increased steadily over the past 38 years; tobacco, which increased dramatically over the past 20 years; and marijuana and illicit drugs, which increased slightly, although not consistently, between 1976 and 2014. In 2014, students that identified as male, African American, or other race and those who reported greater religious commitment were significantly more likely to report lifetime abstinence. Students that lived in single-parent households, spent more evenings out, worked more hours during the school year, and reported lower grades and more truancy had lower abstinence rates.

CONCLUSIONS: Abstinence is a realistic choice for a growing proportion of high school students. With the differences in abstinence trends for individual substances, we suggest strategies for advancing prevention efforts.

WHAT'S KNOWN ON THIS SUBJECT: Adolescent substance use is an important modifiable health behavior. In previous research, authors have largely focused on the use of individual substances, and little is known about trends in substance nonuse.

WHAT THIS STUDY ADDS: We found substantial increases in complete abstinence over the past 40 years. Trends in nonuse differed by substance with marijuana use decreasing the least. Findings suggest a need for increased marijuana prevention in addition to messages that encourage complete abstinence.

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Substance use during adolescence is an important modifiable health behavior because of the developing brain's susceptibility to both acute and long-term harms.[1–3] Considerable resources are spent tracking trends in an attempt to understand the etiology and correlates of substance use to inform prevention efforts.[2,4–7] In previous research, authors have largely focused on youth trends in the use of individual substances, and little attention has been paid to the subset of youth that abstain from all substances. Examining trends in nonuse can determine if factors associated with nonuse are unique for specific substances or are more generalizable. The results may also help to guide prevention strategies. In the current study, we used nationally representative data gathered from 39 consecutive cohorts of high school (HS) seniors and 24 consecutive cohorts of eighth- and 10th-graders to empirically define the subset of youthful abstainers and track their growth as a percentage of the overall youth population over nearly 4 decades. We also examined trends for HS seniors in nonuse of alcohol, tobacco, marijuana, and illicit drugs separately and examined risk and protective factors that have been found to predict substance use for a cohort of HS seniors sampled in 2014.[6,8–10]

METHODS

Sample

Data were drawn from the Monitoring the Future (MTF) Project, a national ongoing, cross-sectional study of alcohol and substance use among adolescents (detailed description is provided in previously published works[11,12]). The study is annually reviewed and approved by the University of Michigan's Institutional Review Board. Since 1975, the study has used questionnaires administered in classrooms to survey samples of students. Surveys consist of 3 separate nationally representative samples of eighth-, 10th-, and 12th-grade students, and public and private schools were selected for participation by using a multistage, stratified research design. Average student response rates in the eighth, 10th (1991–2014), and 12th grades (1976–2014) were 90%, 87%, and 83%, respectively; almost all nonresponse was due to school absence. Students were asked questions regarding use of cigarettes, alcohol, marijuana, and other substances and sociodemographic and behavioral characteristics. Surveys that indicate invalid responding are deleted from analyses.

Measures

Outcome Measures

Two series of questions for lifetime and 30-day use for different substances were used to define the 2 primary outcome measures. Response categories for 30-day and lifetime use for all substances except cigarettes ranged from "0 occasions" to "40 or more" occasions of use. Student use of alcohol during the 2 focal time periods was assessed by using the question "On how many occasions (if any) have you had any alcoholic beverage to drink – more than just a few sips?" in the individual's lifetime and during the last 30 days. Participant use of all other types of nonmedically prescribed drugs and medications was assessed by using a series of separate questions for use of the following: marijuana, LSD, and other hallucinogens; crack cocaine; cocaine in any other form; amphetamines; sedatives and/or barbiturates; tranquilizers; heroin; and other narcotics "without a doctor telling you to take them." Separate binary indicators for lifetime use and use during the past 30 days of a substance were coded as 1 for those who reported any occasions and as 0 if otherwise. Cigarette use during the past 30 days was coded as 1 for respondents who reported any use of cigarettes in response to the question "How frequently have you smoked cigarettes during the past 30 days?" and as 0 if otherwise. Lifetime cigarette use was coded as 1 for study participants who reported that they had smoked any cigarettes in response to the question "Have you ever smoked cigarettes?"

