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THE TRUTH ABOUT MARIJUANA, MENTAL ILLNESS, AND VIOLENCE: A REVIEW OF ALEX BERENSON'S CLAIMS IN *TELL YOUR CHILDREN*

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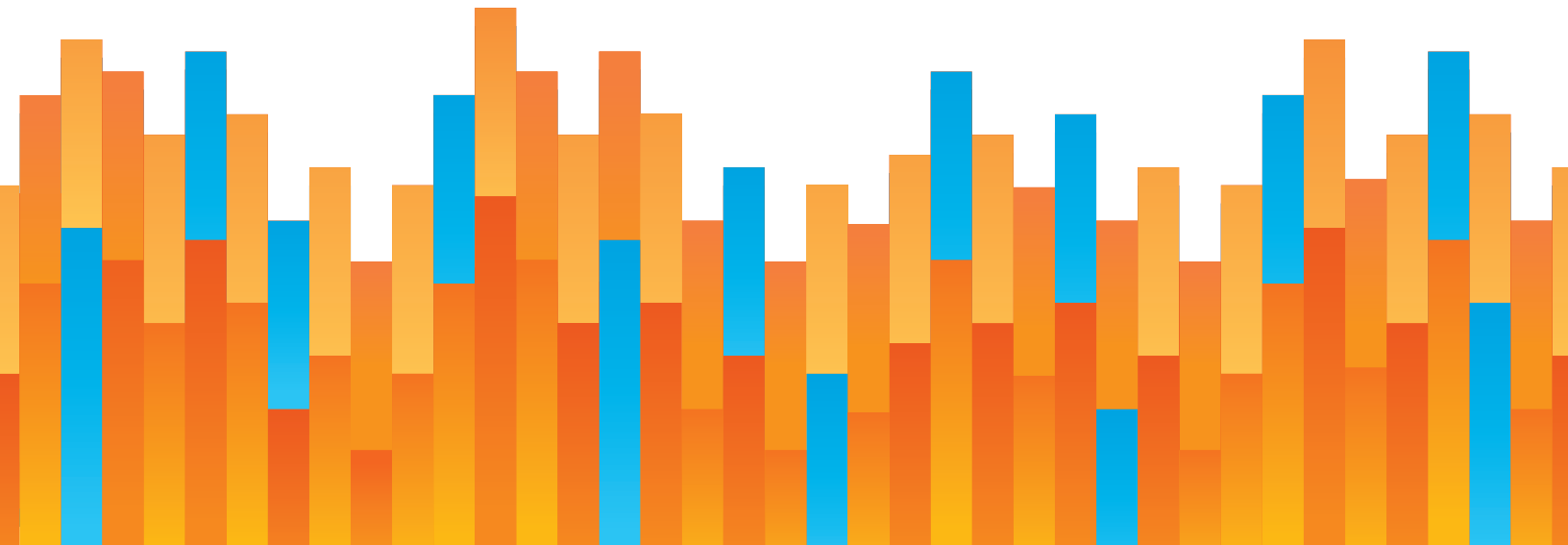

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PART 1

INTRODUCTION

Marijuana liberalization has proliferated throughout the United States over the past decade. Though still technically illegal under federal law, marijuana is now permitted for medical use in 40 states and recreational use in 24 states and the District of Columbia.[1] Attitudes towards marijuana use have greatly changed throughout the United States over the course of the last twenty years. According to a 2024 Pew Research poll, 88% of Americans now believe that marijuana should be made legal for at least medical use, with 57% of Americans also supporting legalization for recreational use.[2] This sentiment stands in stark contrast to public opinion in 2000, when only 31% of Americans supported recreational legalization.[3]

1 Jacob James Rich et al., "Effect of cannabis liberalization on suicide and mental illness following recreational access: a state-level longitudinal analysis in the USA" *medRxiv*, 17 June, 2022, https://doi.org/10.1101/2020.09.25.20201848 (accessed 17 June, 2022).

2 Carroll Doherty et al., "Most Americans Favor Legalizing Marijuana for Medical, Recreational Use," Report, 26 Mar. 2024, https://www.pewresearch.org/wp-content/uploads/sites/20/2024/03/PP_2024.3.26_marijuana_REPORT.pdf (accessed 12 Sep. 2024).

3 Andrew Daniller, "Two-thirds of Americans Support Marijuana Legalization," Pew Research Center, 14 Nov. 2019, www.pewresearch.org/fact-tank/2019/11/14/americans-support-marijuana-legalization/ (accessed 18 Dec. 2020).

> *According to a 2024 Pew Research poll, 88% of Americans now believe that marijuana should be made legal for at least medical use, with 57% of Americans also supporting legalization for recreational use.*

Additionally, major research organizations have concluded that marijuana can effectively treat a range of medical conditions, including chronic pain, according to a report from the National Academies of Sciences, Engineering, and Medicine (NASEM).[4] Other studies show that marijuana is also effective in treating mental illnesses, such as post-traumatic stress disorder.[5, 6] Amid changing perceptions of recreational use and increased understanding of potential medical applications, the U.S. is now considering an adjustment of marijuana's current prohibited status under federal law.[7]

Despite these trends towards the general acceptance of marijuana legalization in the U.S., many remain skeptical of marijuana's alleged benefits and wary of its potential consequences. In his book *Tell Your Children: The Truth About Marijuana, Mental Illness, and Violence*, journalist Alex Berenson voices concern about the relationship between marijuana use and the increased likelihood of experiencing psychosis and developing schizophrenia.[8] Furthermore, the onset of schizophrenia, he argues, makes one more likely to experience a violent psychotic episode, increasing the risks surrounding marijuana use. He also alleges that medical marijuana use is misguided, given that little medical evidence suggests that the drug has any effectiveness in palliating the medical complications its advocates claim it can treat.

4 *The Health Effects of Cannabis and Cannabinoids: The Current State of Evidence and Recommendations for Research*, report, The National Academies of Sciences, Engineering, and Medicine (Washington, DC: National Academies Press, 2017), 13.

