

The Health Effects of the Legalization of Marijuana – Part 3

by Tatiana Bailey
Director, *UCCS Economic Forum*

One of the first things to consider when evaluating public health impacts is how widespread or prevalent a health issue is. Marijuana use has always been on the radar in terms of health and safety, but legalization has magnified that conversation as more than half of U.S. states have legalized medical marijuana and eight states plus the District of Columbia have legalized recreational marijuana. In 2015, 22.2 million Americans had used marijuana in the past month, or roughly 8% of the U.S. population. In the state of Colorado in 2015, surveys show past-month use between 13% and 17%¹, which is significantly higher than the U.S. rate of 8%. In terms of youth across the U.S., 36% of 12th graders had used marijuana in the prior year, 23% had used in the past month, and 6.5% used daily or nearly daily.² By 2016 in Colorado, there were more legal, medical and retail marijuana dispensaries (940 total) than there were McDonalds (202) and Starbucks (322).³

The prevalence makes the understanding of the health impacts particularly important. Yet, as mentioned in article one in this series (<http://www.uccseconomicforum.com/publications/By-the-Numbers-Jul-21.pdf>), it is inherently difficult to tease out health impacts primarily for two reasons. One, the illegality of marijuana up until relatively recently has made data collection challenging. Two, there is possible reverse causation in many of the studies that have shown negative impacts especially on mental health: does marijuana cause increases in mental health disorders or are people predisposed to mental health disorders more likely to regularly use marijuana? The aim in this article is not to promote or reject theories, but only to present relevant health information, especially as it relates to recreational use. Marijuana use mainly for chemotherapy patients, seizure-related disorders, and as a substitute for opioid pain killers is generally accepted by the medical profession and is a somewhat separate issue. Nonetheless, the prevalence of use makes it particularly important to disseminate the reliable information we do have, and the legal status of recreational marijuana in our state provides both an opportunity and a need to do so.

To begin, brain imaging shows that marijuana primarily affects the hippocampus, a brain area responsible for memory formation, and the amygdala, responsible for emotions, survival instinct, memory, and reward system receptors. We know that long-term users of marijuana have reduced volumes in both of these regions of the brain and that even 28 days after not using, there is less activity in these brain regions. We also know that the hippocampus and amygdala undergo prominent developmental changes throughout childhood and adolescence, which likely explains why early users of marijuana show more significant and negative outcomes than those who begin using in adulthood. A large, longitudinal study in New Zealand found that persistent marijuana use during adolescence was associated with a loss of 6-8 IQ points by mid-adulthood, and this was equally true for adults who had quit using as well as those who continued using. Again, these results are not conclusive because the lower IQ may be caused by other factors inherent to young people who choose to use marijuana. It is notable that individuals who began using marijuana heavily in adulthood did not appear to have any loss in IQ.

Given the brain impacts, one area that merits greater attention is the possible correlation between the increased potency of tetrahydrocannabinol⁴, or THC, and youth suicides (see graphs). Given the effects of marijuana particularly on the adolescent brain, the psychotropic properties of THC, and the self-reported increase in suicide ideation⁵, it is possible that the alarming increase in youth suicides may be linked to the increases in THC potency. Correlation is not necessarily causation, but the possibility of association certainly calls for further study.

