Age of First Marijuana Use and Its Impact on Education Attainment and Employment Status

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Abstract

With the increased prevalence of marijuana use among youth, the increase in state legalization, and changing social norms in the United States, it is important to understand the long-term impact of marijuana use initiation. This study examined whether age of first marijuana use is associated with educational attainment and employment status. Data from 5,988 adults aged 26 to 49 years who participated in the 2015 National Survey on Drug Use and Health were used in the current study. Logistic regression analyses were used to examine the odds of graduating from high school and being employed. Controlling for demographics, persons with late-early first use had significantly higher odds of graduating from high school and being employed compared with persons with early first use. Results underscore the importance of early prevention for youth aged 15 and younger and have implications for intervention and policy development.

Keywords

first marijuana use, marijuana policy, adolescent substance use, marijuana legalization

Introduction

Substance use is a significant concern regarding the health and development of adolescents in the United States (Wong, Zhou, Goebert, & Hishinuma, 2013). Marijuana is currently the second most commonly used drug among youth (Cohn, Johnson, Rath, & Villanti, 2016; Kingery, Alford, & Coggeshall, 1999). About 5.7% of all Americans have reported marijuana use in the past month, with 18.7% of those being between the ages of 18 and 25 years old. Approximately 12% of people 12 years of age or older reported past year use (Popovici, French, Pacula, Maclean, & Antonaccio, 2014; Volkow, Baler, Compton, & Weiss, 2014). Among youth, 13% of eighth graders, 29% of 10th graders, and 36% of 12th graders report ever having used marijuana (Friese & Grube, 2013). Twenty-nine states and the District of Columbia have passed laws legalizing the medical use of marijuana (Han, Compton, Blanco, & Jones, 2018; National Conference of State

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Legislatures, 2017), and eight states and the District of Columbia have legalized recreational marijuana use (Cerdá et al., 2017; McGinty, Niederdeppe, Heley, & Barry, 2017).

There are concerns about the potential effect of the recent wave of marijuana legalization on youth. According to recent studies, medical marijuana legalization does not appear to impact adolescent recreational use (Cerdá et al., 2017; Wall et al., 2016). However, limited evidence suggests that legalization of adult recreational use may be associated with increased adolescent recreational use (Cerdá et al., 2017; Rusby, Westling, Crowley, & Light, 2018), increases in intention to use among youth (Rusby et al., 2018), and decreases in perceived risk of negative consequences from marijuana use during early adolescence and mid-adolescence (Cerdá et al., 2017). Such findings further spur considerable debate on the adverse outcomes of marijuana use in adolescence. Although extant research has focused on the impact of legalization on youth marijuana use, little is known about the impact of marijuana use in adolescence on later life outcomes. With the continuous increase of states legalizing marijuana (Wall et al., 2016), and early evidence suggesting such laws impact risk perception, intention to use, and use of marijuana, more research is needed on the long-term impact of marijuana use in adolescence to inform marijuana-related interventions, education, and policies that will positively impact American youth.

Marijuana Use and Socioeconomic Outcomes

Research has suggested that marijuana use in adolescence can have negative long-term effects on school completion (Fergusson, Horwood, & Beautrais, 2003; Homel, Thompson, & Leadbeater, 2014; McCaffrey, Liccardo Pacula, Han, & Ellickson, 2010; Ryan, 2010; Silins et al., 2014; Thompson, Leadbeater, Ames, & Merrin, 2018; Van Ours & Williams, 2009). For example, studies of Canadian, Australian, and New Zealander youth have found that marijuana use in youth and young adulthood is associated with lower likelihood of secondary and postsecondary school completion, and enrollment in postsecondary education (Fergusson et al., 2003; Homel et al., 2014; Silins et al., 2014; Thompson et al., 2018; Van Ours & Williams, 2009). The few studies that have been conducted in the United States corroborate international studies' findings (McCaffrey et al., 2010; Ryan, 2010), but only one study uses a nationally representative sample (Ryan, 2010).

