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Implications of Marijuana Legalization for Adolescent Substance Use

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Abstract

Marijuana that is legally available for adults has multiple implications for adolescent substance use. One potential effect that legalization may have is an increase in adolescent use to due increased availability, greater social acceptance, and possibly lower prices. Legalization may also facilitate the introduction of new formulations of marijuana (edible, vaporized) and with potentially higher potencies. It is unknown what adolescent consumption patterns will be if marijuana is widely available and marketed in different forms, or what effects different patterns of adolescent use will have on cognition, the development of marijuana use disorders, school performance, and the development of psychotic illnesses. Also unclear is whether adolescent users will be experiencing higher levels of THC compared with previous generations of users due to higher potencies. While previous studies of the effects of adolescent marijuana use provide some guidance for current policy and public health recommendations, many new studies will be needed that answer questions in the context of use within a legal adult environment. Claims that marijuana has medicinal benefits create additional challenges for adolescent prevention efforts as they contrast with messages of its harmfulness. Prevention and treatment approaches will need to address perceptions of the safety of marijuana, claims of its medicinal use, and consider family-wide effects as older siblings and parents may increasingly openly consume and advocate for marijuana use. Guidance for primary care physicians will be needed regarded screening and counseling. Widespread legalization and acceptance of marijuana implies that as law enforcement approaches for marijuana control decline, public health, medical, and scientific efforts to understand and reduce negative consequences of adolescent marijuana use need to be substantially increased to levels commensurate with those efforts for tobacco and alcohol.

Keywords

marijuana; legalization; adolescents

INTRODUCTION

The Surgeon General’s 1964 report that smoking is harmful was arguably the most important substance abuse intervention in the United States. This report and subsequent

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efforts by anti-smoking groups, physicians, and public health agencies resulted in a shift in public perceptions of smoking and was followed by a steady decline of smoking in the United States resulting in 8 million lives being saved since 1964 due to tobacco control polices.[1] Currently, however, a reverse phenomenon for marijuana may be taking place. Claims that marijuana has medicinal properties, widespread state-level legalization of medical marijuana, recent recreational legalization in two states, and advertising of marijuana's purported harmlessness, may lead to a substantial increase in adolescent marijuana abuse and dependence.[2] Recent Gallup poll results report that for the first time, a majority of the American population now support marijuana legalization[3] suggesting that future policy shifts in the United States are likely to move toward increased marijuana legalization. The purpose of this commentary is to consider the possible implications of such a shift for adolescent substance use and abuse.

History of the Colorado Experience with Marijuana Legalization

Colorado legalized marijuana for medicinal purposes through a physician's recommendation in 2000, and legalized adult recreational marijuana use as of 2014. In the beginning of 2009, when the federal government emphasized that it would not enforce federal bans on marijuana in states that allowed it for medicinal consumption,[4] there were approximately 2,000 patients with a medical marijuana registration in Colorado. Within two years of the change in federal policy, the number of persons holding a medical marijuana registration had increased to an estimated 150,000.[5] Colorado currently has the highest per-capita number of medical marijuana license holders, with approximately 3% of the population possessing a marijuana license.[6] There has also been a rapid growth in medical marijuana centers, with over 809 dispensaries in Colorado (one-third of the nation's marijuana dispensaries). Recreational marijuana sales to anyone over 21 began January 1st, 2014 and Colorado's marijuana sales taxes (including both recreational and medical) for January, February, and March of 2014 respectively were ~3.5 million, ~4 million, and ~$5 million, reflecting the rapid growth of marijuana sales.[7] While Colorado has been one of the earliest adopters of marijuana legalization, by now medical marijuana laws exist in 21 states and the district of Columbia allowing for legal access to marijuana with a physician's recommendation and Washington state legalized recreational adult consumption.[8] Nationwide, many additional states are considering either allowing medicinal marijuana or outright legalization similar to the Colorado and Washington model. Thus, a substantial portion of the United States is experiencing the phenomena of legal adult marijuana use, either through the predominant medicinal route, but also now for recreational consumption in two states.

Historical Experiences with "Non-Penalization" of Marijuana in Holland

Due to the recency of marijuana policy changes in Colorado and in other states, making inferences about their effect on general population and adolescent use patterns is quite difficult. Analyses of the Dutch "coffeeshop" system of "non-penalization" provide some guidance about the likely effect of such legal changes for Colorado and the United States.[9–12] Based upon previous work analyzing this system it is worth noting both implications for the United States and areas of probable difference. First, Holland never

