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Past 15-year trends in adolescent marijuana use: Differences by race/ethnicity and sex

Renee M. Johnson[a,*], Brian Fairman[a], Tamika Gilreath[b], Ziming Xuan[c], Emily F. Rothman[c], Taylor Parnham[a], C. Debra M. Furr-Holden[a]

[a] Johns Hopkins Bloomberg School of Public Health, Baltimore, MD, United States
[b] University of Southern California School of Social Work, Los Angeles, CA, United States
[c] Boston University School of Public Health, Boston, MA, United States

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ABSTRACT

Background: The potential for increases in adolescent marijuana use is an important concern given recent changes in marijuana policy. The purpose of this study was to estimate trends in marijuana use from 1999 to 2013 among a national sample of US high school students. We examine changes over time by race/ethnicity and sex.

Methods: Data are from the National Youth Risk Behavior Survey (YRBS), which involves biennial, school-based surveys that generate nationally representative data about 9th–12th grade students in the United States. Students self-reported sex, race/ethnicity, and marijuana use (i.e., lifetime use, past 30-day use, any use before age 13). We generated national estimates of the prevalence of marijuana use for the time period, and also tested for linear and quadratic trends ($n = 115{,}379$).

Results: The prevalence of lifetime marijuana use decreased modestly from 1999 to 2009 (44% to 37%), and has increased slightly since 2009 (41%). Other marijuana use variables (e.g., past 30-day use) followed a similar pattern over time. The prevalence of past 30-day use from 1999 to 2013 for all groups and both sexes was 22.5%, and it was lowest among Asians and highest among American Indian/Alaska Natives. Although boys have historically had a higher prevalence of marijuana use, results indicate that male–female differences in marijuana use decreased over time.

Conclusion: Despite considerable changes in state marijuana policies over the past 15 years, marijuana use among high school students has largely declined. Continued surveillance is needed to assess the impact of policy changes on adolescent marijuana use.

1. Introduction

After alcohol and tobacco, marijuana has been consistently the most commonly used drug of abuse in the US. In 2012, 42.6% of Americans aged 12 and older reported lifetime marijuana use, whereas 61.9% reported lifetime cigarette use and 82.3% reported lifetime alcohol use (SAMHSA, 2014). Adolescence is the developmental period during which most people first use marijuana (Schulden et al., 2009). National data show that 23.4% of high school students report past 30-day marijuana use and that 40.1% report lifetime marijuana use in 2013 (Kann et al., 2014).

The US has undergone significant social change regarding marijuana policy in the past 15 years. Since 1996, 34 states have passed legislation removing criminal sanctions for medical use of marijuana. Twenty states have passed legislation to "decriminalize" marijuana use and possession, nine in the late 1970s and the remainder since 2001. Additionally, since 2012, statutes that effectively end sanctions for recreational marijuana use by adults (≥21 years) have been passed in four states (National Conference of State Legislatures [NCSL], 2015). There is increasingly widespread public support for loosening laws prohibiting marijuana, particularly among those younger than 30 (Palamar, 2014; The Pew Research Center, 2013; Swift, 2013).

Given the current political climate, it is important to examine patterns of adolescent marijuana use and consider how they may change if marijuana were to become legally available for recreational use. Some have argued that it will result in an increase in use among youth, because: (1) the price would likely fall dramatically

* Corresponding author at: Johns Hopkins Bloomberg School of Public Health, Department of Mental Health, 624 North Broadway, 8th Floor, Room 898, Baltimore, MD 21205-1999, United States.
E-mail address: rjohnson@jhu.edu (R.M. Johnson).

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– making it more affordable to young people, (2) it would be more widely available to youth (i.e., diversion from legal outlets to adolescents is likely), and (3) use will be normalized (Anderson and Rees, 2014; Friese and Grube, 2013; Pacula et al., 2014; Palamar et al., 2014). Additionally, in the absence of strong public health regulations, adolescent use could increase in response to targeted advertising and promotion efforts by corporations (D'Amico et al., 2015; Pacula et al., 2014).