5 Zach Walsh et al., "Cannabis for Therapeutic Purposes: Patient Characteristics, Access, and Reasons for Use," *International Journal of Drug Policy* 24, no. 6 (Nov. 2013).

6 Zach Walsh et al., "Medical Cannabis and Mental Health: A Guided Systematic Review," *Clinical Psychology Review* 51 (Feb. 2017).

7 Office of Public Affairs, U.S. Department of Justice, "Justice Department Submits Proposed Regulation to Reschedule Marijuana," 16 May, 2024 (accessed 14 Nov., 2024).

8 Alex Berenson, *Tell Your Children: The Truth About Marijuana, Mental Illness, and Violence*, Free Press, (January 8, 2019).

This review examines Berenson's claims in light of the current literature in epidemiology, public health, and economics by reviewing his research summary and analyzing government data measuring marijuana use, mental illness, and violence. Despite Berenson's claims, much of the literature he cites concludes that marijuana is effective in treating many conditions, including chronic pain—one of many scientific findings Berenson chooses to omit in his book.

However, there does appear to be an association between mental illness and marijuana use at the individual level, including a rare onset of schizophrenia.[9, 10] Still, the risk of developing mental illness is less associated with marijuana use than other intoxicants, like alcohol, and the risk decreases with lower levels of consumption.[11, 12] Additionally, it is unclear whether marijuana use leads to an increased likelihood of developing mental illness or if people with mental illnesses, like depression, are just more likely to use marijuana. The possibility of self-medication further complicates the understanding of this relationship.

> *Due to predictive decreases in violence following regulated marijuana access at the state level, we conclude that benefits from further liberalization outweigh public health concerns surrounding mental illness.*

Due to predictive decreases in violence following regulated marijuana access at the state level, we conclude that benefits from further liberalization outweigh public health concerns surrounding mental illness. Additionally, the risk of schizophrenia can be materially

9 Sven Andréasson et al., "Cannabis and Schizophrenia: A Longitudinal Study of Swedish Conscripts," *The Lancet* 330, no. 8574 (1987).

10 S. Andréasson, P. Allebeck, and U. Rydberg, "Schizophrenia in Users and Nonusers of Cannabis," *Acta Psychiatrica Scandinavica* 79, no. 5 (1989).

11 Jacob James Rich et al., "Effect of cannabis liberalization on suicide and mental illness following recreational access: a state-level longitudinal analysis in the USA" *medRxiv*, 17 June, 2022, https://doi.org/10.1101/2020.09.25.20201848 (accessed 17 June, 2022).

12 *The Health Effects of Cannabis and Cannabinoids: The Current State of Evidence and Recommendations for Research*, report, The National Academies of Sciences, Engineering, and Medicine (Washington, DC: National Academies Press, 2017), 294.

eliminated for almost all people with no current mental health issues through reasonable moderation. Furthermore, because marijuana-induced mental illness is so rare, marijuana's effect on violence through compounding mental illness is not measurable and marijuana legalization appears to reduce the prevalence of violent crime and suicide.

Our analysis finds that at the state level:

- Recreational and medical marijuana legalization are not followed by increases in mental illness.
- Increases in marijuana use are associated with increases in mental illness for all age groups.
- Regulated marijuana access is followed by slight reductions in suicide for young adult men.
- Recreational marijuana access is followed by reductions in homicide.
- Recreational and medical marijuana legalization are associated with reductions in drug crime arrest rates and reductions in racial disparities in drug-sale arrests.
- Recreational marijuana legalization is followed by increases in marijuana use among adults, but stable rates of marijuana use among children.

Berenson's characterization of the academic literature studying marijuana is limited, periodically inaccurate, and not sufficient to model policy. Despite the claims made in *Tell Your Children*, marijuana prohibition does not reduce rates of mental illness, while legalization appears to reduce violence by eliminating dangerous illicit markets.

PART 2

MARIJUANA AND MENTAL ILLNESS

2.1 THE DIFFERENCE BETWEEN PSYCHOSIS AND "GETTING HIGH"

According to the National Institute of Mental Health, "[t]he word psychosis is used to describe conditions that affect the mind, where there has been some loss of contact with reality."[13] Symptoms can include hallucinations, delusions, incoherent speech, and other inappropriate behaviors. In *Tell Your Children*, Berenson builds his thesis on the assumption that there is a strong relationship between various psychoses and the consumption of marijuana. Although Berenson is correct that marijuana use is the cause of some psychosis-like symptoms, his observations are presented as derisions and ignore much of the context surrounding recreational marijuana use.

The truth is that there is no clear definitional difference between psychosis and being "high."[14] Marijuana's active ingredient tetrahydrocannabinol (THC) can be any combination of a stimulant, depressant, and hallucinogen, all of which can motivate euphoric experiences that can be labeled as psychoses. While psychosis can be undesirable, in the

[13] National Institute of Mental Health, "What is Psychosis?" Health Topics, Schizophrenia, What is RAISE? https://www.nimh.nih.gov/health/topics/schizophrenia/raise (accessed 11 July, 2022)

[14] See Bob Green, David Kavanagh, and Ross Young, "Being Stoned: A Review of Self-reported Cannabis Effects," *Drug and Alcohol Review* 22, no. 4 (Dec. 2003), 455.

context of marijuana use, it is important to acknowledge that altering one's mental state is often the goal of consumption. If someone is found hallucinating under the influence of marijuana, the observation can be accurately labeled an episode of psychosis and simultaneously a benign desired effect. The depressant qualities can be pursued to mimic the effects of alcohol, while also impairing speech. And many other effects that are associated with marijuana use including paranoia, delusions (or abstract thoughts), anxiety, and lack of motivation, can be equally labeled psychoses. In order to condemn the psychoactive effects associated with marijuana, Berenson must either show that increasing consumption will disproportionately harm society through externalities or that psychosis can become permanent after use. His project fails in these regards.

In order to condemn the psychoactive effects associated with marijuana, Berenson must either show that increasing consumption will disproportionately harm society through externalities or that psychosis can become permanent after use. His project fails in these regards.