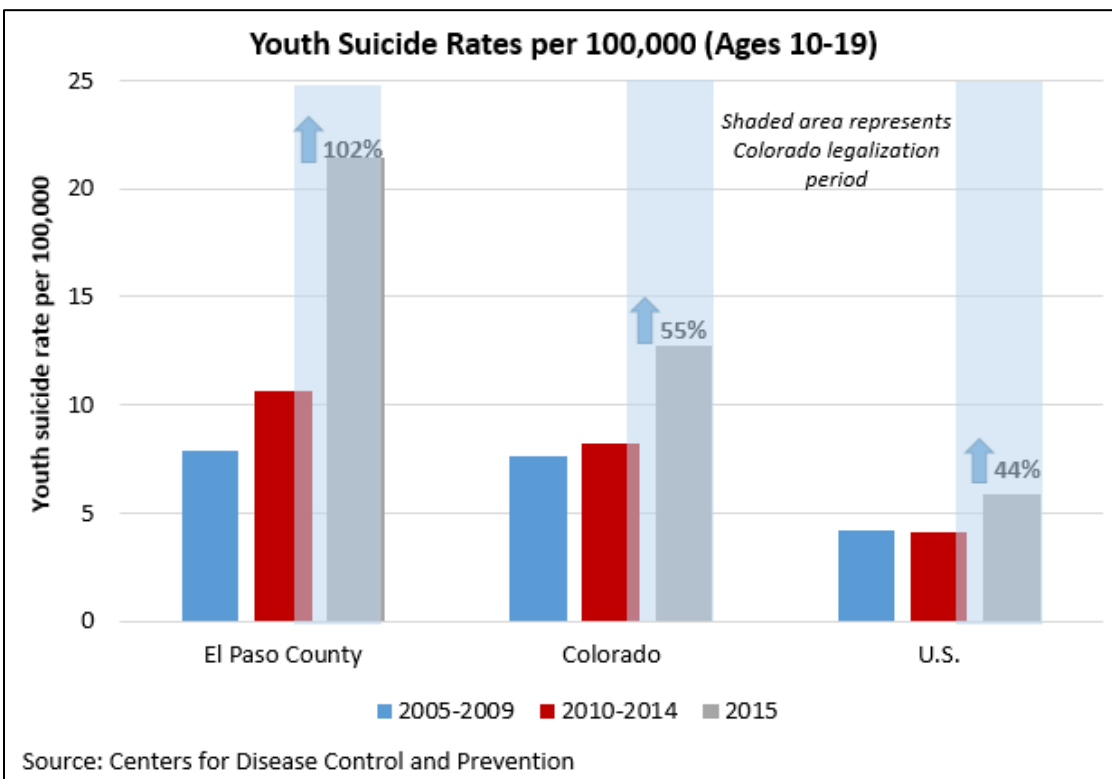
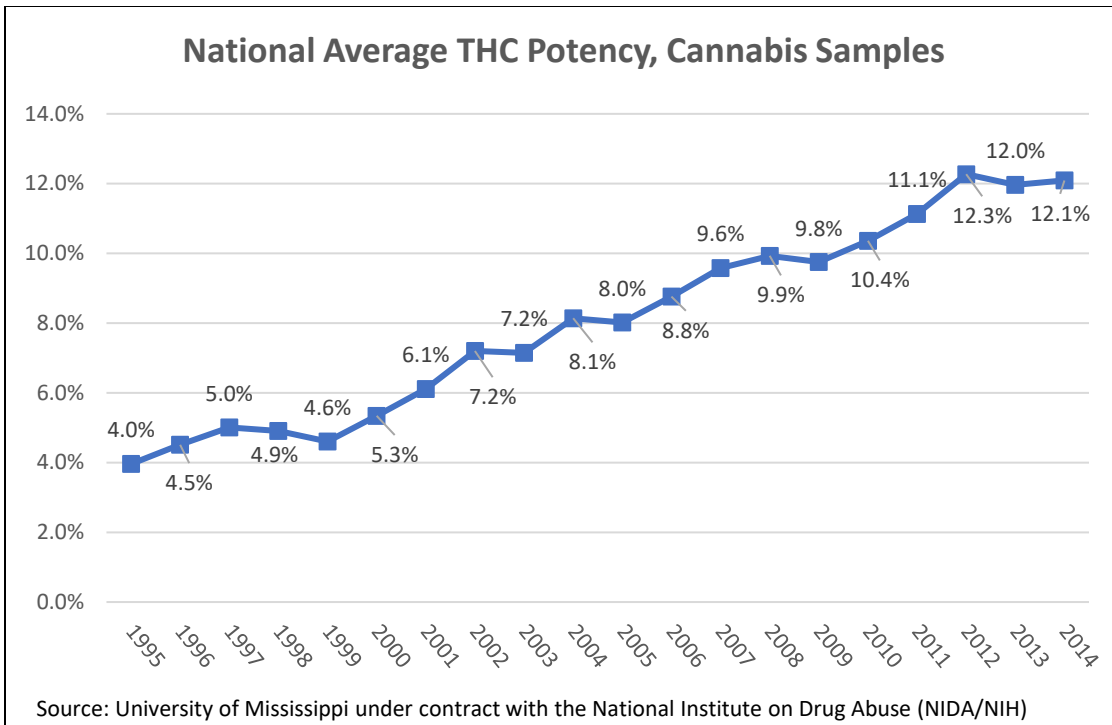
¹ Colorado Department of Public Health and Environment.

² National Institute on Drug Abuse (NIDA), a branch of the National Institutes of Health (NIH)

³ Rocky Mountain High Intensity Drug Trafficking Area, Sept. 2016.

⁴ THC is the main mind-altering ingredient found in the marijuana plant.

⁵ Bovasso, G.B. "Cannabis Use as a Risk Factor for Depressive Symptoms." *American Journal of Psychiatry*. 2001.



