Declining Prevalence of Marijuana Use Disorders Among Adolescents in the United States, 2002 to 2013

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Objective: Little is known about recent trends in marijuana use disorders among adolescents in the United States. We analyzed trends in the past-year prevalence of *DSM-IV* marijuana use disorders among adolescents, both overall and conditioned on past-year marijuana use. Potential explanatory factors for trends in prevalence were explored.

Method: We assembled data from the adolescent samples of the 2002 to 2013 administrations of the National Survey on Drug Use and Health (N = 216,852; aged 12–17 years). The main outcome measures were odds ratios describing the average annual change in prevalence and conditional prevalence of marijuana use disorders, estimated from models of marijuana use disorder as a function of year. Post hoc analyses incorporated measures of potentially explanatory risk and protective factors into the trend analyses.

Results: A decline in the past-year prevalence of marijuana use disorders was observed (odds ratio = 0.976 per year; 95% CI = 0.968, 0.984; $p < .001$). This was due to both a net decline in past-year prevalence of use and a decline in the conditional prevalence of marijuana use disorders. The trend in marijuana use disorders was accounted for by a decrease in the rate of conduct problems among adolescents (e.g., fighting, stealing).

Conclusion: Past-year prevalence of marijuana use disorders among US adolescents declined by an estimated 24% over the 2002 to 2013 period. The decline may be related to trends toward lower rates of conduct problems. Identification of factors responsible for the reduction in conduct problems could inform interventions targeting both conduct problems and marijuana use disorders.

Key words: marijuana, addiction, adolescence, epidemiology, externalizing

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The social and policy landscapes governing the use, possession, and availability of marijuana by adults in the United States have shifted markedly in the past 2 decades. The implementation of state-level decriminalization, medical, and recreational legalization policies has raised concerns about direct or indirect policy influences on adolescent marijuana use. Direct effects might occur if teenagers have easier access through diversion of medical or recreational marijuana purchased by adults.[1] Relaxed policies might act indirectly by causing adolescents to view marijuana use as less risky and more socially acceptable, thereby leading to higher prevalence of use.[2,3] Despite these changes in policy and associated changes in social norms,[4] the prevalence of adolescent marijuana use has been relatively stable over the past 10 to 15 years.[5,6] It is less clear whether there have been changes in rates of problem use or of marijuana use disorders during this period. The distinction between experimental use and abuse or dependence is important because there may be many individual-level factors that confer liability to problem use among adolescent marijuana users.[7-9] With this in mind, the objective of this study was to examine recent trends in the prevalence of marijuana use disorders among US adolescents. To our knowledge, no such studies have been previously conducted.

Our specific objectives were to examine trends in the past-year prevalence of *DSM-IV* marijuana use disorders (abuse or dependence), both overall and conditioned on past-year use, among adolescents over the period 2002 to 2013. We also analyzed trends in marijuana use over the same period to parse the trends in risk for marijuana use disorders into those stemming from trends in use and those related to changes in the conditional prevalence. Finally, we examined secular trends in a number of risk and protective factors and whether they might explain trends in the prevalence of marijuana use disorders. We present results of analyses that use data from the National Survey on Drug Use and Health (NSDUH), an annual survey representative of the household-dwelling population of the United States that has yielded year-to-year comparable estimates of drug use, abuse, and dependence since 2002.[10,11]

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Supplemental material cited in this article is available online.