Tell Your Children begins with an anecdote of a woman stabbing eight children to death while experiencing a schizophrenic-linked psychosis. Berenson argues that the woman's early use of cannabis caused her schizophrenia and goes on to highlight many other anecdotes where people commit atrocities amid major symptoms of psychosis, while also under the influence of marijuana.[15] Although there is no way to prove that marijuana definitely caused these acts of violence, Berenson points to the high percentage of violent offenders who were under the influence of marijuana while committing their crimes. While conceding that most marijuana users will not become schizophrenic or violent, Berenson warns that a substantial amount of people are prone to developing permanent psychosis after consuming marijuana and that their propensity for violence increases.[16] As prohibition promotes major costs to consume marijuana, Berenson argues that more of the at-risk

15 Berenson, 195.

16 Ibid, 172.

population will be exposed to marijuana after legalization, and that society will suffer through higher rates of mental illness and violent crime.

Yet Berenson often quickly dismisses or completely neglects competing theories from the literature on why marijuana use is associated with violence. For example, one study posits that drug abuse does not cause crime, but that a third factor—namely, traumatic childhood experiences—is responsible for both outcomes.[17] As such, the literature suggests that this apparent relationship is far less clear than Berenson suggests.

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2.2 THE TENUOUS RELATIONSHIP BETWEEN MARIJUANA USE AND SCHIZOPHRENIA

The relationship between marijuana use and the development of a variety of mental illnesses has also been widely studied in the literature. Notably, a branch of the epidemiological literature has emerged focusing on the effect of marijuana use on schizophrenia.

According to Berenson, the use of marijuana increases one's likelihood of developing schizophrenia. Many studies do suggest that individuals who do not have psychosis can develop the disease through heavy cannabis use. In the aforementioned review from NASEM, "substantial evidence" is found to support the claim that marijuana use is associated with "[t]he development of schizophrenia or other psychoses, with the highest risk among the most frequent users."[18] Additionally, "moderate evidence" is found to

17 Jodi M. Gilman, Sara M. Sobolewski, and Anne Eden Evins, "Cannabis Use as an Independent Risk Factor For, or Component Cause Of, Schizophrenia and Related Psychotic Disorders," *The Complex Connection Between Cannabis and Schizophrenia* (2018), 225.

18 *The Health Effects of Cannabis and Cannabinoids: The Current State of Evidence and Recommendations for Research*, report, The National Academies of Sciences, Engineering, and Medicine (Washington, DC: National Academies Press, 2017), 326.

suggest that cannabis use is associated with "[i]ncreased symptoms of mania and hypomania in individuals diagnosed with bipolar disorders … a small increased risk for the development of depressive disorders," and increased incidences of social anxiety and suicidal tendencies.[19]

These findings are supported by much of the relevant literature. Over a three-year period, J. Van Os et al. studied "4,045 psychosis-free persons" and found that more than 50% of the psychosis diagnoses that developed in this cohort "could be attributed to cannabis use." However, having a baseline psychotic disorder increased the risk of cannabis use by 54% among this cohort, which complicates the direction of the effect.[20]

This is consistent with another study from John R. DeQuardo et al., who concluded that marijuana does not cause schizophrenia but influences the onset of it.[21] Other studies suggest that those who use cannabis are more likely to develop schizophrenia than those who do not. For instance, Louise Arsenault et al. find that "[u]sing cannabis in adolescence increases the likelihood of experiencing symptoms of schizophrenia in adulthood."[22] However, they qualify this statement by saying that "most young people use cannabis in adolescence without harm," indicating that while marijuana use increases the risk of schizophrenia development relative to abstinence, schizophrenia is still a rare disorder.[23]

> *The literature also suggests that smoking marijuana appears to worsen the condition of individuals who already display symptoms of schizophrenia.*

19 Ibid.

20 J. Van Os, "Cannabis Use and Psychosis: A Longitudinal Population-based Study," *American Journal of Epidemiology* 156, no. 4 (Aug. 2002), 319.

21 John R. DeQuardo, Christopher F. Carpenter, and Rajiv Tandon, "Patterns of Substance Abuse in Schizophrenia: Nature and Significance," *Journal of Psychiatric Research* 28, no. 3 (May & June 1994).

22 L. Arseneault, "Cannabis Use in Adolescence and Risk for Adult Psychosis: Longitudinal Prospective Study," *BMJ* 325, no. 7374 (Nov. 2002), 1213.

23 Ibid.

The literature also suggests that smoking marijuana appears to worsen the condition of individuals who already display symptoms of schizophrenia.[24] One study cited by Berenson states that, "[o]f 14 chronic cases with endogenous psychosis present before the drug debut, 7 showed a marked aggravation of the psychotic symptoms during periods of cannabis abuse."[25] It is interesting to note, however, that NASEM later found that among those individuals who already have "psychotic disorders and a history of cannabis use," improvements in general cognitive abilities are associated with smoking marijuana, a finding that Berenson fails to acknowledge after citing the report.[26]

… any relationship between marijuana use and schizophrenia appears to be "dose-dependent," meaning that the more of the substance someone consumes, the higher one's likelihood is of developing mental complications.

Still, any relationship between marijuana use and schizophrenia appears to be "dose-dependent," meaning that the more of the substance someone consumes, the higher one's likelihood is of developing mental complications.[27] This implies that people who use marijuana moderately are at a lower risk for developing schizophrenia than heavy users. This is also true for alcohol and other intoxicants in regard to general mental illness.[28]

24 See Anton Grech et al., "Cannabis Use and Outcome of Recent Onset Psychosis," *European Psychiatry* 20, no. 4 (June 2005); Cécile Henquet et al., "Prospective Cohort Study of Cannabis Use, Predisposition for Psychosis, and Psychotic Symptoms in Young People," *BMJ* 330, no. 7481 (Jan. 2005).

25 Gunila Bernhardson and Lars M. Gunne, "Forty-Six Cases of Psychosis in Cannabis Abusers," *International Journal of the Addictions* 7, no. 1 (1972), 15.

26 *The Health Effects of Cannabis and Cannabinoids: The Current State of Evidence and Recommendations for Research*, report, The National Academies of Sciences, Engineering, and Medicine (Washington, D.C.: National Academies Press, 2017), 326.