Less attention has been given to long-term influences of marijuana use in youth and later employment as an outcome. Lee, Brook, Finch, and Brook (2015) examined associations between trajectories of marijuana use from age 14 to 36 and their association with unemployment at age 36. The study found that persons classified by their trajectories as "chronic users" and "late quitters" were at greatest risk of being unemployed at age 36 (Lee et al., 2015). These associations persisted to age 43 (Zhang, Brook, Leukefeld, & Brook, 2016). Hara, Huang, Weiss, and Hser (2013) studied the influence of marijuana use in young adulthood on later trajectories of employment and found that having used marijuana by age 23 was associated with fewer weeks of employment per year over time.

Studies on marijuana use and socioeconomic outcomes have indicated that having used marijuana in youth and young adulthood, as well as the frequency of use, is associated with negative educational and employment outcomes concurrently and later in life. However, studies on educational attainment are limited in that most were conducted outside of the United States, and so, results may not be generalized to the unique sociocultural experiences of youth in the United States. In addition, some studies did not differentiate marijuana use in adolescents from adults and young adults who may each have distinct social, interpersonal, and societal experience that influence marijuana use and later socioeconomic outcomes, and therefore, each should be studied separately. Finally, all studies compared persons who used marijuana with persons who did not use. However, it is equally important to understand the timing of first use among those who used

marijuana in adolescence, as age of initiation has been associated with numerous factors that could influence long-term socioeconomic outcomes, such as increased likelihood of substance use disorder (Volkow et al., 2014) and cognitive impairment (Levine, Clemenza, Rynn, & Lieberman, 2017), and mental health problems (Marmorstein & Iacono, 2011).

The Current Study

The current study examines the relationship of age at first use with educational attainment and employment status among adults who reported ever using marijuana before the age of 18. This study aims to (a) specifically explore the impact of first marijuana use on a representative sample of youth in the United States and (b) exclusively examine persons who have used marijuana only, and focus on use initiation in adolescence. With the changes in legalization status of medical and recreational marijuana use, this study contributes to the debate on the impact of adolescent marijuana use on life course outcomes. Considering the current research literature, we hypothesized that individuals who reported first marijuana use at a younger age (12-14 years old) will have decreased odds of graduating from high school and being employed compared with those who reported first use later in adolescents (15-17 years old).

Method

This study analyzed data from the 2015 National Survey on Drug Use and Health (NSDUH). The NSDUH is maintained and distributed by the National Addiction & HIV Data Archive Program (NAHDAP). It was designed to measure the patterns of drug use in the United States among the noninstitutionalized population (including civilians on military bases) of individuals aged 12 and older. The NSDUH used multistage probability sampling to gather data in all 50 states and the District of Columbia. The public use sample size for the 2015 NSDUH is 57,146 with a response rate of 81.9%, and a weighted interview response rate for the computer-assisted interviewing (CAI) was 71.2%.(Center for Behavioral Health Statistics and Quality, 2016) The current study utilized data from a subsample of individuals between the ages of 26 and 49 years, inclusive, at the time of the survey who reported first marijuana use before age 18 ($n = 5,988$). The Institutional Review Board at The University of Texas at Austin approved all study protocols.

Measures

Demographics. Sociodemographic variables used were race/ethnicity (White, Black/African American, Hispanic, and Other, which included American Indian/Alaska Native; Native Hawaiian/Pacific Islander; Asian) and gender (male or female).

Age when first used marijuana/hashish. The NSDUH asked individuals "How old were you the first time you used marijuana or hashish?" Responses to this question were used to identify the subsample of individuals who reported first marijuana use between the ages of 12 and 17. Among those persons, this study examined two groups; those who reported first use of marijuana between the ages of 12 and 14 (early first use), and those who reported first use between the ages of 15 and 17 (late-early first use). There is no standard cutoff for early first use of marijuana (Poudel & Gautam, 2017). The Substance Abuse and Mental Health Services Administration (SAMHSA) suggests that marijuana use before age 18 is a critical risk period that is associated with future dependence and abuse, and separates early initial use as ages 12 to 14 and late-early initial use as ages 15 to 17 (SAMHSA, 2014).

