



# Smoke and Mirrors: The Recreational Marijuana Debate

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## Abstract

The increasingly widespread legalization of recreational marijuana should raise concerns regarding the societal and medical impact of its use. The relative cultural acceptance for its use should be counterbalanced with an honest and scientific review of the adverse impacts. This article provides a synopsis of recent studies that point to significant concerns from medical and psychiatric viewpoints.

**Summary:** With the increasing number of states that have legalized the use of recreational marijuana, concerns regarding its negative effects are necessary. There is growing scientific evidence that the use of marijuana for recreational purposes has a wide variety of negative health effects, both physical and psychiatric.

## Keywords

Addiction, Addiction psychiatry, Adolescent health, Drug side effects, Neuroendocrine effects of exogenous substances, Marijuana, Public policy

Ten states and the District of Columbia currently allow adults to legally use recreational marijuana. Nearly every other state has introduced legislation that seeks to decriminalize it, and several contenders for the 2020 presidential election voiced support for a nationwide legalization of recreational cannabis. It is the most commonly used illicit drug in the United States in spite of contentious debate over the benefits of legalized recreational use *versus* its negative impacts. Over the past several years, a growing body of evidence in the scientific literature has raised significant questions regarding the advisability of legal and ready access to cannabis for “recreational” purposes.

The primary psychoactive component of cannabis is delta-9 tetrahydrocannabinol (D9-THC). After inhalation or ingestion, D9-THC binds to cannabinoid receptors (CBRs), part of the endocannabinoid system. The CBRs are important in regulation of cognitive, behavioral, and emotional functions, but with exposure to D9-THC, CBRs are excessively activated, leading to the “high” reported by marijuana users (Sullivan and Austriaco 2016). Simultaneously, cognitive functions are further impaired by

a decrease in cortical dopamine levels (Stokes et al. 2010). A growing body of evidence has clarified the pharmacogenetics in humans related to marijuana use and its effects. These data have demonstrated increased risks of schizophrenia and dependency in genetically predisposed individuals, particularly with identification of specific single-nucleotide polymorphisms (Hryhorowicz et al. 2018).

## Adverse Medical Effects

From a medical perspective, the adverse impact of cannabinoids on multiple organ systems has been demonstrated. Marijuana use has been linked to immunosuppression, producing a greater vulnerability to infection and disease (Friedman, Newton, and Klein 2003). Alterations in the structure and function

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of pulmonary macrophages have been noted, resulting in extensive airway injury and impairment with inhaled marijuana (Aldington et al. 2007). As a result, chronic users of marijuana have a higher risk for long-term pulmonary diseases including bronchitis and emphysema (Beshay et al. 2007). Cardiovascular effects are among the most concerning, including increased risk of angina, myocardial infarction, and fatal stroke (Grace, Kloner, and Rezkalla 2014; Jones 2002).

## Adverse Neurologic Effects

A significant amount of research regarding marijuana usage relates to neuropsychological and psychiatric studies. When compared to matched controls, marijuana users demonstrate impairments in cognitive abilities including verbal memory, spatial working memory, spatial planning, and decision-making (Sullivan and Austriaco 2016). Structural neuroimaging studies show growing evidence of abnormalities in hippocampus volume and gray matter density of cannabis users relative to controls, while functional neuroimaging studies suggest an altered pattern of brain activity associated with cannabis use (Nader and Sanchez 2018).

With diffusion-weighted magnetic resonance imaging and brain connectivity mapping of regular cannabis users and matched controls, microstructural alterations were found in axonal connectivity in cannabis users. These structural changes were most notable in the hippocampus, the corpus callosum, and commissural fibers. A direct relationship between the degree of the abnormal findings and the age the user began using cannabis was demonstrated, with the greatest impact in those who commenced regular use between ages ten years and eighteen years. The authors concluded that “long-term cannabis use is hazardous to the white matter of the developing brain” (Zalesky et al. 2012).