27 See Marta Di Forti, Diego Quattrone, and Tom P. Freeman, "The Contribution of Cannabis Use to Variation in the Incidence of Psychotic Disorder across Europe (EU-GEI): A Multicentre Case-control Study," *The Lancet* 6, no. 5 (May 2019); Deepak Cyril D'Souza et al., "Delta-9-tetrahydrocannabinol Effects in Schizophrenia: Implications for Cognition, Psychosis, and Addiction," *Biological Psychiatry* 57, no. 6 (Mar. 2005); Sven Andréasson et al., "Cannabis and Schizophrenia: A Longitudinal Study of Swedish Conscripts," *The Lancet* 330, no. 8574 (1987).

28 Jacob James Rich et al., "Effect of cannabis liberalization on suicide and mental illness following recreational access: a state-level longitudinal analysis in the USA" *medRxiv*, 17 June, 2022, https://doi.org/10.1101/2020.09.25.20201848 (accessed 17 June, 2022).

Berenson's study of mental illness tends to focus principally on the relationship between marijuana and schizophrenia. Though increased use of marijuana may have a positive relationship with the prevalence of schizophrenia, other studies show that it can be rather effective in treating other mental illnesses—findings that are missing from Berenson's analysis. According to Zach Walsh et al., cannabis may have therapeutic use to treat post-traumatic stress disorder without increasing harm to the user.[29] Other studies show that cannabis has been effective in reducing symptoms of mental illness such as stress, anxiety, and depression in users.[30] In fact, an analysis of medical marijuana laws showed reductions in young adult male suicide rates following legalization.[31] Thus, while cannabis use may increase one's likelihood of developing schizophrenia in certain scenarios, the drug may also be an effective treatment for other mental illnesses, indicating that the relationship between marijuana use and mental health is complex and possibly bidirectional.

Though increased use of marijuana may have a positive relationship with the prevalence of schizophrenia, other studies show that it can be rather effective in treating other mental illnesses—findings that are missing from Berenson's analysis.

29 Zach Walsh et al., "Medical Cannabis and Mental Health: A Guided Systematic Review," *Clinical Psychology Review* 51 (Feb. 2017).

30 See Marcel O. Bonn-Miller et al., "Self-reported Cannabis Use Characteristics, Patterns and Helpfulness among Medical Cannabis Users," *The American Journal of Drug and Alcohol Abuse* 40, no. 1 (Jan. 2014); George R. Greer, Charles S. Grob, and Adam L. Halberstadt, "PTSD Symptom Reports of Patients Evaluated for the New Mexico Medical Cannabis Program," *Journal of Psychoactive Drugs* 46, no. 1 (2014); CW Webb and SM Webb, "Therapeutic Benefits of Cannabis: A Patient Survey," *Hawaii J Med Public Health* 73, no. 4 (Apr. 2014); Zach Walsh et al., "Cannabis for Therapeutic Purposes: Patient Characteristics, Access, and Reasons for Use," *International Journal of Drug Policy* 24, no. 6 (Nov. 2013); Helen Nunberg et al., "An Analysis of Applicants Presenting to a Medical Marijuana Specialty Practice in California," *Journal of Drug Policy Analysis* 4, no. 1 (Feb. 2011); Wendy Swift, Peter Gates, and Paul Dillon, "Survey of Australians Using Cannabis for Medical Purposes," *Harm Reduction Journal* 2, no. 1 (Oct. 2005); Tod H. Mikuriya, "Cannabis as a Substitute for Alcohol: A Harm-Reduction Approach," *Journal of Cannabis Therapeutics* 4, no. 1 (2004).

31 Anderson et al., "Medical Marijuana Laws and Suicides by Gender and Age," *American Journal of Public Health*, no. 104 (2014), 2369–2376.

2.3

A STATISTICAL ANALYSIS OF THE RELATIONSHIP BETWEEN MARIJUANA AND MENTAL ILLNESS: GIVING BERENSON HIS DUE

Many claims that Alex Berenson makes in *Tell Your Children* rely on a relationship between marijuana use and the increased likelihood of developing mental illnesses. According to Berenson, "[c]annabis produces insanity" and his analyses "cut to the heart of the last defense put up by doubters of the link between cannabis and mental illness."[32]

To buttress this bold assertion, Berenson conducted a data analysis with New York University's Sanford Gordon with annual data published by the National Survey on Drug Use and Health (NSDUH), which is conducted by the federal Substance Abuse and Mental Health Services Administration (SAMHSA). Berenson observes that the survey "found a marked rise in serious mental illness in the United States, especially among adults 18 to 25, the heaviest users of cannabis."[33] However, this correlation between increased cases of mental illness among young adults and marijuana use does not necessarily imply causation. There are many possible explanations of mental illness among young people, ranging from marijuana to the prevalence of social media use.[34]

To further evaluate these claims, we also compiled data from the NSDUH from various periods between 2006 to 2020, the years in which comparable state-level data are available for the relevant disorders, and analyzed the state-level relationships between rates of marijuana use in the past year/month and various mental health prevalence outcomes: major depressive episodes, suicidal ideation, serious mental illness, and any mental illnesses. For a detailed description of our methodology, see the Appendix and our working paper on the topic, which is currently under peer review.[35]

First, we set out to evaluate Berenson's implication that the increase in serious mental health cases was due to marijuana use. Adjusting the methods of Anderson et al. (2014), we do find evidence to support Berenson's claim.[36] Table 2 in the Appendix reports that among

32 Berenson, xxiii, 140.

33 Ibid, 172.

34 Jonathan Haidt, *The Anxious Generation*, Penguin Press (March 26, 2024).

35 Jacob James Rich et al., "Effect of cannabis liberalization on suicide and mental illness following recreational access: a state-level longitudinal analysis in the USA" *medRxiv*, 17 June, 2022, https://doi.org/10.1101/2020.09.25.20201848 (accessed 17 June, 2022).