For both adolescents and adults, some research suggests that marijuana use increases the chances of developing psychotic disorders including schizophrenia when an individual has a genetic predisposition. Although research continues on this topic, it is evident that for individuals who carry a specific gene, there is a seven-fold increased risk of developing psychosis, or loss of reality, when that individual uses marijuana. For schizophrenia, a user also has to carry a specific gene⁶ in order to be at increased risk with marijuana use of triggering schizophrenia or worsening the condition. About one percent of the population has schizophrenia and even less carry that specific gene. However, there are two important points to consider. One, for all users, in high enough doses, marijuana does cause psychosis, and there is mounting evidence that

⁶ In terms of psychosis, it is the AKT1 gene. For schizophrenia, it is the Val-type COMT gene (NIDA/NIH).

psychosis itself is harmful to the brain and can increase the probability of triggering a psychotic disorder. Another point to consider is that the U.S. already has a high prevalence of mental health disorders and at the same time, a low availability of providers to treat mental illness.

The circulatory system is also impacted by marijuana use because an individual's heart rate is elevated for up to 3 hours after smoking. The increased potency in edibles magnifies this effect. There are now numerous studies that show a person's risk of a heart attack during the first hour after smoking marijuana is almost five times his or her usual risk.⁷ Most healthy individuals can easily withstand an increase in their heart rate although edibles, in particular, can cause a heart rate to even double. This increase in beats per minute is too taxing on the circulatory system of some individuals who have either diagnosed or undiagnosed heart conditions.

In terms of marijuana possibly being a "gateway drug," studies are inconclusive. It is true that marijuana causes cross sensitization meaning that the impact of other drugs (including alcohol) are heightened when the brain has already been exposed to marijuana. This would suggest that marijuana is a gateway drug, however, reverse causation may again explain this phenomenon. Marijuana users may be predisposed to drug taking, and marijuana may simply be the easiest drug to start with given its availability and that it is relatively inexpensive.

There are longitudinal studies that have shown less optimal life outcomes for regular marijuana users, such as lower educational attainment, lower income, lower life satisfaction and increased prevalence of anxiety and depressive disorders. It is possible that the above-mentioned impacts on the brain do provide a plausible biological explanation. It is also possible that at least some of the less optimal life outcomes are due to the downstream effects of (particularly early) use of marijuana and its impact on school performance, high school completion and in some cases, even incarceration related to marijuana possession and/or use. In other words, perhaps the unfavorable, long-term impacts are partially due to the biological impacts, but also due to the social outcomes associated with early use, which young adults can carry with them throughout adulthood (e.g. absence of a high school diploma).⁸ In either case, there are associated, long-term social and economic costs.

In the short term, it is also important, and in effect, easier to assess health care costs. A comprehensive, retrospect analysis was done of Colorado hospital admissions and ED visits with marijuana-related billing codes and calls to regional poison control centers (RPC). Results show an increase in hospitalizations: from 2000 to 2015, hospitalization rates with marijuana-related billing codes increased from 274 to 593 per 100,000 admissions (up 116%). The prevalence of mental illness among ED visits with marijuana-related codes was five-fold higher than the prevalence of mental illness without marijuana-related codes comparing the same two time periods. In 2014, the first year of commercially available recreational marijuana, calls to RPCs increased 79.7%.⁹

If I try to take off my public health hat and step back from these negative health repercussions, I do acknowledge that not unlike alcohol, limited and responsible *adult* use of marijuana does not appear to be that different than responsible drinking. The negative impacts of both substances are very dose dependent. The question remains on whether we can successfully regulate use and potency, reduce or eliminate childhood and adolescent use given the deleterious impacts on the developing brain, and whether it is wise to readily expose our communities to even more sources of costly health problems and increased safety issues. Given that our state has already gone down the path of legalization, what is certain is the call for a holistic analysis that not only focuses on economic benefits, but one that also incorporates and quantifies the associated health and safety costs of increased access and use of marijuana.

Thank you to Rebecca Wilder and Katya Campbell for compiling the youth suicide rates.

Published by the Colorado Springs Business Journal on September 15, 2017; www.csbj.com.

⁷ California Association of Addition Medicine, a state chapter of the American Society of Addiction Medicine, 2011.

⁸ California Association of Addition Medicine, a state chapter of the American Society of Addiction Medicine, 2011.

⁹ Wang GS, Hall K, Vigil D, Banerji S, Monte A, VanDyke M. "Marijuana and Acute Health Care Contacts in Colorado." Elsevier, March 22, 2017.