Journal of Adolescent Health 57 (2015) 205–211

ELSEVIER

JOURNAL OF ADOLESCENT HEALTH

www.jahonline.org

Original article

Predicting Young Adult Degree Attainment by Late Adolescent Marijuana Use

Jennifer L. Maggs, Ph.D. [a,b,*], Jeremy Staff, Ph.D. [c], Deborah D. Kloska, M.A. [b], Megan E. Patrick, Ph.D. [b], Patrick M. O'Malley, Ph.D. [b], and John Schulenberg, Ph.D. [b]

[a] *Human Development and Family Studies, Pennsylvania State University, University Park, Pennsylvania*
[b] *Survey Research Center, Institute for Social Research, University of Michigan, Ann Arbor, Michigan*
[c] *Department of Sociology and Criminology, Pennsylvania State University, University Park, Pennsylvania*

Article history: Received October 10, 2014; Accepted April 29, 2015
Keywords: Marijuana use; Marijuana use consequences; Drug use consequences; Educational attainment; Degree attainment; Propensity score methods; Adolescents; Young adults

A B S T R A C T

Purpose: The purpose of this study was to assess whether infrequent and frequent marijuana use at age 19/20 years predicts receipt of educational degrees by the mid-20s, independent of confounding age 18 adolescent risk factors.
Methods: Data were from the Monitoring the Future study, an annual nationally representative survey of high school seniors followed into adulthood. Thirteen cohorts (1990–2002) of high school seniors were followed longitudinally to their mid-20s (n = 4,925; 54% female). We used logistic regression and propensity score matching with successive inclusion of age 18 risk factors and substance use to compare age 19/20 frequent marijuana users (six or more occasions in past 30 days) to nonusers, frequent users to infrequent users (1–6 occasions), and infrequent users to nonusers on their likelihood of degree attainment by the mid-20s.
Results: Frequent marijuana users were less likely than infrequent users and nonusers to earn bachelor's degrees, even after controlling for a host of age 18 risk factors (e.g., family socioeconomic background, academic performance, educational expectations, truancy). However, these differences were reduced in magnitude to statistical nonsignificance when we controlled for age 18 substance use. Across analyses, the proportion reaching this educational milestone did not differ significantly between infrequent users and nonusers.
Conclusions: Results support a growing body of work suggesting that frequent marijuana use predicts a lower likelihood of postsecondary educational attainment, and this difference may originate during secondary school.

IMPLICATIONS AND CONTRIBUTION

In a national sample, late adolescent frequent marijuana users were less likely to attain bachelor's degrees by their mid-20s compared with infrequent and nonusers, independent of adolescent risk factors but not of adolescent substance use. Infrequent users and nonusers did not differ in degree attainment.

Marijuana is the most widely used illegal drug among adolescents [1]. Marijuana use during adolescence is clearly associated with many deleterious social and psychological correlates, with evidence of a link to lower educational attainment, especially among early and frequent users [2–6]. However, significant methodological challenges have led some scholars to question the evidence for marijuana's detrimental *causal* impact [4,7,8]. Notably, ethical and legal constraints against randomized trials

Conflicts of Interest: The authors have no conflicts of interest or financial relationships relevant to this article to disclose. All authors receive support from the U.S. National Institutes of Health; D.D.K., P.M.O., and J.S. receive support from the Robert Wood Johnson Foundation; and John Schulenberg receives support from the U.S. National Science Foundation.

* Address correspondence to: Jennifer L. Maggs, Ph.D., Human Development and Family Studies, HHD 119, Pennsylvania State University, University Park, PA 16802.
E-mail address: jmaggs@psu.edu (J.L. Maggs).

1054-139X/
http://dx.doi.org/10.1016/j.jadohealth.2015.04.028

make it difficult to rule out reverse causality (low achievement leading to substance use) or third variable influences (confounders underlying substance use and educational attainment). Using nationally representative longitudinal data from 13 cohorts of U.S. high school seniors, we use regression and propensity score methods to examine whether the frequency of late adolescent marijuana use (age 19/20 years) predicts lower likelihood of degree attainment by the mid-20s. By successive consideration of risk factors assessed in high school (including age 18 substance use), we test the robustness of observed differences in the face of potential selection effects.

Past research: Empirical work and methodological challenges

Most longitudinal epidemiological research on consequences of marijuana use has focused on use by adolescents in secondary school [4]. Early onset during middle and high school are associated with lower school commitment, grades, and high-school graduation [6,9–15]. Recent longitudinal studies also show persistent predictive power of adolescent marijuana use on enrollment in and completion of postsecondary education [9,12,16].