The 2 sets of binary indicators for (1) lifetime and (2) 30-day use for all of the constituent substances were summed and then dichotomized to create binary indicators for lifetime and 30-day abstinence, coded as 1 for respondents who reported no use during the specified time interval and as 0 for those who reported any use of 1 or more substances. Separate binary indicators were created for any lifetime and 30-day use of alcohol, cigarettes, and marijuana, and a composite binary measure was created for the use of any drug other than marijuana ("other illicit drugs": substances detailed above).

Adolescent Risk and Protective Factors

Consistent with previous research,[13] the following risk and protective factors measured in the 2014 MTF study were included in our logistic regression models: student-reported sex, race and/or ethnicity, number of parents in the household, parental education, enrollment in college preparatory HS program, college plans, grades, truancy, number of evenings that seniors went out for recreation, religious commitment, employment, urbanicity, and region of the country (Table 1). We used previously validated scales for measures of religious commitment[14,15] and hours of employment.[16]

Analyses

For each annual cohort, we computed the percentage of students in each grade who reported complete abstinence from all

TABLE 1 Adolescent Sociodemographic and Behavioral Factors

Category	Variable
Demographic factors	
Sex	Dichotomous variable: 1 = male, 0 = female
Race and/or ethnicity	Four-category variable: non-Hispanic white, African American, Hispanic, other racial and/or ethnic group (reference group: non-Hispanic white)
Parents in household	Binary variable indexing whether there were 2 or 0 or 1 parent in the home (0 = 2-parent home; 1 = single-parent home or no parent in household)
Parental education	Three-category variable indexing parents' highest education: college degree or higher; some college, but no degree; HS diploma or less with no college (reference group: college degree or higher)
Urbanicity of neighborhood	Urbanicity of primary residence. Three categories: suburban, urban, and rural (reference group: suburban)
Region of residence	Region of primary residence. Four categories: South, Northeast, Midwest, and West (reference group: South)
School type and adolescent risk and protective factors	
College preparatory program	Binary variable for whether participant attends a college preparatory HS program (1 = college prep; 0 = general, vocational, technical or commercial, or other type of HS program)
College plans	How likely it is that the participant will graduate from college (4-y program): (1 = definitely will or probably will; 0 = probably won't or definitely won't)
Truancy	Truancy during the past 4 wk (1 item: "How many whole days of school have you missed because you skipped or 'cut'?" 0 = none; 1 = 1 or more d)
Low GPA	Self-report of average GPA in the current school y. Recoded to index whether participant's GPA was low or not (0 = B- or higher; 1 = GPA of C+ or less)
Evenings out	One item indexing whether participants spent 3 or more nights out during a typical wk (not including outings with parents or other adult relatives). "During a typical week, on how many evenings do you go out for fun and recreation?" (0 = <3 nights per wk; 1 = out 3+ nights per wk)
Religiosity	Mean of 2 items: "How often do you attend religious services?" and "How important is religion in your life?" (4-point scales: 1 = never to 4 = approximately once a wk or more; 1 = not important to 4 = very important; respectively)
Hours worked per wk	"On average over the school year, how many hours per week do you work in a paid or unpaid job?" (8-point scale: 1 = none to 8 = >30 h)

GPA, grade point average.

substances for the last 30 days and during their lifetimes. The results were graphed to reveal trends over time. A similar method was used to track separately the trends in lifetime abstinence from alcohol, tobacco, marijuana, and other illicit drugs for the HS seniors.

To assess potential relationships between risk and protective factors with substance nonuse, we conducted logistic regressions and produced sets of bivariate odds ratios and adjusted odds ratios (aORs) for lifetime abstinence from all use of alcohol, tobacco, marijuana, and illicit drugs for seniors in the 2014 MTF study. Logistic regression models were estimated by using Mplus, and all models accounted for complex sampling. Full information maximum likelihood[17] estimation procedures were used to maximize the data and include all possible observations. All analyses were conducted in Mplus version 7.4 (Muthén & Muthén, Los Angeles, CA).