METHOD

Survey Overview and Sample

Analyses presented here used the adolescent subsamples of the NSDUH, which include participants aged 12 to 17 years, from the

years 2002 through 2013. The year 2002 was chosen as the beginning of the observation window because data from earlier years are not comparable to the most recent surveys due to methodological changes in NSDUH procedures. The most recent year for which public use data were available at the time of writing was 2013. NSDUH data were obtained from the Interuniversity Consortium for Social and Political Research.[12] The NSDUH is an ongoing survey of the civilian noninstitutionalized population of the United States, aged 12 years and over, including those living in group quarters such as college dormitories and shelters.[10] The survey is overseen by the Substance Abuse and Mental Health Services Administration (SAMHSA) and is currently contracted through RTI, International. Briefly, the survey uses multistage probability sampling from all 50 states and the District of Columbia. Adolescents and young adults are oversampled, with one-third of the samples drawn from each of 3 age groups: 12 to 17 years, 18 to 25 years, and 26 years and older. The interview is conducted in dwelling units by RTI fieldworkers with drug use questions and other sensitive items administered by audio-computer–assisted self-interview to maximize privacy and confidentiality. Detailed methods are available through SAMHSA.[13] The combined 2002 to 2013 yielded a sample of 216,852 adolescent participants.

Variables

The primary variables of interest were past-year marijuana use and past-year *DSM-IV* marijuana use disorders; that is, the proportion of individuals meeting *DSM-IV* criteria for marijuana abuse or marijuana dependence. We focus on *DSM-IV* because it was the diagnostic standard throughout the observation period, although it has since been superseded by *DSM-5*.[14] Furthermore, despite substantial overlap between *DSM-IV* and *DSM-5* criteria, *DSM-IV* did not assess craving,[15] which is a new addition to *DSM-5*, and so that criterion was not operationalized in the NSDUH interview. Past-year marijuana use was queried of individuals who reported lifetime use. A module assessing past-year *DSM-IV* marijuana abuse and dependence was administered to individuals who reported using marijuana on 6 or more days in the prior year.[16]

Covariates in demographics-adjusted models of trends included sex, age, and race/ethnicity, which were also used as stratification variables. Race/ethnicity was recoded into 4 groups: non-Hispanic white, non-Hispanic black, Hispanic, and other non-Hispanic. Age was treated as a categorical variable for descriptive analyses. Two broad age categories were defined, namely, 12 to 14 years and 15 to 17 years, and a number of trend analyses were stratified by these age categories.

A series of variables operationalizing risk and protective factors that might explain changes in the prevalence of marijuana use disorders was examined. Scores for each variable were constructed from items from the NSDUH Youth Experiences module using item response theory (IRT). Risk factors included frequency of arguments and fights with parents, number of conduct problems, and a measure of permissive parental attitudes toward alcohol, tobacco, and other drugs (as perceived by the child/adolescent). Protective factors included measures of positive attitudes toward school, parental monitoring, frequency of affirmation by parents, number of activities outside of school, exposure to drug education programs, and religious commitment. More details about the selection and construction of these variables are given in Supplement 1 (available online); items comprising the constructs are listed in Table S1 (available online).

Statistical Procedures

All statistical analyses were carried out with SAS version 9.4 software and used survey weights and procedures that account for the complex sample design of the NSDUH in variance estimation. Trends were analyzed using logistic regression. The most basic analyses simply modeled marijuana use disorder (or marijuana use) as a function of year, coded as a continuous variable. This analysis yields an estimated odds ratio that describes the average change in odds for marijuana use disorders per year. We also used the estimated intercepts from the logistic regression analysis to calculate fitted values of prevalence for years 2002 and 2013, respectively. Demographic covariates were incorporated into some models to estimate "partially adjusted" trends. This label was chosen to differentiate from fully adjusted models that incorporated risk and protective factors; these analyses are described more fully below. Stratified analyses were also conducted to examine the degree to which trends varied by sex, race/ethnicity, and age group; these analyses did not incorporate other covariates.

Post hoc analyses focused on the degree to which trends in marijuana use disorders were related to secular trends in the risk

FIGURE 1 Prevalence of past-year marijuana use (A), past-year marijuana use disorders (B), and past-year marijuana use disorders among past-year users (C), 2002 to 2013. Note: Lines represent fits to linear trend models and are not intended to model the functional form of the trend line. Error bars represent 95% CIs.