An increasing amount of attention to marijuana use among adolescents adds evidence of the profound adverse effect on the developing brain. In a placebo-controlled, double-blind crossover study, adolescents did not demonstrate satiety after cannabis administration; rather, they wanted more. Findings of impaired memory, physiological, and psychotomimetic effects are suspected as a factor in the increase in adolescent use of marijuana, particularly in the mid-teen years, after exposure at a young age (Mokrysz et al. 2016).

High-resolution MRI scans of young adult marijuana users and matched controls revealed exposure-dependent alterations of the neural matrix

particularly in the left nucleus accumbens, hypothalamus, and amygdala. This change in these “core reward structures,” particularly the amygdala and nucleus accumbens, is consistent with earlier animal studies demonstrating changes in dendritic arborization (Gilman et al. 2014).

## Adverse Psychiatric Effects

More recent studies of the psychiatric impact of cannabis use are of significant importance and concern. A study of daily cannabis users in Europe and Brazil revealed increased risk of first-episode psychosis compared to never-users. The authors reported a direct relationship between the risk of first-episode psychosis and other variables, including use of high-potency cannabis, daily usage of cannabis, and users who spent more than €20 per week on cannabis. The authors’ conclude that “the strongest independent predictors of whether any given individual would have a psychotic disorder or not were daily use of cannabis and use of high-potency cannabis.” They estimated that 12 percent to 50 percent of first-episode psychosis cases could be prevented if high-potency cannabis were not available (Di Forti et al. 2019). Additional concern is warranted with studies of cannabis use in adolescents which also demonstrate an increased risk of psychosis (Mustonen et al. 2018).

An elevated incidence of psychotic symptoms and schizophrenia-like psychoses has also been associated with cannabis use in prospective epidemiological studies. These reports are related to several factors, particularly early onset of use, daily use of high-potency cannabis, and synthetic cannabinoids, with functional MRI studies linking the psychotomimetic and cognitive effects of THC to activation in brain regions implicated in psychosis (Murray et al. 2017).

## Potential Addiction Effects

Marijuana proponents often maintain that the risk of addiction with cannabis use is low or nonexistent. However, ample data are available to counter this claim. Both human and animal studies have revealed that the THC in cannabis supports “the acquisition and maintenance of robust drug-taking behavior in subjects with no history of exposure to other drugs” (Justinova et al. 2005). Evidence such as this appropriately raises caution about the substitution of cannabis for treatment of opioid addiction and the potential harm incurred (Humphreys and Saitz 2019).

In contrast to the support for the medical use of marijuana as a “safer alternative” to other prescription medications, the opposite result has been demonstrated. Medical marijuana users were significantly more likely to report medical use of prescription drugs in the preceding twelve months, and were also significantly more likely to report nonmedical use in the preceding twelve months of any prescription drug, with elevated risks for pain relievers, stimulants, and tranquilizers (Caputi and Humphreys 2018).

### Adverse Social Effects

The impact of marijuana use on society at large is significant and increasing. Large government-funded surveys of the American population are both instructive and cautionary with findings regarding marijuana use (Substance Abuse and Mental Health Services Administration 2015). Marijuana use has increased from 5.8 percent of those twelve years of age or older in 2007 to 7.5 percent in 2013, an increase of 5.4 million marijuana users. As a counterpoint to the position that marijuana is not a “gateway drug,” this 2015 survey found that more than 70 percent of new illicit drug users began with marijuana. Further, marijuana was found to have the highest rate of dependence or abuse among all illicit drugs. The survey reported that 4.2 million Americans met the clinical criteria for marijuana dependence or abuse, which is twice the number for prescription pain relievers and five-fold higher than cocaine.

The American Association of Poison Control Centers studied state trends in “unintentional pediatric marijuana exposures” from 2005 to 2011. The results are profound, especially as the median age of the child exposed was less than two years old. Decriminalized states reported a 30 percent increase in annual calls, while there was no change in call volume in nonlegal states (Wang et al. 2014).