Conversely, others suggest that adolescent use will remain stable or increase only marginally. A primary reason for this assertion is that existing and proposed statutes prohibit selling to minors, and selling a product illegally to minors is a risk for businesses (Anderson et al., 2014; Anderson and Rees, 2014; Pacula et al., 2014). Secondarily, the scientific evidence on changes in adolescent marijuana use following medical marijuana legislation does not suggest an increase, although additional studies with longer follow-up periods are needed to draw more definitive conclusions (Choo et al., 2014; Hasin et al., 2015). A third reason that adolescent marijuana use may increase only marginally, if at all, relates to the fact that adolescents already report that they have easy access to marijuana. National data from 2013 show that 70% of 10th graders and 81% of 12th graders say that it would be fairly easy or very easy to obtain marijuana (Johnston et al., 2014). Thus, a large portion of youth abstainers is likely doing so by choice, rather than because they lack access.

There is uncertainty about how adolescent marijuana use will change in response to policy changes, underscoring the importance of closely monitoring patterns of use. The best information about the prevalence of adolescent marijuana use comes from large, nationally representative surveillance systems. The three most widely used such datasets are the NSDUH (SAMHSA, 2014), Monitoring the Future (MTF; Johnston et al., 2014), and the National Youth Risk Behavior Survey (YRBS; Kann et al., 2014). Although direct comparisons are difficult to make given differences in the methodology of the three systems, taken together the data demonstrate that adolescent marijuana use was highest in the 1970s, declined throughout the 1980s and was lowest in 1992, and has remained somewhat stable over the past 20 years (Johnston et al., 2014; Kann et al., 2014; Lanza et al., 2015; Schulden et al., 2009; SAMHSA, 2014). MTF data show that 51% of twelfth graders reported past 12-month use of marijuana use in 1979, compared to 22% in 1992 (Johnston et al., 2014). Although adolescent marijuana use has increased since the early 1990s, the prevalence of use has not reached the peak levels seen in the 1970s (Johnston et al., 2014; Kann et al., 2014; Lanza et al., 2015; Schulden et al., 2009).

The goal of this article is to investigate trends in adolescent marijuana use since 1999. Data are from the national YRBS, which is a biennial, school-based survey that generates nationally representative estimates about health and risk behaviors, including substance use, among high school students (Kann et al., 2014). First, we examine the prevalence and trends in adolescent marijuana use for the past 15 years overall, and by race/ethnicity and sex. We examine lifetime use, past 30-day use, early use (i.e., any use before age 13), and frequent use (i.e., three or more instances of use over the past 30 days). Second, we examined the lifetime prevalence of seven additional substances (i.e., alcohol, tobacco, cocaine, ecstasy, methamphetamine, heroin, and hallucinogens) to evaluate how observed trends in adolescent marijuana use compare to those for other drugs of abuse. Third, we examine whether there were sex differences in past 30-day marijuana use within each race/ethnicity group.

We selected to use data from the YRBS rather than from other, nationally-representative and methodologically-rigorous datasets for two reasons. First, because it is administered in schools (vs. in the home), youth are less likely to underreport marijuana use (Kann et al., 2002; SAMHSA, 2012). Second, because 9th-12th graders are surveyed, grade-pooled estimates represent students in US high school students as a whole, versus just specific grades. Thus, the results we present can be used to summarize the prevalence of marijuana use in US high schools.