RESULTS

Trends in Lifetime Abstinence

The prevalence of lifetime abstinence increased in a linear fashion from 1991 to 2014 (Fig 1) for eighth-, 10th-, and 12th-graders. In 1976, only 5% of HS seniors reported lifetime abstinence, or in other words, 95% of seniors had at least sampled alcohol, tobacco, marijuana, or another drug by senior year. The prevalence of lifetime abstinence for seniors fell to its lowest point (3%) in the early 1980s before climbing to ∼15% in the mid-1990s. Over the next 2 decades, this percentage rose to the 26% rate found in 2014. A parallel trend was observed for 10th-graders. The largest increase in lifetime abstinence of 38% occurred among eighth-graders for whom rates of abstinence grew from 24% in 1991 to 62% in 2014.

Trends in Past 30-Day Abstinence

In Fig 2, we plot trend lines showing an increasing percentage of 12th-graders who report no current (past 30 day) substance use between 1976 and 2014. Only 23% of seniors in 1976 reported no past-month use of alcohol, tobacco, marijuana, or other drugs; this figure dipped to ∼16% in the early 1980s before a rapid climb over the next 10 years to ∼40%. After a slight decline, the percentage of abstainers began a relatively steady annual increase in 1998 to reach 52% in 2014. The trends for younger students reveal similar patterns, although the prevalence of past-month abstinence is always higher for younger students.

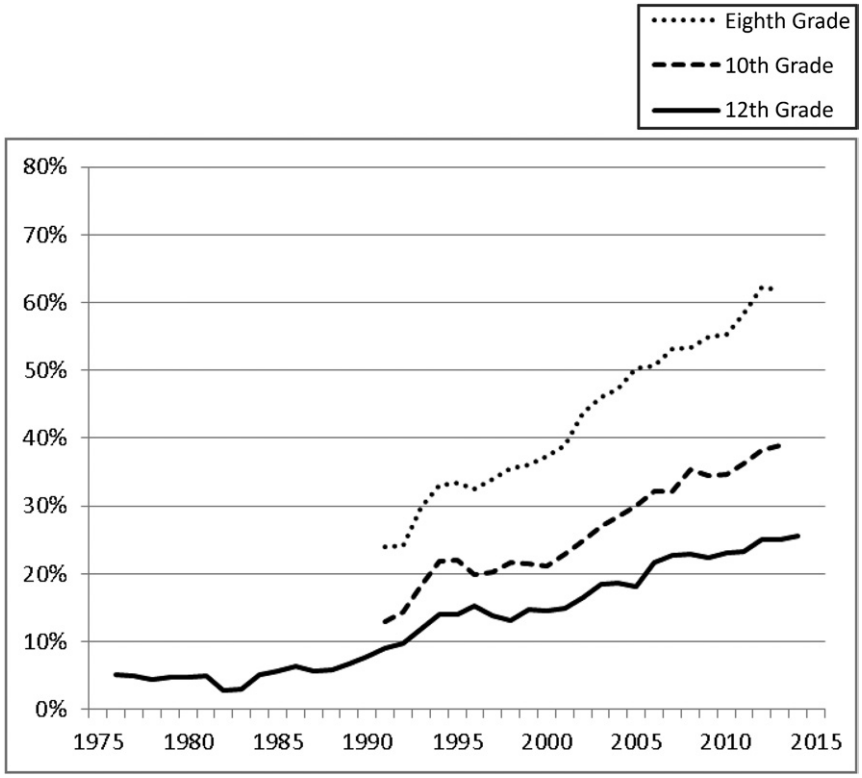

FIGURE 1
Percentage of eighth-, 10th-, and 12th-grade students reporting lifetime abstinence from alcohol, tobacco, marijuana, and other drugs, MTF, 1976–2014.

Trends in Lifetime Abstinence From Individual Substances Among 12th-Graders

Trends in HS seniors' lifetime nonuse of alcohol, tobacco, marijuana, and illicit drugs other than marijuana are shown in Fig 3. The trend lines from 1976 to 2014 reveal increasing nonuse for each of these substances; however, trends varied by substance. Alcohol was and still remains the substance that most seniors report having used at least once in their lifetimes. In 1976, only 8% of seniors reported lifetime alcohol nonuse. Since that time, the trend line for alcohol nonuse has grown steadily, reaching 34% in 2014.