The negative impact on education and safety is demonstrated by the association of marijuana use and the increased likelihood of dropping out of school as well as the two-fold increase in the risk of a car accident when driving under cannabis’ influence (Volkow et al. 2014).

It is noteworthy, and troubling, that the potency of illicit cannabis plant material has increased consistently. Over the past twenty-five years, the average THC content has tripled, while the CBD content has fallen by half. This has produced an increase in the THC: CBD ratio of 14:1 in 1995 to

nearly 80:1 in 2014, with concomitant increase in the psychoactive effects (EISohly et al. 2016).

Concerns regarding legalization of recreational marijuana have also been raised in the mainstream media. These cautionary accounts are found even in states such as Colorado, where legalization began in 2012. Marijuana-related emergency room visits to Children’s Hospital Colorado facilities for teenagers and young adults under 20 years old increased dramatically from 106 in 2005 to 631 in 2014. In addition, the number of visits by these individuals who subsequently needed psychiatric evaluation increased by seven-fold, from 65 in 2005 to 442 in 2014 (Ingold 2017)

Additional reports from Colorado reveal an increase in marijuana-related traffic deaths. In the political arena, numerous state regulators have been indicted for corruption. The increased tax revenue expected following legalization was touted for its benefit to Colorado schools. However, after early experience following legalization, the superintendent of one of the largest school districts in the state commented, “The only thing that the legalization of marijuana has brought to our schools has been marijuana” (Hunt 2017, p. 8).

### Conclusion

It is highly likely that the evidence-based findings that identify the harmful effects of marijuana will increase steadily. As discussed above, proponents of legal recreational marijuana argue that there is no greater risk for addiction compared to alcohol. Such a comparison is superficial and illogical, given the evolution of cannabis potency over time. Alcohol content has remained stable in alcoholic beverages over many decades. In contrast, the concentration of D9-THC, the most psychoactive ingredient in cannabis, has tripled within the past three decades. Cigarette and alcoholic beverage companies are investing billions of dollars in cannabis companies, especially in Canada, ostensibly anticipating a growing opportunity in the American marketplace. The tactics of the pro-marijuana movement bear an eerie similarity to those of “Big Tobacco” in the past. In a quest to maximize profits, manufacturers added increasing amounts of addictive chemicals to cigarettes in the mid-twentieth century. The success of their business was directly correlated with their customers’ physical need for their product. Does “Big Marijuana” have the same business plan? The potency of their product is being increased. Large farms for growing aim to feed a market that is trying

to move from a criminal to a retail world, including unregulated online sales.

The parallels between recreational marijuana and the current “opioid epidemic” are also striking and instructive. The original Food and Drug Administration approval of Oxycontin in 1995, followed by its approval for the drug’s reformulation in 2010, coincided with the 1998 endorsement of the Federation of State Medical Boards for opioid use with noncancer pain. Further emphasis on a perceived need for increased opioid prescriptions followed the Joint Commission’s requirement that pain assessment be considered the “fifth vital sign” in 2000. This unleashed a “perfect storm” for increasing opioid use and demand. Today, the negative societal impact of these combined factors is clear. As the recreational marijuana debate moves forward, it is imperative to recall this and other past experiences with “the law of unintended consequences.”

We can be confident in all states debating this issue that the battle will continue. A very simple question is needed, which is pertinent from both medical and social perspectives. Do the benefits outweigh the risks? A thorough and objective review of the literature of the past two decades leads to a clear conclusion of harm greatly exceeding any purported benefit. A finer philosophical point can be added from then Cardinal Ratzinger: “Drugs are the pseudo-mysticism of a world that does not believe, yet cannot rid the soul’s yearning for paradise.” An honest assessment reveals a clear distinction between the tree of the knowledge of good and evil in the Garden of Eden (Genesis 2:9) and the marijuana plant. The Old Testament tree offers a path of truth, while recreational use of the *Cannabis* genus is ill-advised, deceitful, and harmful.

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