



Research Paper

Reefer madness or much ado about nothing? Cannabis legalization outcomes among young adults in the United States



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ABSTRACT

In 2012, Colorado became one of the first two U.S. States to legalize cannabis for recreational use for adults 21 and older. Given that cannabis use holds potential physical and mental health risks, particularly among adolescent users, concerns have grown regarding changes in use following this change in policy. Studies examining medical cannabis legalization have found inconsistent changes in cannabis use and prevalence of dependence following medical implementation. However, recreational legalization holds potential unique changes, such as increased availability and social acceptance, as well as decreased price and perceived harm of use. There also may be increased interest in moving to Colorado related to the changes in cannabis laws. Based on past literature, two hypotheses were made for this study. First, college student cannabis use would increase after recreational legalization, however just for those 21 years old and older. Second, there would be a positive relation between the influence of cannabis legislation on out-of-State student's decision to attend a Colorado university and their cannabis use. Data from 5241 undergraduate students was available to test study hypotheses using Pearson's Chi-square, negative binomial regressions, and path analysis. Results indicated that cannabis use increased since recreational legalization for all students, but more so for those over 21 years. No differences in past month use frequency were found between pre- and post-legalization. Influence of cannabis laws on non-resident student's decision to attend a Colorado college predicted lifetime and past 30-day use. Additionally, out-of-State students reported higher past 30-day use than in-State students. These findings may help inform other States considering recreational legalization of potential outcomes, as well as potential interventions.

Reefer madness or much ado about nothing? cannabis legalization outcomes among young adults

In 2012, Colorado and Washington became the first two States in the United States (U.S.) to implement policy legalizing the recreational use of cannabis since 1937 (Hopfer, 2014). Colorado began selling recreational marijuana in 2014, and since then, seven more States have passed laws permitting casual use of the drug (National Organization for the Reform of Marijuana Laws, 2017). While some have enjoyed their newfound privilege, others are concerned of potential increases in adolescent use, negative consequences, and dependence, following legalization (Hopfer, 2014; Pew Research Center, 2014). These worries are well-placed, as cannabis holds acute and chronic public health concerns (Hall, 2009; Volkow, Baler, Compton, & Weiss, 2014). Moreover, potential impairments from use are more pronounced among those who initiate use in adolescence (Volkow et al., 2014). As cannabis use is highest among 18 to 25 year olds, typically referred to as college-aged individuals in the U.S., and there is an increased likelihood of

adverse consequences, understanding policy implications of legalization of recreational cannabis use is particularly important (Center for Behavioral Health Statistics and Quality [CBHSQ], 2016; Volkow et al., 2014). However, legalization is still relatively new and there is limited research examining the outcomes and implications of this policy change. Moreover, cannabis policy in the U.S. is continually evolving, presenting a complex landscape to study.

Several factors influence the likelihood of increased cannabis use among college-aged individuals following legalization. Currently, approximately 35% of incoming college freshman have used cannabis, and almost 74% of non-users will be offered cannabis while in college (Pinchevsky et al., 2013; Suerken et al., 2014). By graduation, approximately 47% of students have tried cannabis, and this rate is often influenced by peers who use, prior drug use, and low parental monitoring. Following legalization, there may be even more opportunities for non-users to come into contact with cannabis. Additionally, normative beliefs surrounding peer use also predict cannabis use (LaBrie, Hummer, Lac, & Lee, 2010). From 2007–2008 to 2010–2011, there was

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a significant decrease in perceived risk of use in both adolescents and adults, paired with increased perceived availability among adults (Schuermeyer et al., 2014). Specific to Colorado, descriptive norms may be influenced by having the highest young adult cannabis use of any State (CBHSQ, 2016). This higher-than-average use is also suggestive of a culture that is more accepting of both recreational and medicinal cannabis use. While these influences existed prior to legalization, they may both impact and be impacted by changes in legislation, leading to higher normative beliefs and cannabis use.

One way to predict the impact of legalizing recreational use of cannabis is to examine the outcomes of implementing medical cannabis in the U.S. Typically, States with medical cannabis laws tend to report higher rates of cannabis use and cannabis dependence than those without similar legislation (Cerdá, Wall, Keyes, Galea, & Hasin, 2012). They also tend to have higher potency cannabis (Sevigny, Pacula, & Heaton, 2014). Despite reported higher rates of use and dependence, several studies did not detect differences in prevalence of use or dependence following medical cannabis legislation (Lynne-Landsman, Livingston, & Wagenaar, 2013; Wall et al., 2016). However, Wen, Hockenberry, & Cummings (2015) found that medical cannabis implementation was associated with an increase in initiation for those under 21, and an increase in use frequency and dependence among those over 21. While effects of medical cannabis implementation are mixed, these studies suggest that rate of adolescent (i.e., under 21) cannabis use disorder (CUD) may remain constant even with policy changes legalizing recreational cannabis use.