Nonuse of cigarettes, which until recently was the second most popular substance among seniors, also increased greatly during this period, but the trend was not as uniformly gradual as alcohol. Lifetime nonuse rates for tobacco increased steadily from ~25% in 1976 to ~38% in the early 1990s before declining slightly until the end of that decade. Starting in the new millennium, there were dramatic annual increases, with two-thirds of seniors (66%) reporting lifetime abstinence from cigarettes in 2014.

The trend line for marijuana reveals an increase in lifetime nonuse from ~47% in 1976 to ~56% in 2014; however, the rate was even higher at one point, reaching a peak of ~67% in 1992. The trend in seniors' nonuse of all other drugs was similar to that for marijuana, but the changes were less pronounced because since the study's inception in 1976, the majority of students reported not using drugs.

Correlates of Abstinence for the 2014 MTF 12th-Grade Cohort

The 2014 MTF cohort was composed of 13 015 HS seniors. The analytic sample for models used to examine sociodemographic and behavioral correlates of lifetime abstinence included 11 674 participants who had complete data for all items for substance use and was used to create the measure for lifetime abstinence: 2975 (25.5%) respondents reported that they had never used alcohol, cigarettes, marijuana, or any other illicit, nonmedically prescribed substance and 8699 (74.5%) students reported that they had used 1 or more of these substances on at least 1 occasion.

Table 2 presents descriptive statistics for sociodemographic and behavioral characteristics of the analysis sample by lifetime abstinence status and summarizes findings from a multivariate logistic regression model for lifetime abstinence from all substances. The multivariate aORs reported are mutually adjusted for all of the other predictors included in the model. Male students had significantly higher odds for reporting lifetime abstinence (aOR = 1.25; 95% CI = 1.10–1.42) than female students. Compared with non-Hispanic white students, African American students (aOR = 1.53; 95% CI = 1.27–1.85) and those in the other race category (aOR = 1.23; 95% CI = 1.02–1.47) were significantly more likely to report abstinence; there were no significant differences between white and Hispanic students (aOR = 0.98; 95% CI = 0.80–1.21). The aOR that a student from a single- or no-parent household would be abstinent was 67% less than that for a student from a 2-parent family (aOR = 0.67; 95% CI = 0.59–0.76).

After controlling for all other variables, students in the West appeared to be 35% more likely to be abstinent than those in the South (aOR = 1.35; 95% CI = 1.04–1.76). In the fully adjusted model, we did not find a statistically significant relationship between the odds of abstaining from substance use and urbanicity of neighborhood, attendance at a college preparatory

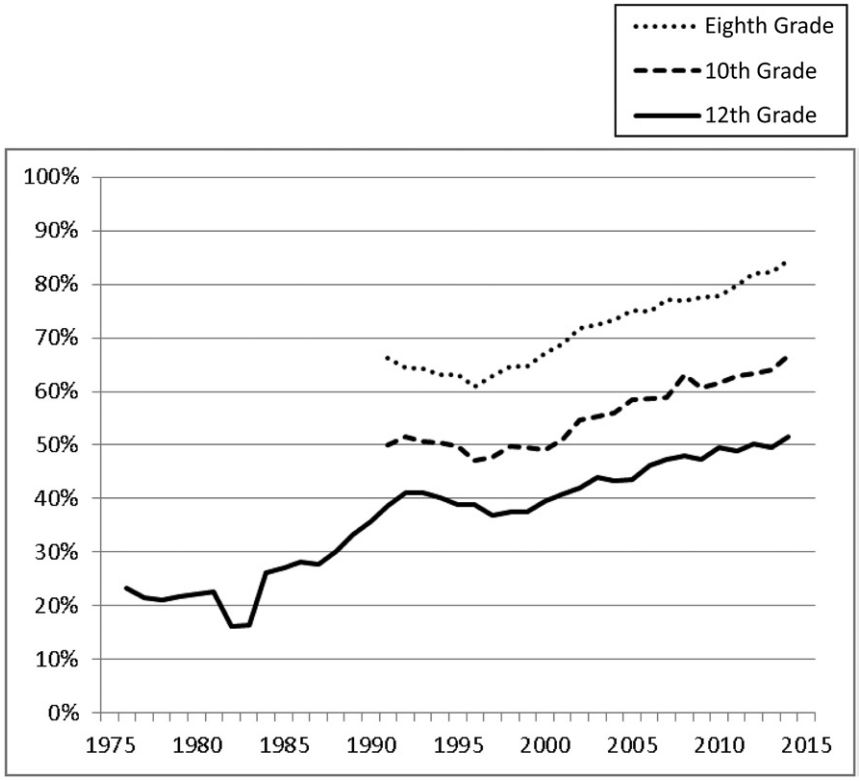

FIGURE 2
Percentage of eighth-, 10th-, and 12th-grade students reporting abstinence from alcohol, tobacco, marijuana, and other drugs during the last 30 days, MTF, 1976–2014.