36 Anderson et al., "Medical Marijuana Laws and Suicides by Gender and Age," *American Journal of Public Health*, no. 104 (2014), 2369–2376.

adults there is a positive association between past month/year marijuana use and major depressive episodes, any mental illness, and serious mental illness. Interestingly, there is no association between past year/month marijuana use and suicidal ideation.

> *… there is no association between past year/month marijuana use and suicidal ideation.*

In light of these observations, we also test for the effect of reverse causality (or simultaneity) by switching the dependent and independent variables to see if the models also suggest various types of mental illness cause marijuana use. By switching the variables in Table 2 of the Appendix, the estimate magnitudes and p-values typically stay the same or increase, meaning that the direction of the effect between marijuana use and mental illness is not determinable. As such, the possibility of a multidirectional relationship between marijuana use and mental illness complicates Berenson's conclusions that marijuana use alone causes mental illness. These findings suggest that those who are already suffering from mental illness may in fact be more likely to use marijuana, possibly as a means of self-medication.

These findings conform to recent literature on the subject. For example, Isaac C. Rhew et al. find that "youth with more chronic or severe forms of depression during early adolescence may be at elevated risk for developing cannabis use disorder compared with otherwise similar youth who experience fewer depressive symptoms during early adolescence."[37] Moreover, individuals with depression may be self-medicating with marijuana as a way to treat their depressive symptoms. According to a 2014 study, cannabis may be effective in treating chronic stress, "one of the major causes of depression."[38] The study's principal author has also noted that, "[u]sing compounds derived from cannabis—marijuana—to

[37] Isaac C. Rhew et al., "Examination of Cumulative Effects of Early Adolescent Depression on Cannabis and Alcohol Use Disorder in Late Adolescence in a Community-based Cohort," *Addiction* 112, no. 11 (Nov. 2017): doi:10.1111/add.13907.

[38] S. Haj-Dahmane and R.-Y. Shen, "Chronic Stress Impairs 1-Adrenoceptor-Induced Endocannabinoid-Dependent Synaptic Plasticity in the Dorsal Raphe Nucleus," *Journal of Neuroscience* 34, no. 44 (Oct. 2014): doi:10.1523/jneurosci.1310-14.2014.

restore normal endocannabinoid function could potentially help stabilize moods and ease depression."[39]

As such, the findings of this study, as well as the current literature, suggest that the relationship between mental illness is more complex than is argued by Berenson. While we do find a link between marijuana use and increased rates of major depressive episodes and other mental illnesses, the same seems to be true of the reverse, complicating the direction of the relationship. These findings compromise Berenson's claims that marijuana is responsible for increased rates of mental illness in the United States. One limitation of our analysis, however, is that we evaluate annual use data, which could ignore the effects of long-term use. But current users are more likely to have been long-term users and if there is some sort of measurable harm caused by marijuana, our analysis should capture some of the effect at the current-use level.

A key component of Alex Berenson's argument in *Tell Your Children* is that marijuana use leads to mental illness in users, which is why public health experts should resist marijuana legalization. Although the relationship between marijuana use and mental health is significant, the main consideration for policymakers is not marijuana use per se, but what follows marijuana legalization. If marijuana legalization is in fact a dangerous policy, indicators of undesirable consequences should have manifested over the past decade amid various levels of marijuana liberalization at the state level.

If marijuana legalization is in fact a dangerous policy, indicators of undesirable consequences should have manifested over the past decade amid various levels of marijuana liberalization at the state level.

[39] "RIA Neuroscience Study Points to Possible Use of Medical Marijuana for Depression," News Center, February 04, 2015, www.buffalo.edu/news/releases/2015/02/004.html (accessed 7 Nov. 2021).

Table 2 of the Appendix also presents the relationship between the aforementioned mental health prevalence rates and marijuana legalization, showing that neither medical nor recreational access is followed by increases in any form of mental illness. The results in our working paper further replicated the procedures of D. Mark Anderson et al. (2014), which measured the effect of recreational and medical marijuana legalization on suicide and mental illness.[40] After extending Anderson et al.'s analysis from 1990-2007 to 1990-2020, we confirmed the original paper's conclusion that marijuana legalization of any form is not followed by increases in suicide. In fact, there were modest statistically significant decreases in the suicide rates among men, driven by decreases in the age 30 to 39 categories, following medical marijuana legalization. Even if the reduction in suicide is spurious, it's at least clear that adverse mental health outcomes do not follow either recreational nor medical marijuana legalization at the population level.

... there were modest statistically significant decreases in the suicide rates among men, driven by decreases in the age 30 to 39 categories, following medical marijuana legalization.

[40] Jacob James Rich et al., "Effect of cannabis liberalization on suicide and mental illness following recreational access: a state-level longitudinal analysis in the USA" *medRxiv*, 17 June, 2022, https://doi.org/10.1101/2020.09.25.20201848 (accessed 17 June, 2022).

PART 3

MARIJUANA, MENTAL ILLNESS, VIOLENCE, AND CRIME

Berenson's argument regarding marijuana's effect on violence is essentially two-fold: first, he claims that marijuana use leads to mental illness and, in turn, that this instability leads users to commit violence.[41] Having presented the relationship between marijuana use and mental illness, we now turn to its potential relationship with violence.

3.1 THE TENUOUS RELATIONSHIP BETWEEN MARIJUANA AND VIOLENCE

The literature covering the relationship between marijuana use and violence appears to be largely inconclusive, especially with studies conducted in a laboratory setting. Several studies indicate that cannabis use has no effect on or even a negative relationship with violence.[42] For example, one study examining the effect of marijuana use on aggression found that, "[m]arijuana-induced relaxation of inhibitions is not ordinarily accompanied by

41 Berenson, 173.

42 See C. Salzman, BA Van Der Kolk, and RI Shader, "Marijuana and Hostility in a Small-group Setting," *American Journal of Psychiatry* 133, no. 9 (Sept. 1976); Stuart P. Taylor et al., "The Effects of Alcohol and Delta-9-tetrahydrocannabinol on Human Physical Aggression," *Aggressive Behavior* 2, no. 2 (1976).

an exaggeration of aggressive tendencies" in individuals.[43] This sentiment of relaxation among users is quite prevalent in the literature surveying marijuana use.[44]