Another way to predict consequences of recreational legalization is to look at self-reported intentions of use. When surveying high school seniors in Washington and Colorado prior to legalization, Palamar, Ompad, and Petkova (2014) found that the vast majority of cannabis users stated they would continue to use the same amount, while about 10% of non-users stated they would try cannabis once if the drug became legal. A minority (18%) of users reported an intention to increase use, which was correlated with more recent cannabis use. It was unclear, however, if this survey stated that cannabis use would be legal for their age group, or only for adults, such as the current laws in Colorado. Nonetheless, these survey results point to a potential increase in adolescent use following legalization.

Hopfer (2014) predicted several other potential changes due to legalization policies. Along with potential increases in use due to increased availability and social acceptance, a legal market may increase competition and subsequently decrease prices. High alcohol prices are negatively correlated with alcohol use and related adverse consequences, particularly in adolescents (Chaloupka, Grossman, & Saffer, 2002). Indeed, the average cost per gram of cannabis sold in Colorado dispensaries decreased from January 2014 (i.e., start of legalization) through April 2017 (BDS Analysis, 2017). Decreasing cannabis prices could make the drug more affordable, and may reflect a similar trend to alcohol whereby lower prices increase use even more so among adolescents (Chaloupka et al., 2002). Additionally, new cannabis products and forms, such as novel edible forms and portable vaporizers, may increase interest in use (Hopfer, 2014). All these influences may impact adolescent cannabis use post-legalization.

Another trend that may impact prevalence of cannabis use is changes in population in States enacting legalization policies. From 2010 to 2014, Colorado saw an increase in number of residents (U.S. Census Bureau, 2015). Additionally, record numbers of tourists visited Colorado in both 2014 and 2015 (Blevins, 2016). This influx may be related to the medical and recreational cannabis legislation, though its exact cause is unknown. Newspapers have anecdotal reports of families moving to Colorado in order to provide medical cannabis to ailing family members (e.g., Flener, 2015). If people moving to Colorado are doing to access legal cannabis, this may result in an increased prevalence of cannabis users.

Similarly, now that there is recreational cannabis, there may be additional interest in attending a Colorado college among out-of-State

users. State colleges, such as Colorado State University and University of Colorado Boulder, have received a relatively constant number of applications from Colorado residents; however, they have also been receiving increasing numbers of non-resident applications (Institutional Research & Analysis, 2014; P. Lehene-Singh, personal communication, May 12, 2015). In Boulder, in-State applications decreased from 8117 in 2010 to 7191 in 2011, then increased to 7923 by 2014. More strikingly, Boulder non-resident applications steadily increased from 13,012 to 20,929 during that same time period. Similarly, from 2010 to 2014, Colorado State University in-State applications fluctuated between 8419 and 9289. However, out-of-State applications increased from 6385 in 2010 to 9021 in 2013, then dropped to 8248 in 2014. Colorado State University and University of Colorado Boulder have also admitted increasing numbers of nonresident students over the past several years (Institutional Research, 2014; Institutional Research & Analysis, 2014). Though the cause of this shift is also unknown, it may be influenced by additional interest in Colorado schools by out-of-State cannabis users. This may be especially pertinent for those in States with more restrictive cannabis laws and limited access. If this is the case, there may be a rise in cannabis use among college students due to a change in the student body, and not because of changes in use among Colorado residents.

Based on the findings of the aforementioned studies and projections, there may be several implications of policy changes legalizing recreational cannabis use. The pattern of increasing use will likely continue as cannabis becomes more easily accessible, socially acceptable, less costly, and perceived as less harmful. While some adolescent non-users report intentions to try cannabis if it were recreationally legal (Palamar et al., 2014), increased adolescent use has not been observed in every State that has legalized medical cannabis. Though price decreases might increase accessibility to young adults, it may be mitigated by the 28% tax placed on recreational cannabis (Colorado Department of Revenue, 2015). Finally, an influx of cannabis users, especially to universities, may result in an increase in use, both as a whole, and due to more cannabis using peers. As increases in adolescent use are a common concern (Pew Research Center, 2014), intervention programs are a likely preventative measure. With so many influencing factors, the exact outcome of recreational legalization on adolescent cannabis use is difficult to predict.

Based on past research, two hypotheses were made. First, recreational cannabis legalization would be related to an overall increase in cannabis use in college students. When broken down by age, underage students would show no statistically significant change in overall use, while over-age students would show an increase in use. Additionally, a positive relation was hypothesized between the influence of cannabis legislation on out-of-State student's decision to attend a Colorado university and their cannabis use. Finally, since it is predicted that more non-resident users would begin attending a Colorado university related to the influence of recreational cannabis laws, it was hypothesized that frequency of use when compared would be higher among out-of-State-students than among in-State students, reflecting the increase in out-of-State users.

Methods

Participants and procedures

Undergraduate college students ($N = 5241$) completed a survey as part of a study on personality and health risk behaviors. Participants were 64.8% female between the ages 18 and 58 ($M = 19.67$, $SD = 2.43$). See Table 1 for full demographic and descriptive information. Participants were recruited from introductory and research methods psychology courses and received research credit in exchange for participation in the survey. The majority were from the introductory class which has students from various majors. The survey was completed on a personal computer either online or in a lab space with

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