legalized marijuana, but developed a policy of "non-penalization," which is different from the current United States approach which has resulted in outright legalization in two states. There were two "phases" of cannabis quasi-legalization: non-penalization followed by commercialization.[10] During the commercialization phase there was some evidence of an increase in use among adolescents and some evidence of users increasing their consumption, however, it is important to note that in Holland cannabis prices remained fairly high, access became more restrictive (buyers currently have to be members of "cannabis clubs"), and that Dutch cannabis policy has shifted in response to perceptions of problematic use patterns developing (for example, initially youth aged 16 were allowed in the "coffeeshops" but this was then changed to 18). Dutch youth do have a higher mean level of marijuana use than those of youth in other European countries, however, their levels of use are below that of the United States, the United Kingdom, and France which have all (until recently) not allowed legal cannabis. There was also an increase in adolescent treatment seeking for cannabis problems associated with non-penalization, although it is unclear whether this was a causal relationship. Growing up within 20 kilometers of a marijuana dispensary was also associated with earlier age of onset of marijuana use.[13] Due to ongoing policy shifts it is difficult to determine whether Dutch youth were influenced by the "coffeeshop" system and were more likely to try marijuana or use it more frequently than before it existed. The major lessons from the Dutch experience for the United States are that marijuana control policies are likely to evolve, however, full-scale legalization as is now occurring in two states (Colorado and Washington) is a phenomena that is distinct from the Dutch experience. One area of major potential difference, is that full legalization and commercialization may substantially reduce the eventual price of marijuana.[9] Adolescents may be particularly influenced by eventual price reductions as they typically have more limited financial means and may be a primary target of black market sales.

Recent Analyses of United States Data and Case Reports of Adverse Outcomes

A number of manuscripts have analyzed recent United States trends in marijuana attitudes and consumption patterns in relation to medical marijuana laws and have come to differing conclusions regarding their effects. A recent report analyzing the effect of medical marijuana laws found that states with such laws have higher marijuana use, although it is unclear whether this effect is causal.[14] Another paper using data from the Youth Behavior Risk Survey up to 2011 found minimal evidence of an effect of changes in medical marijuana laws on marijuana use patterns in the first 1–5 years after enactment,[15] whereas a different manuscript using data from the National Household Survey on Drug Use that also examined data up to 2011 reported a significant decrease in adolescent perceptions of marijuana risk in Colorado compared to non-medical marijuana states as well as a significantly higher adolescent marijuana/abuse dependence prevalence after widespread adult medical legalization.[2] A number of reports suggest substantial diversion of medical marijuana to adolescents[16–19] as well as increases of marijuana overdoses in young children[20–22] as well as a significant increase in the proportion of marijuana-positive drivers involved in traffic fatalities in Colorado compared to non-medical marijuana states.[23] News reports have also recently noted two deaths linked to marijuana edibles, apparently resulting

from severe intoxication.[24] In summary, analyses of recent trends in marijuana consumption patterns and their relation to legal marijuana laws provide some evidence that when marijuana is legalized, there is an increase in marijuana use and marijuana-related problem behaviors, however, these findings must still be considered preliminary.

Marijuana as a Possible "Substitute" for Other Substances

Economic theory has focused on the association between alcohol and marijuana use with some authors suggesting that alcohol and marijuana use are complements,[25] while others suggest they are substitutes.[26] For example, Pacula (1998)[25] reported that an increased federal tax on beer had "a negative and significant effect on the demand for both alcohol and marijuana, implying that alcohol and marijuana are economic complements". Similarly, creating stricter college alcohol policies has been associated with reductions in marijuana use.[27] In contrast, other groups have shown that restricting the availability of alcohol by increasing the minimum drinking age[26] is associated with increased marijuana use and a decrease in marijuana use and increase in alcohol use around the age of 21 years, when alcohol use becomes legal, consistent with the substitute model.[28] Similarly, Chaloupka & Laixuthai (1997)[29] conclude "the successful marijuana related efforts in the 'War on Drugs', which can be expected to reduce the supply of marijuana and, hence, increase its price will not only lead to less marijuana consumption, but will have the unintended consequence of raising alcohol consumption." Anderson et al. (2013)[30] found that medical marijuana laws were associated with decreased likelihood of past-month alcohol consumption and binge drinking. Marijuana and tobacco use are also highly comorbid and some recent work suggests that changes in marijuana use may impact tobacco use, though the directionality of the relationship also remains unclear. For example, Allsop et al. (2014)[31] demonstrated that during voluntary abstinence from marijuana use, tobacco use increased by 14 cigarettes per week. In contrast Peters & Hughes, (2010)[32] studying daily marijuana users during a 13 day period of abstinence, did not demonstrate increases in cigarette or non-marijuana illicit drug use. Finally, it has recently been suggested that medical marijuana use may be associated with reductions in opioid use.[33,34] Thus both models have some empirical support, but predict opposite marijuana-related effects of legalization and rapid commercialization of marijuana.