Educational attainment. Educational attainment was measured with participants' self-report of highest grade or year of school completed (less than high school, high school/General Education

Table 1. Descriptive Characteristics (*N* = 5,988).

	Early first use (ages 12-14, *n* = 1,961) M or proportion (95% confidence interval)	Late-early first use (ages 15-17, *n* = 4,027) M or proportion (95% confidence interval)
Race		
White	70.3 [67.4, 73.3]	73.1 [71.5, 74.6]
Black	10.7 [9, 12.3]	10.9 [9.5, 12.2]
Hispanic	13.7 [11.4, 16.1]	11.8 [10.8, 12.9]
Other	5.3 [4.2, 6.3]	4.2 [3.6, 4.9]
Gender		
Male	41.7 [39, 44]	47.5 [45.2, 50]
Female	58.3 [55.6, 61]	52.5 [50.2, 54.8]
High school diploma/GED		
Yes	85.5 [83.5, 87.5]	91.1 [90.1, 92]
No	14.5 [12.5, 16.5]	8.9 [8, 9.9]
Employed		
Yes	91.5 [90, 93.1]	94.1 [93.2, 95]
No	8.5 [6.9, 10.1]	5.9 [5, 6.8]

Diploma (GED), 1-3 years of college, 4 or more years of college). This variable was dichotomized to represent persons who reported having at least a high school diploma/GED and persons who reported having less than a high school education.

Employment status. Employment status was measured in four categories in the NSDUH (employed full-time, part-time, unemployed, other/not in labor force). For this study, employment status was dichotomized to represent persons who were employed (full-time or part-time) and persons who were unemployed.

Data Analyses Plan

Two logistic regression models were estimated using Mplus software program (v 7.4) to determine the relationship between age of first marijuana use (0 = early first use; 1 = late-early first use) and two outcomes of interest: (a) educational attainment (0 = no diploma/GED; 1 = diploma/GED) and (b) employment status (0 = not employed; 1 = employed). Race and gender were used as covariates. Race was represented as three dummy coded variables, wherein White individuals served as the reference group; gender was coded as 0 for female and 1 for male. Descriptive statistics, adjusted odds ratios (AOR), and predicted probabilities were calculated. All analysis incorporated weights to account for the complex sampling design of the NSDUH.

Results

Descriptive characteristics are summarized in Table 1. There were 5,988 individuals who reported first marijuana use before age 18, with 32.2% reporting early first use and 67.8% reporting late-early first use. In the group who reported early first use, 85.5% had a high school diploma or GED, 91.4% were employed full-time or part-time, 70.3% were White, and 41.7% were male. Of the group who reported late-early first use, 91.1% had a high school diploma or GED, 94.1% were employed, 73.1% were White, and 47.5% were male.

Table 2. Logistic Regression: Educational Attainment (*n* = 5,988).

	Unstandardized estimate	Adjusted odds ratio	95% confidence interval
Age at first use	0.51**	1.67	[1.33, 2.10]
Black	−0.82***	0.44	[0.33, .60]
Hispanic	−0.74***	0.48	[0.35, .64]
Others	0.30	1.35	[0.83, 2.19]
Gender	0.60***	1.82	[1.46, 2.27]

**p < .01. ***p < .001.

Table 3. Logistic Regression: Employment Status (*n* = 5,049).

	Unstandardized estimate	Adjusted odds ratio	95% confidence interval
Age at first use	0.37**	1.45	[1.12, 1.86]
Black	−1.13***	0.32	[0.22, 0.48]
Hispanic	−0.33	0.72	[0.43, 1.20]
Others	−0.37	0.69	[0.38, 1.26]
Gender	0.32*	1.38	[1.04, 1.83]

*p < .05. **p < .01. ***p < .001.