Beyond the laboratory, the literature generally suggests that marijuana use is associated with an increase in violent behavior. Berenson does in fact present a wide body of evidence testifying to the relationship between these variables. For example, in a study of 411 males ranging from ages 8 to 56, Schoeler et al. find that, "cannabis use predicts subsequent violent offending, suggesting a possible causal effect."[45] Other surveys support this finding that marijuana use increases belligerence and one's likelihood of violence.[46] Marijuana is also used among over 50 percent of people accused of homicide and domestic violence, although alcohol is used at even a higher rate in violent criminals.[47, 48]

> *S. MacDonald et al. conclude that there is no relationship between marijuana use and violence when controlling for other factors such as frequency of cocaine and alcohol use, disrespect for the law, aggressive personality, age, and sex.*

43 C. Salzman, BA Van Der Kolk, and RI Shader, "Marijuana and Hostility in a Small-group Setting," *American Journal of Psychiatry* 133, no. 9 (Sept. 1976), 1031.

44 Bob Green, David Kavanagh, and Ross Young, "Being Stoned: A Review of Self-reported Cannabis Effects," *Drug and Alcohol Review* 22, no. 4 (Dec. 2003); Andrew D. Hathaway, "Marijuana and Lifestyle: Exploring Tolerable Deviance," *Deviant Behavior* 18, no. 3 (1997).

45 Tabea T. Schoeler et. al, "Continuity of Cannabis Use and Violent Offending over the Life Course," *Psychol Med* 46, no. 8 (June 2016), 1633.

46 Felice Francesco Carabellese, Chiara Candelli, and Domenico Martinelli, "Cannabis Use and Violent Behaviour: A Psychiatric Patients Cohort Study in Southern Italy," *Rivista Di Psichiatria* 48, no. 1 (2013); K. Hughes et al., "Predictors of Violence in Young Tourists: A Comparative Study of British, German and Spanish Holidaymakers," *The European Journal of Public Health* 18, no. 6 (Dec. 2008).

47 Steven E. Lize et al., "A Meta-analysis of the Effectiveness of Interactive Middle School Cannabis Prevention Programs," *Prevention Science* 18, no. 1 (2017); Todd M. Moore and Gregory L. Stuart, "A Review of the Literature on Marijuana and Interpersonal Violence," *Aggression and Violent Behavior* 10, no. 2 (2005); Jennifer M. Reingle, Wesley G. Jennings, and Mildred M. Maldonado-Molina, "Risk and Protective Factors for Trajectories of Violent Delinquency Among a Nationally Representative Sample of Early Adolescents," *Youth Violence and Juvenile Justice* 10, no. 3 (July 2012); Barry Spunt et al., "The Role of Marijuana in Homicide," *International Journal of the Addictions* 29, no. 2 (Feb. 1994).

48 Ryan C. Shorey et al., "Marijuana Use Is Associated with Intimate Partner Violence Perpetration among Men Arrested for Domestic Violence" *Translational Issues in Psychological Science* 4, no. 1 (2018).

Other studies in the literature, however, challenge this relationship. For instance, S. MacDonald et al. conclude that there is no relationship between marijuana use and violence when controlling for other factors such as frequency of cocaine and alcohol use, disrespect for the law, aggressive personality, age, and sex.[49] In addition, evidence suggests that violence among users of marijuana is still rare. Evelyn H. Wei et al. find that "[m]ost substance users did not engage in violence, and the proportion of substance users who engaged in violence was smaller than the proportion of violent offenders who were also substance users."[50] The authors do note that frequent use of marijuana was associated with an increased likelihood of violence, but that the effect was insignificant after controlling for factors like hard drug use.

The relationship between mental illness and violence is also a matter of contention. Again, Berenson does cite literature which shows that those with psychosis are five times more likely to commit violent crime and nearly 20 times more likely to commit murder than those who do not have the illness.[51] Other studies indicate that 6% to 9% of all homicides in a sample were committed by someone with schizophrenia.[52] Still, the rate at which people with schizophrenia commit violent crimes is extremely low. In a study which Berenson himself cites, Ceslo Arango clarifies that "[m]ost patients with schizophrenia will never be violent. For every schizophrenic patient who commits a homicide, 100 will commit suicide. Furthermore, schizophrenia also increases the likelihood of being the victim of crime and exploitation."[53]

Consequently, it is relevant to determine whether there is a relationship between the prevalence of marijuana use and various proxies for violence. Berenson does acknowledge that there is much violence associated with the illegal trade of marijuana on the illicit market. He notes that "cannabis is associated with a surprising amount of violence even

49 S. Macdonald et al., "Predicting Violence among Cocaine, Cannabis, and Alcohol Treatment Clients," *Addictive Behaviors* 33, no. 1 (Jan. 2008).

50 Evelyn H. Wei, Rolf Loeber, and Helene Raskin White, "Teasing Apart the Developmental Associations Between Alcohol and Marijuana Use and Violence," *Journal of Contemporary Criminal Justice* 20, no. 2 (May 2004), 166.

51 E. Y. H. Chen et al., "Maintenance Treatment with Quetiapine versus Discontinuation after One Year of Treatment in Patients with Remitted First Episode Psychosis: Randomised Controlled Trial," *BMJ* 341, no. 1 (2010); Seena Fazel, Niklas Långström, and Anders Hjern, "Schizophrenia, Substance Abuse, and Violent Crime," *Journal of the American Medical Association* 301, no. 19 (May 2009).

52 O. Nielssen et al., "Homicide of Strangers by People with a Psychotic Illness," *Schizophrenia Bulletin* 37, no. 3 (2009); Matthew Large, Glen Smith, and Olav Nielssen, "The Relationship between the Rate of Homicide by Those with Schizophrenia and the Overall Homicide Rate: A Systematic Review and Meta-analysis," *Schizophrenia Research* 112, no. 1-3 (June 2009); Janet Meehan et al., "Perpetrators of Homicide With Schizophrenia: A National Clinical Survey in England and Wales," *Psychiatric Services* 57, no. 11 (2006).