We add to a growing literature evaluating longer term detrimental impacts of marijuana use on postsecondary credentials in three ways. First, much extant research has not accounted for prior selection effects that may underlie observed associations [5,8]. We use logistic regression with and without controls for prior risk factors and substance use as well as propensity score methods matching individuals with similar risk (or propensity) for marijuana use to further reduce confounding; these alternative approaches have benefits and limitations. Second, many samples have been small or contained insufficient numbers of drug users for optimal statistical power [12,15]. The national U.S. Monitoring the Future study oversamples drug users for longitudinal follow-up, providing increased power to distinguish nonusers from infrequent and frequent marijuana users. Finally, most research has focused on early onset or use of marijuana during secondary school [16,17]. However, the normative lifetime peak of marijuana use occurs later [18,19]. We focus on marijuana use during the years immediately following high school, a pivotal period for career planning and educational enrollment. Any factors reducing successful transitions to new accomplishments may have long-term detrimental effects on qualifications and occupational attainment [13,18,20].

Alternative process models

We examine two hypotheses to explain links between marijuana use and lower educational attainment. The *causal hypothesis* proposes a detrimental effect on attainment [9] through multiple intervening processes [6,7,21]. Marijuana users, especially frequent users, may be more likely to adopt a delinquent, illegal lifestyle [3,6] or make earlier transitions to work, partnering, and parenting [22,23]. Alternatively, marijuana use may increase risk for accident and injuries [24] or harm cognitive neuropsychological performance, neural connectivity, and brain development [19,25]. Finally, marijuana users are more likely to use other substances with their own harmful effects [6]. In summary, the causal hypothesis views early, frequent, or heavy marijuana use as the underlying direct or indirect cause of reduced educational attainment.

Alternatively, the *common cause hypothesis*, posits that apparent harmful impacts of marijuana use may be spurious, that is, due primarily to shared underlying risk factors for both marijuana use and low achievement [7]. In support of this view, apparent effects of heavy marijuana use on educational attainment tend to be attenuated (although not eliminated) in longitudinal studies that statistically controlled for likely confounders including family background and functioning, parent substance use, child cognitive ability and adjustment, and early educational performance (e.g., [10,11]). Effects of infrequent use appear more sensitive to adjustment for confounding than effects of frequent use [26]. In addition to a broad range of demographic, attitudinal, academic, and behavioral risk factors at age 18 years, we assess whether age 18 substance use attenuates any observed effects of post–high-school marijuana use.

Aims of article

Objectives were to: (1) test whether infrequent and frequent marijuana use during the transition to adulthood predict a lower likelihood of bachelor's (4-year) degree attainment by the mid-20s and (2) examine the generality of results by extending follow-up through the age of 25/26 years, focusing only on those who initiated higher education and predicting 2-year degree attainment. We hypothesized that frequent marijuana use relative to nonuse and infrequent use would reduce the likelihood of obtaining a degree by the mid-20s. Postsecondary enrollees are the most likely to graduate but are also are vulnerable to dropping out. Logistic regression models predicting degree attainment are presented, followed by propensity score methods, which first match participants who had similar *propensities* for marijuana use but differed in their *actual* use frequency. Using both approaches, we present results accounting for age 18 risk factors and then for age 18 risk factors and substance use.

Methods

Participants

Data come from the Monitoring the Future study, an ongoing series of annual surveys of nationally representative samples of high-school seniors in the 48 contiguous United States. Random subsamples of respondents participate in biennial follow-up surveys beginning 1 or 2 years after high school, with a random half assigned to each. Drug users are oversampled for follow-up, making these surveys ideal for examining effects of frequency of marijuana use on bachelor's degree completion. The project is overseen and approved by the University of Michigan's institutional review board. The survey design and methods are described in detail elsewhere [18,27].

We used longitudinal data collected among high-school seniors from 1990 to 2002 (modal age 18 years; background risk variables), 1 to 2 years later (modal age 19/20 years; frequency of marijuana use), and 5 to 6 years later (modal age 23/24 years; degree completion). The analytic sample included 4,925 cases (54% female) that provided complete data. Previous attrition analyses found that retained cases were more likely to be female, have higher parent education, and have lower high school drug use [28]. Attrition weights were used only in logistic regressions; the propensity models' focus on creating matched samples for comparison, rather than obtaining population estimates of prevalence.