Educational Attainment

Table 2 summarizes the results of a logistic regression model wherein educational attainment was regressed on age at first use, race, and gender. Age at first use, race/ethnicity, and gender were significantly associated with education attainment. Controlling for sociodemographics, individuals who reported late-early first use of marijuana had 1.67 times (95% confidence interval [CI] = [1.33, 2.10]) the odds of graduating from high school compared with those who reported early first use. Those who endorsed early first use had a 92% probability of graduating from high school, whereas those who endorsed late-early first use had a 95% probability of graduating from high school. Being Black was associated with 56% lower odds (AOR = 0.44; 95% CI = [0.33, 0.60]) and being Hispanic was associated with 52% lower odds (AOR = 0.48; 95% CI = [0.35, 0.64]) of having graduated from high school compared with Whites. Women had about twice the odds of graduating from high school compared with men (AOR = 1.8; 95% CI = [1.46, 2.27]).

Employment Status

Table 3 summarizes the results of the logistic regression model wherein employment status was regressed on age at first use, race, and gender. Age at first use, being Black, and gender were significantly associated with employment status. Controlling for sociodemographics, individuals who reported late-early first use of marijuana had 1.45 times (95% CI = [1.12, 1.86]) the odds of being employed compared with those who reported early first use. Those who endorsed early first use had a 94% probability of being employed, whereas those who endorsed late-early first use had a 96% probability of being employed. Race/ethnicity and gender status were significantly associated with employment status. Being Black was associated with 68% lower odds (AOR = 0.32; 95% CI = [0.22, 0.48]) of being employed compared with Whites. Women were 1.38 times (95% CI = [1.04, 1.83]) more likely to report being employed than men.

Discussion

Previous studies have shown that marijuana use in youth and early adulthood can impact socio-economic outcomes (Homel et al., 2014; Silins et al., 2014), but less is known about how age at initiation of adolescent marijuana use impacts later employment and educational attainment. Current study findings regarding educational attainment were consistent with previous studies comparing persons who used marijuana in youth versus did not use marijuana in youth (Fergusson et al., 2003; McCaffrey et al., 2010; Silins et al., 2014; Van Ours & Williams, 2009). Among persons who used marijuana before the age of 18, those who first used marijuana between the ages of 15 and 17 were 45% more likely to complete high school compared with those who reported first using marijuana between the ages of 12 and 14. Age at first use of marijuana was significantly associated with current employment status. This finding is consistent with studies that have reported on the association between marijuana use in youth and employment status in adulthood (Lee et al., 2015; Zhang et al., 2016). Taking together the current study and previous work, it is possible that use of marijuana in adolescence, and the timing of first use, are important determinants of high school completion and employment status.

There are several pathways through which early marijuana use in youth can influence life course outcomes. The adolescent brain is more susceptible to the long-term effects of drug use, particularly for youth who report use between the ages of 12 and 14 (Gruber, Dahlgren, Sagar, Gönenç, & Lukas, 2014). Using marijuana at younger ages can increase the likelihood of substance use disorder (Volkow et al., 2014), and other studies have shown marijuana use predicts the use of alcohol and other illicit drugs (Tarter, Vanyukov, Kirisci, Reynolds, & Clark, 2006). Importantly, marijuana use in youth has a demonstrated impact on cognitive development and functioning (Jackson et al., 2016; Pope et al., 2003; Scott et al., 2018; Yanes et al., 2018). Any of these factors, either individually or cumulatively, could contribute to not completing high school and limiting employment opportunities. A possible explanation for the relationship between marijuana use and current employment can be as a result of the legality of marijuana possession and use by state. Individuals who use marijuana may have previously been arrested, thus leaving them with limited opportunities to gain employment in states where employers can discriminate against persons with a criminal conviction. In addition, individuals using marijuana may have a difficult time seeking employment from employers who require drug testing. This possibility can significantly limit employment prospects for marijuana users in adulthood.