53 Ceslo Arango, "Violence in Schizophrenia," *Dialogues Clin. Neurosci.*2, no. 4 (Dec. 2000), 392.

without psychosis. The assaults and homicides around small-time marijuana dealing are the most common example."[54]

However, this observation seems to suggest that marijuana legalization, not prohibition, would be the appropriate policy solution. Increased access to legal marijuana could lower rates of violent crime related to the trade, similar to how alcohol legalization lowered crime after prohibition by allowing transactions to be enforced through the judicial system and regulated through company reputation, rather than through illicit-market violence.[55] Municipalities that have legalized marijuana have also increased their crime clearance rates after redirecting their resources to prosecute violent and property crimes.[56]

While arguing that marijuana use increases violence, Berenson claims that "the first four states that legalized marijuana for recreational use—Alaska, Colorado, Oregon, and Washington—have seen their rates of murder and aggravated assault increase much faster than the United States' rates as a whole since legalization."[57] However, this is simply is not true.

Reproduced in Figure 1 are graphs of the homicide rates for these four states over the period of 2010 to 2022, with a vertical line indicating the year in which the state legalized recreational marijuana. These graphs suggest no apparent trend in crime post-legalization.

Furthermore, the graphs depict homicide trends in these four states in comparison with the national average. For Colorado, Oregon, and Washington, the homicide rate remains below the U.S. average for the entire time series. The increase in homicide rates in recent years amid the COVID-19 pandemic also seem to be lower than the national average. Although the homicide rate in Alaska did spike after recreational marijuana was regulated in 2015, the homicide rate in Alaska is historically higher than the national average. Because Alaska has such a small population density, its trends are much noisier compared to other states, and Alaska should not be used as a lone anecdote to justify any statistical relationship. Evidently, there does not seem to be a compelling increase in homicide among the states that have legalized, as compared to the national average.

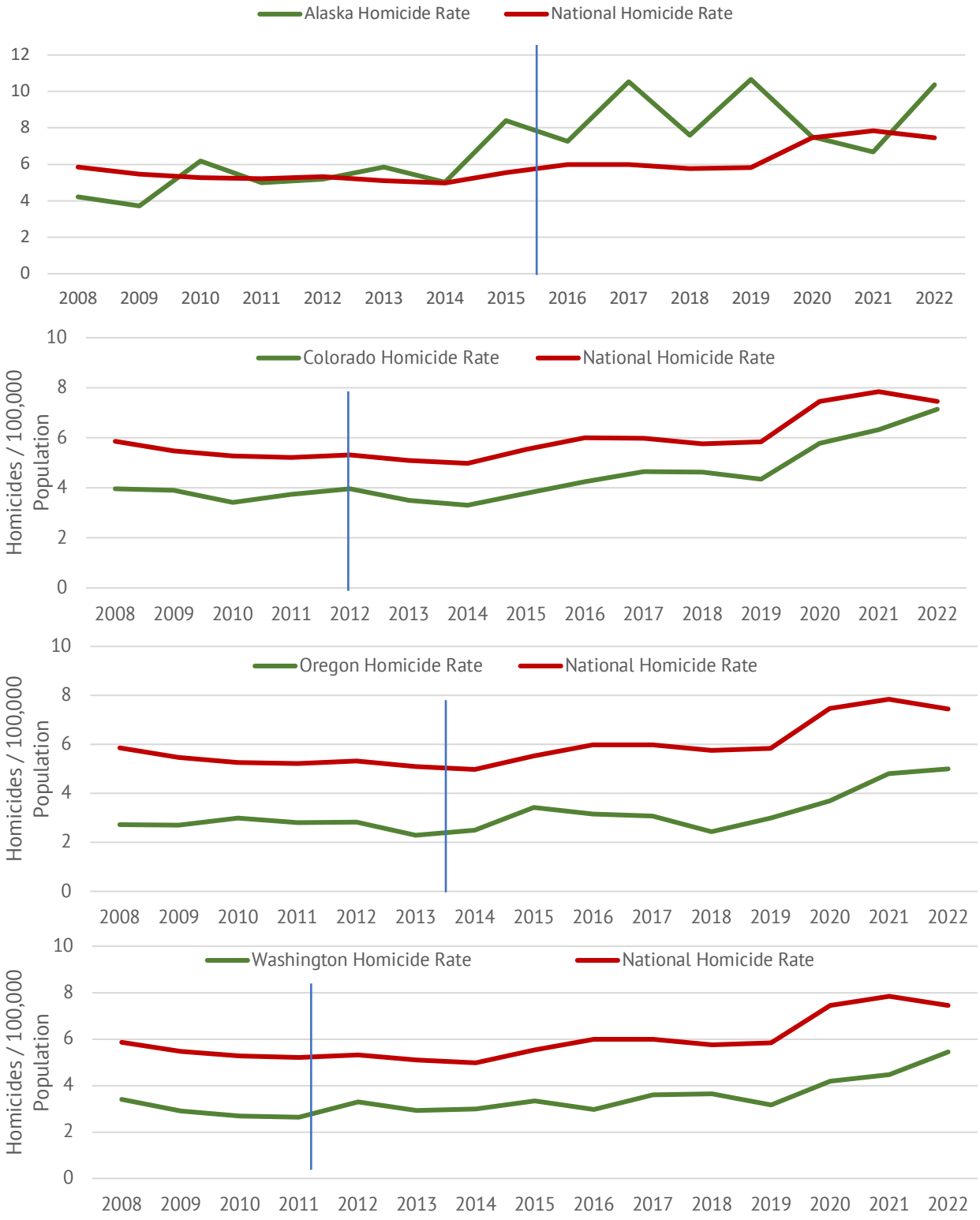
54 Berenson, 209.

55 Jeffrey A. Miron and Jeffrey Zwiebel, "The Economic Case Against Drug Prohibition," *Journal of Economic Perspectives* 9, no. 4 (1995).

56 David A. Makin et al., "Marijuana Legalization and Crime Clearance Rates: Testing Proponent Assertions in Colorado and Washington State," *Police Quarterly* 22, no. 1 (July 2018).