HS, or parental educational attainment.

Adolescent Risk Factors

Adolescents that reported higher levels of religious involvement were significantly more likely to report lifetime abstinence (aOR = 1.41; 95% CI = 1.32–1.51). Alternatively, low grade point average (C+ or less), past-month truancy, going out for recreation 3 or more evenings a week, and employment (hours of work at a job) during the school year were all associated with lower rates of abstaining from substance use (Table 2).

DISCUSSION

This exploratory study demonstrates 40 years of consistent growth in the proportion of adolescents who report lifetime substance nonuse. The proportion of adolescents who report no current substance use, as defined by no use of any substance in the past 30 days, has also increased steadily, suggesting that fewer teenagers are using substances on a regular or frequent basis compared with previous generations.

The examination of trends for lifetime abstinence from individual substances reveals different patterns of change. Alcohol nonuse has increased slowly but steadily over the past 40 years as alcohol has been increasingly seen as unhealthy, particularly for adolescents.[7] A federal law that effectively raised the national drinking age to 21 in 1984 may have contributed to this trend. Major gains in tobacco nonuse have occurred in the last 20 years as reduced social tolerance accelerated the stigmatization of smoking. The Truth Campaign was remarkably successful in shifting public perception of tobacco from glamorous to repulsive.[18,19] For marijuana and other drugs, a broad cultural movement fueled by (1) a White House campaign discouraging youth drug use, (2) the crack cocaine epidemic that fostered a general antidrug sentiment, and (3) an organized parent's movement dramatically drove down youth marijuana use, resulting in a drop from an all-time high in 1979 to an all-time low in 1992.[20–22]

In the early 1990s, the pro-marijuana movement was resurrected, helping to sustain the rate of youth marijuana use despite a general trend toward overall rejection of substance use.[21,23,24] Over time, marijuana use by teenagers has eclipsed tobacco by becoming the second-most common substance used by HS students in the past 30 days in 2009 and the most common substance used daily in 2015.[7,25,26] As more and more states have legalized marijuana, the impetus toward increased youth marijuana use has been furthered by a powerful marijuana lobby and emerging industry that work to portray marijuana as medicine and safer than alcohol, despite significant contrary evidence.[3,27] Although state-by-state comparisons have not yet provided a definitive picture of the impact of changing marijuana policy, the national stabilization in marijuana use rates may portend a more widespread phenomenon that could ultimately slow or even reverse the overall 40-year trend of increasing rates of complete abstinence.[28,29] This subtle finding is worthy of consideration in the ongoing national conversation regarding marijuana policy.

Rates of alcohol, tobacco, and marijuana use are higher among boys than girls, although in this study, boys were more likely than girls to report overall abstinence. Substances other than alcohol, tobacco, and marijuana account for this finding and in particular, nonmedical use of prescription medications, especially opioids, is more common among girls.[30–33] Girls report more