Several statistically significant associations with the outcomes of interest were observed among the covariates used in the current study. Of particular note was that non-White persons were less likely to graduate high school or be currently employed compared with White persons. This underscores long-recognized structural and systemic issues such as discrimination and segregation in the United States against persons of color. Furthermore, these factors likely influence marijuana use, age of initiation, and socioeconomic outcomes and the relationships among these variables. For example, racial disparities in health care practices, including access to treatment and prevention interventions, impact life course outcomes (Lewis, Hoffman, Garcia, & Nixon, 2018). Although White individuals are more likely to initiate marijuana earlier, they are just as likely to enter treatment earlier compared with racial/ethnic youth, who are more likely to continue use because of limited access to interventions (Lewis et al., 2018; Wu, Temple, Shokar, Nguyen-Oghalai, & Grady, 2010). Similarly, many studies suggest that perceived discrimination is associated with increased risk of substance use for racial/ethnic youth leading to greater substance use–related consequences later in life (Broman, 2016; Rose et al., 2018; Sanders-Phillips et al., 2014).

The current study underscores the need for substance use prevention programs in early adolescence. Clinicians should be well equipped to work with early- and pre-adolescents and be able to identify risk factors that can lead to substance abuse at a later age. To that end, studies that

identify risk factors for early use (vs. late-early) among adolescents are necessary to both identify targets of interventions and priority populations at risk of early marijuana use. Although the current study cannot speak to determinants of early versus late-early use, there exists a general consensus that a holistic approach to substance use treatment and prevention is necessary (Akinola, Kuo, Oswald, & Obisesan, 2017; More et al., 2017). Considering other environmental contextual variables (e.g., neighborhood, income, school environment) is an essential next step toward determining a causal relationship between early first marijuana use and life course outcomes.

The person-in-environment (PIE) system is designed to identify relationships between individuals, environment, and components of development that impact social functioning, mental health, and physical health (Karls, O'Keefe, & Roberts, 2008). A PIE framework underscores the dynamic interactions between systems that are necessary to holistically serve those impacted by substance use (Greene, 1999). Moreover, PIE expands the knowledge base that enhances understanding of multiple ecological stressors that may lead to first marijuana use. To effectively intervene on the detrimental outcomes of first marijuana use, researchers and clinicians must focus on ecological influences that are present prior to use, instead of simply focusing on marijuana use itself.

Few studies have examined environmental factors and their association with marijuana use among youth, but such factors may present unique opportunities to facilitate not only prevention but also empowerment. There are individual, family, and environmental factors that may contribute to how early marijuana use impacts adolescent development (Cheetham & Lubman, 2016). For example, studies suggest that boys living in underresourced, low-income neighborhoods with a greater proportion of abandoned properties in childhood were at increased risk of marijuana use in young adulthood (Kogan, Cho, Brody, & Beach, 2017; Tarter et al., 2009). Similarly, it is essential for researchers to examine other health, economic, and environmental factors, including subclinical mental health symptoms or negative employment experiences, that impact youth development and adult outcomes (Bechtold, Hipwell, Lewis, Loeber, & Pardini, 2016; Hara et al., 2013), thus acknowledging the reverse causal association between marijuana use and outcomes (Bechtold et al., 2016; Hara et al., 2013). The concept of reverse causality has been used to examine bidirectional pathways, which encourages researchers to consider the direction of the causal relationship between variables (Fergusson, Horwood, & Ridder, 2005). Community-oriented practitioners such as mental health professionals are in a unique position to contribute to marijuana use prevention through community advocacy efforts and community mobilizing with youth, whose voices are traditionally not heard or utilized in research or policy formation.

The current study has some limitations. Data used in this study are self-reported and individuals may under report behaviors that may be stigmatizing such as marijuana use during childhood (Fendrich & Johnson, 2005). Data used regarding marijuana use in adolescence were collected retrospectively; a longitudinal study would be able to provide a more robust test of causal relationships. In addition, the current study focused on sociodemographic variables which often measure broader constructs too narrowly, or merely proxies for more important social determinants. Mixed method approaches would be an ideal means by which to gather additional in-depth information on the context surrounding marijuana use initiation and socioeconomic outcomes of study participants.

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