2. Methods

2.1. National Youth Risk Behavior Survey (YRBS)

The YRBS was initiated by the Centers for Disease Control and Prevention (CDC) in 1990 to monitor the incidence and prevalence of priority health risk behaviors among adolescents in the US (Kann et al., 2014). The CDC uses a three-stage, cluster random sampling design to obtain the YRBS samples. All 50 US states and the District of Columbia are invited to participate. The primary sampling unit (PSU) consists of counties or analogous geographic units, and the secondary sampling unit (SSU) consists of schools. Both PSUs and SSUs have a probability of selection that is proportional to their population size. The third sampling unit consists of classrooms (1–2 for each grade level), and all students within selected classrooms are invited to participate. Additional selection strategies are used to oversample Black and Hispanic students (Brener et al., 2013; Kann et al., 2014). Participants complete self-administered, machine-readable questionnaires during a regular class period. Participation is confidential, voluntary, and approved by parents. Overall response rates from 1999 to 2013 ranged from 63% to 71% (Brener et al., 2013).

2.2. Measures

Students are asked about sex (male, female) and race/ethnicity (Hispanic, any race; non-Hispanic American Indian/Alaska Native; non-Hispanic Asian; non-Hispanic Black; non-Hispanic Native Hawaiian or other Pacific Islander; non-Hispanic White; and non-Hispanic Multi-Racial).

The YRBS inquires about any lifetime cigarette use, as well as about the frequency of lifetime use of: marijuana, alcohol, cocaine (any form), heroin, hallucinogens, ecstasy, and methamphetamine. (Hallucinogens were described to respondents as including LSD, "acid", PCP, "angel dust", mescaline, and mushrooms.) The items are worded as follows: "During your life, how many times have you used marijuana?"; and there are seven response options (i.e., never, 1–2 times, 3–9 times, 10–19 times, 20–39 times, 40–99 times, and 100 times or greater). For all eight substances, those who responded affirmatively to any use were classified as reporting lifetime use. We created an additional lifetime use variable for marijuana, which we termed "repeated lifetime use." This variable was derived from the lifetime use variable, and represented those who reported having used marijuana at least 3–9 times throughout their lifetimes.

The YRBS item on past 30-day marijuana use is phrased as follows: "During the past 30 days, how many times did you use marijuana?"; and there are 6 response options (i.e., never, 1–2 times, 3–9 times, 10–19 times, 20–39 times, and 40 times or greater). We used data from this question to develop three additional variables representing: (1) *current use* (i.e., any past 30-day use); (2) *repeated past 30-day use* (i.e., reported use at least 3–9 times in the past 30 days); and (3) *frequent use* (i.e., reported use at least 20–39 times in the past 30 days).

Finally, there is one YRBS item on age at first marijuana use (i.e., "How old were you when you tried marijuana for the first time?"), with the following response options: never used, ≤8 years old, 9–10 years old, 11–12 years old, 13–14 years old, 15–16 years old, or aged 17 years or older. We created a binary variable reflecting *early use*, i.e., whether marijuana had been used for the first time before age 13 (i.e., reported age of first use at ≤8 years, 9–10 years or 11–12 years).

2.3. Analyses

We used YRBS data for the years 1999–2013, for the US and the District of Columbia. There were 117,540 respondents in the full YRBS sample. We excluded 2,161 respondents due to missing data on sex, race/ethnicity, or substance use, resulting in a final analytic sample of 115,379. The sample was evenly split by sex, and 42% were White, 22% were Black, 27% were Hispanic, 3% each were Asian and Multi-Racial, and 1% each were Native Hawaiian/Pacific Islander and American Indian/Alaska Native. We obtained the YRBS data from a public use dataset, and received an exemption from review by the Boston University School of Public Health IRB.

We conducted three series of analyses to generate national estimates of the prevalence of substance use and 95% confidence intervals (CIs). Estimates were calculated for the entire time period (i.e., from 1999 to 2013 combined) and for each year of data independently. Additionally, estimates were calculated for the full sample and for girls and boys separately. In sex-stratified analyses, we used Chi-square tests to assess whether sex differences were statistically significant. In instances in which the 95% confidence intervals overlapped, but the p value was less than 0.05, we report the finding as statistically significant (Mulla and Cole, 2004). In the three series of analyses we calculated prevalence estimates and confidence intervals for:

(1) marijuana use variables (i.e., lifetime use, repeated lifetime use, current use, repeated past 30-day use, frequent use, and early use);