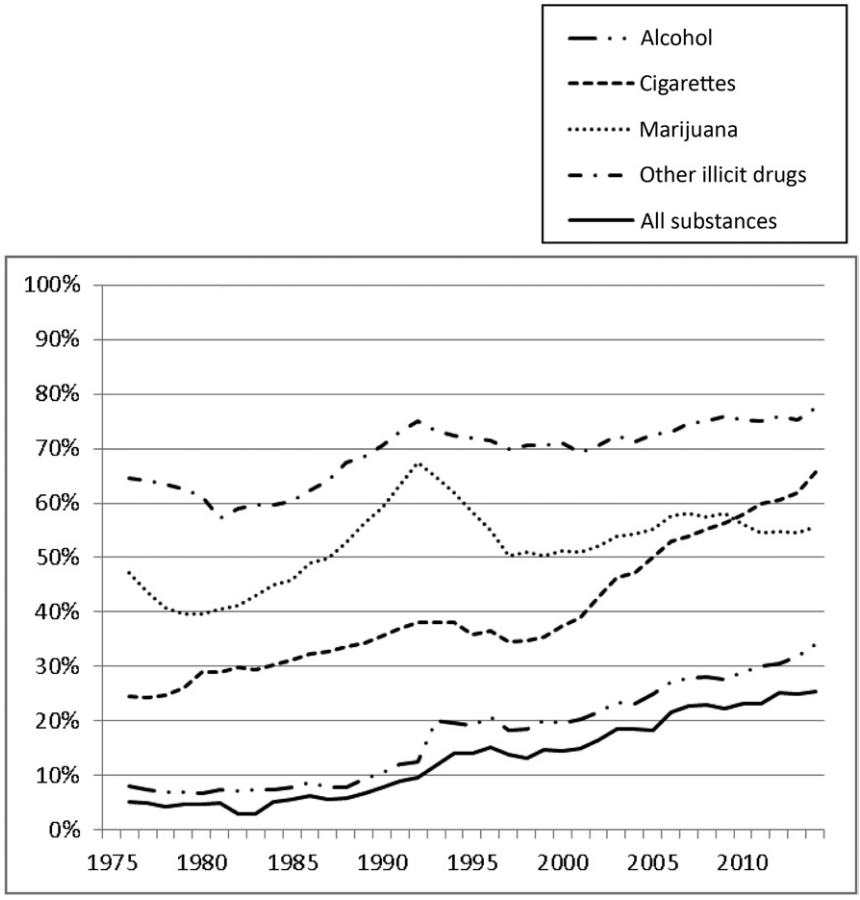

FIGURE 3
Percentage of 12th-grade students reporting lifetime abstinence from specific drug classes (alcohol, cigarettes, marijuana, and other illicit drugs) and all substances, MTF, 1976–2014.

nonmedical opioid use for pain relief, whereas boys report more use "to get high."[34,35] Nonmedical use for pain relief may be less associated with use of alcohol, tobacco, and marijuana, creating a cluster of girls with this type of substance use only. This finding is worthy of further investigation.

Race was significantly associated with abstinence rates, with African American adolescents more likely to be completely abstinent than white or Hispanic students, as has been described before for individual substances.[36] The increasing proportion of racial and ethnic minority HS students may be partially responsible for increasing rates of overall abstinence.

This analysis, in which we used the well-established regions of this national survey based on the US Census Bureau, revealed that adolescents living in the West (Pacific and Mountain states) reported higher rates of abstinence. This is consistent with previous findings in which lower rates of alcohol and cigarette use were reported among HS seniors living in the West.[37–39] However, these broad geographical areas group together disparate states and regions which may obscure more nuanced findings when rates of use of alcohol, tobacco, marijuana, and illicit drugs are combined. This is particularly true in the West, which includes not only Colorado and Washington, which have recorded accelerated rises in marijuana use rates since the enactment of legalization, but also Utah, Wyoming, and Idaho, which have low rates of marijuana use, thus complicating the interpretation of this finding.[40] With our findings, we caution against the overinterpretation of regional data, which can be misleading.

Factors associated with use of any particular substance are well described: ties to religion, a focus on education, avoiding truancy, and spending fewer evenings out for nonacademic activities are associated with nonuse.[16,41–50] Time spent working at a job during the school year is inversely correlated with abstinence. Possible explanations include less future orientation and greater resources for obtaining substances.[16] These findings do not vary by substance, underscoring the importance of nonspecific cultural and environmental factors. Adolescents that initiate use are not necessarily drawn to a particular substance but rather use the one that is most accessible to them. Strategies that engage young people in positive activities that have successfully reduced alcohol and tobacco use may be similarly used to support campaigns promoting abstinence from all substances,[42,51–53] such as in Iceland, where the provision of engaging prosocial afterschool activities for adolescents has been associated with steep drops in substance use.[54–56] With our findings, we highlight the potential for this type of programming within the diversity of the US population.