Scientific Views on Harms of Adolescent Marijuana Use

A substantial concern about legalization of adult marijuana use is that it will result in an increase in adolescent use, a group that appears to be most vulnerable to its harmful effects. A recent review summarized much of the current knowledge regarding the harmful medical and behavioral effects of marijuana consumption[35] Adolescent marijuana use has been associated with impairment in a number of areas: impaired cognitive functioning,[36] increased risk of developing marijuana dependence,[37] elevated rates of school dropout,[38] an elevated risk of developing psychotic illnesses,[39,40] and an increased rate of engaging in risky behaviors.[41] Weekly marijuana use under age 18 years has been associated with an eight-point drop in intelligence among those who develop persistent dependence, while those with adult onset of comparable levels of use are less affected; importantly, the loss of cognitive capacity may not recover completely after desisting from marijuana use.[42] Some

authors have criticized this finding for not accounting for social economic status[43] or personality[44] differences, however, empirical analyses have not found support for this concern.[45] Schweinsburg et al.[36] reviewed the literature of marijuana's effect on cognition and concluded that adolescents demonstrate persisting deficits related to heavy marijuana use for at least six weeks following discontinuation, particularly in the domains of learning, memory, and working memory. Further, they appear more adversely affected by heavy use than adults. However, the authors noted that "although adolescents who use marijuana heavily demonstrate decrements compared to non-using teens, it is still unknown whether marijuana use caused or contributed to these effects." Similarly, early use has been associated with poor outcomes in a number of other domains, however, these associations do not necessarily signify causality. Instead early use may act as a marker of a more generalized tendency to engage in risky behaviors.[46,47] Thus, although many studies of adolescent marijuana use demonstrate harms associated with such use, difficulties in controlling for the effects of third variables or confounders that may influence both marijuana use and adverse outcomes limits the strength of the conclusions that can be drawn about the causal influence of adolescent marijuana use. Finally, all research on the epidemiology of marijuana use conducted to date in the United States has been conducted in an environment where marijuana use is illegal. Results of previous studies examining the patterns of marijuana use and associations with other substances, patterns of development of marijuana use disorders, and associations with other psychopathology may not generalize to conditions of widespread legality, an environment where marijuana use has greater social acceptance, is marketed and available in different forms (e.g., drinks, edibles, vaporized), and where the marijuana itself may have substantially higher THC contents than marijuana previously consumed.[48]

The issue of scientific clarity regarding the harms of adolescent marijuana use has substantial implications beyond influencing the debate about whether marijuana should be legalized or not. Consider a hypothetical environment where marijuana is legal for adult recreational consumption, widely available, and widely believed to be harmless or even beneficial. How will prevention efforts be conducted if there is not clear scientific, medical, and public consensus that marijuana use is harmful? How will treatment be conducted when there is substantial disagreement about the harmfulness of using marijuana? Will primary care physicians screen adolescents for marijuana use as they do for alcohol and tobacco? How will counseling be conducted and what guidelines for physician advice will be promoted? What if an adolescent requests marijuana as a treatment for psychiatric or medical conditions? Legalization implies that law enforcement efforts to control or reduce marijuana use will be limited, leaving public health, medical, and scientific organizations to reduce harm and educate the public. These stakeholders face major challenges in developing clear messages, particularly in an evolving policy climate. If marijuana becomes widely legal in the United States or internationally, the need grows to have current and rigorous scientific evidence about the effects of marijuana consumption, particularly for adolescents. Claims of medicinal benefits need to be addressed clearly and concerted efforts to develop a coordinated public health policy response to legalization are needed.

Recommendations for a Research Agenda and Practitioners

Marijuana policy continues to evolve, however, legal marijuana use appears likely to become more accepted given recent trends. Tobacco is widely recognized as a legal, but a harmful substance for both adolescents and adults and is the focus of substantial public health, physician, and scientific efforts to mitigate public harms and consumption. Alcohol is understood to be harmful when consumed in excess, and clear guidelines exist for its consumption by adults. Substantial efforts exist to understand and reduce adolescent drinking. In contrast, marijuana is alternatively a banned substance with no medicinal properties federally, while being allowed for medicinal purposes in many states with essentially no enforcement of federal laws, and now available for recreational consumption in two states. Apparently, partly in response to the growing acceptance of marijuana, the National Institute on Drug Abuse, National Institute on Alcohol Abuse and Alcoholism, the National Cancer Institute, and the National Center on Child Health and Development plan to launch a major national study to examine the effects of substance exposure on developing adolescents.[49] Such a study would certainly help elucidate the effects of marijuana and other substances on the developing adolescent. Additional studies however, will be needed to examine treatment and prevention messages that can be effective in a more permissive environment, as well as addressing claims of medicinal benefits and coming to a clearer scientific consensus about the strength of such claims. For clinicians in the adolescent substance abuse field who are treating adolescents with cannabis or other substance abuse disorders, a major challenge will be around issues of relapse or use of marijuana in a legal environment. Although this is not a new challenge for any clinician, marijuana may become the new “tobacco” in the sense that patients and their families may view it as not being as serious a substance to worry about and it may act as the first substance which triggers a relapse. Family members own use of marijuana may also become a more serious barrier to adolescents trying to maintain sobriety. Education about the addictive properties and deleterious effects of marijuana for both patients and family members may need to become a more routine part of any adolescent substance abuse treatment.

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