The data used in this analysis were derived from a large, nationally representative sample of HS students collected over the past 40 years. We were not able to examine the impact of potentially important factors that are not included in the survey. Adolescents that were not in school on the day the survey was administered and those who have dropped out of school are a higher risk group not included in this sample. Self-reported substance use is subject to possible bias, although confidential survey

TABLE 2 Adolescent Sociodemographic and Behavioral Characteristics by Categories for Self-Reported Lifetime Use of Alcohol, Tobacco, Marijuana, and Illicit Drugs and aORs for a Nationally Representative Sample of US HS Seniors (N = 11 674), MTF, 2014

Characteristic	Full Sample (100%), %	Lifetime Abstainers (n = 2975; 25.5%), %	Used 1+ Substances (n = 8699; 74.5%), %	aOR (95% CI)
Boy (versus girl)	48.2	49.1	47.9	1.25 (1.10–1.42)**
Race and/or ethnicity				
White	56.8	53.8	57.9	—
African American (versus white)	12.1	15.0	11.1	1.53 (1.27–1.85)***
Hispanic (versus white)	17.5	16.4	17.9	0.98 (0.80–1.21)
Other race (versus white)	13.5	14.8	13.1	1.23 (1.02–1.47)*
Single parent or no parent in household (versus 2 parents)	33.1	25.5	35.7	0.67 (0.59–0.76)***
Parent educational attainment				
College degree	52.1	56.3	50.7	—
Some college (versus college degree)	20.9	19.9	21.3	1.09 (0.95–1.25)
Less than or equal to HS (versus college degree)	26.9	23.8	28.0	1.04 (0.89–1.21)
Attends college preparatory program (versus nonpreparatory)	50.0	52.9	48.9	0.95 (0.83–1.07)
Plans to graduate from 4-y college	82.7	86.7	81.3	1.18 (1.01–1.37)*
Adolescent risk factors				
Truancy	26.6	13.2	31.5	0.38 (0.32–0.45)***
Low grade point average (≤C+)	15.3	9.9	17.3	0.63 (0.52–0.75)***
Evenings out per wk (3+ per wk)	38.2	27.9	41.8	0.55 (0.48–0.64)***
Religiosity (4-point scale mean)	2.51	2.81	2.41	1.41 (1.32–1.51)***
Hours worked per wk (8-point scale mean[a])	3.15	2.54	3.36	0.87 (0.84–0.90)***
Urbanicity of neighborhood				
Suburban	50.8	47.9	51.8	—
Urban (versus suburban)	28.1	29.3	27.7	1.09 (0.90–1.32)
Rural (versus suburban)	21.1	22.8	20.5	1.18 (0.89–1.56)
Region of residence				
South	37.8	37.4	37.9	—
Northeast	19.0	17.3	19.7	1.06 (0.87–1.29)
Midwest	20.1	18.6	20.7	0.96 (0.76–1.20)
West	23.0	26.7	21.7	1.35 (1.04–1.76)*

—, not applicable.

[a] Hours worked per wk: (1) none, (2) ≤5, (3) 6–10, (4) 11–15, (5) 16–20, (6) 21–25, (7) 26–30, (8) >30.

* $P < .05$.

** $P < .01$.

*** $P < .001$.

data are generally considered the criterion standard for this type of information. Students with missing data for any substance were excluded from the analyses, and this group may have included a relatively large proportion of substance users. Thus, rates of abstention reported here may be higher than rates in the entire US population. Data collection was cross-sectional and repeated annually; thus, causal relationships that explain these findings cannot be firmly established.

CONCLUSIONS

Steady increases in lifetime abstinence from all substances demonstrate that nonuse is a realistic option for HS students. To advance this progress, we suggest a 2-pronged public health strategy. First, the stability of marijuana use rates in the context of declining rates of alcohol and tobacco use is a warning sign and suggests a need to counterbalance messaging from the growing marijuana industry. Simultaneously, efforts to promote the health benefits of nonuse in general may help to avoid the revolving door of one substance losing favor to be replaced by another. Pediatricians have the opportunity and the credibility to deliver a generalized proactive prevention message that nonuse is best for adolescent health, a message that is simple to deliver and backed by our burgeoning knowledge of neuroscience and the special developmental vulnerability of adolescents to both acute and long-term morbidity and mortality associated with substance use.

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ABBREVIATIONS

aOR: adjusted odds ratio
HS: high school
MTF: Monitoring the Future

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