57 Ibid, 180.

FIGURE 1: STATE-LEVEL & NATIONAL HOMICIDE* RATES BEFORE AND AFTER RECREATIONAL MARIJUANA ACCESS IN ALASKA, COLORADO, OREGON, AND WASHINGTON 2010-2022



*Homicides are defined by the International Classification of Diseases (ICD-10) codes X85-Y09.9, Y87.1, U01-U02.

Much of the academic evidence suggests that any positive relationship between legalization and violent crime is spurious. According to Robert G. Morris et al., the legalization of medical marijuana did not increase crime at the state level and "may be correlated with a reduction in homicide and assault rates."[58] Research in *Justice Quarterly* also claims there is no relationship between recreational marijuana legalization and increases in crime rates.[59] Amid conflicting evidence within the literature surrounding the influence of marijuana use and legalization on crime, we now adjust the preceding analysis to estimate these relationships.

3.2 A STATISTICAL ANALYSIS OF THE RELATIONSHIP BETWEEN MARIJUANA AND VIOLENT CRIME

To further investigate the relationship between marijuana and violence, we undertook a statistical analysis using homicide data collected annually by the Centers for Disease Control and Prevention (CDC). These data are preferable to FBI data on homicides because almost all local jurisdictions within the U.S. report cause-of-death data to the CDC, while such police department reporting is voluntary to the FBI. Additionally, non-homicidal violent crimes are often not reported to the authorities, while a murder is almost always categorized as such on death certificates. Therefore, we did not review non-homicidal incidents and assume homicides can be used as a proxy for violent crime. For a detailed description of our methodology, see our working paper on the adjusted model and the Appendix describing the variables.[60]

First, we set out to measure whether either past-year or past-month marijuana use was associated with an increase in the homicide rate for the years 2003 to 2020, which is reported in the Appendix. On average, increases in past-year and past-month marijuana use are correlated with decreases in the homicide rate, although the relationship is only statistically significant in two of the three models. Consequently, we can't draw a causal relationship between the variables, but we are at least certain that homicide rates do not rise with increasing rates of marijuana use.

58 Robert G. Morris et al., "The Effect of Medical Marijuana Laws on Crime: Evidence from State Panel Data, 1990-2006," *PLoS ONE* 9, no. 3 (2014), 1.

59 Ruibin Lu et al., "The Cannabis Effect on Crime: Time-Series Analysis of Crime in Colorado and Washington State," *Justice Quarterly* (2019).

60 Jacob James Rich et al., "Effect of cannabis liberalization on suicide and mental illness following recreational access: a state-level longitudinal analysis in the USA" *medRxiv*, 17 June, 2022, https://doi.org/10.1101/2020.09.25.20201848 (accessed 17 June, 2022).

Second, we measured the effect of recreational marijuana legalization on homicides for the years 1999 to 2022. On average, both recreational and medical marijuana legalization are associated with a decrease in the homicide rate and the model is statistically significant for all three specifications.

> *On average, both recreational and medical marijuana legalization are associated with a decrease in the homicide rate.*

Overall, we find no evidence of a positive relationship between marijuana and homicide. Additionally, our findings support the notion that recreational and medical marijuana legalization are associated decreases in violence, possibly through a decrease in drug crime arrests. This relationship might be because of two reasons: 1. Law enforcement resources that were previously used for marijuana enforcement are now used to police violent crimes, which is supported by the literature; and 2. Violence that is incentivized by the illegal marijuana trade is reduced after the illicit market is replaced by regulated suppliers.[61] This finding makes sense given recent trends in policing. According to the FBI Uniform Crime Reports, in 2015 43.2% of all drug arrests were due to marijuana, with 38.6% of arrests due to marijuana possession alone.[62] Thus, in the states that have legalized recreational marijuana, the vast reduction in drug crime arrests rates have had a significant impact on the criminal justice system. Additionally, there may be significant fiscal benefits of marijuana legalization. According to Jeffrey Miron, legalization could save states a total of $6 billion and the federal government $3.96 billion in annual law enforcement costs, allowing for resources to be diverted to violent crime prevention.[63]

61 David A. Makin et al., "Marijuana Legalization and Crime Clearance Rates: Testing Proponent Assertions in Colorado and Washington State," *Police Quarterly* 22, no. 1 (July 2018).

62 "Crime in the U.S. 2015," FBI Unified Crime Reports, May 03, 2016, www.ucr.fbi.gov/crime-in-the-u.s/2015/crime-in-the-u.s.-2015 (accessed 7 Jan. 2020).

63 Jeffrey A. Miron, *The Budgetary Effects of Ending Drug Prohibition*, report no. Tax and Budget Bulletin, Cato Institute, vol. 83, Tax and Budget Bulletin (Washington, DC: Cato Institute), 2018.

PART 4

MARIJUANA AND TEEN AND ADULT USE

Much of Berenson's analysis focuses specifically on the potential threat that marijuana poses to teen users. Throughout the book, he profiles several cases of how individual teenagers were harmed by smoking marijuana. For instance, Berenson tells the story of a young New York teen named Andrew who was a regular marijuana user and came from a family with a history of mental illness, including a brother who displayed schizophrenic symptoms allegedly due to his long-term use of marijuana. Understandably, this history made his parents concerned about Andrew's daily marijuana use.

According to his father, Eric, "marijuana is more popular with him and his friends because it is much easier to buy and use than alcohol."[64] This observation raises an interesting point about the relative availability of marijuana for teenagers. At the time of *Tell Your Children*'s publication, Andrew's home state of New York had not yet legalized marijuana for recreational use, therefore it was only purchased illegally on the illicit market. Interestingly, one recent study published in *JAMA Network Open* finds that teen marijuana use was unaffected by recreational marijuana legalization.[65] A potential explanation for this non-relationship is that when marijuana is legalized and sold in licensed dispensaries, illegal dealers (who are more likely to sell to teens) may be crowded out of the market, thus making it more difficult for teens to acquire the drug. Thus, at least according to this

64 Berenson, 131.

65 Julia A. Dilley et al., "Prevalence of Cannabis Use in Youths After Legalization in Washington State," *JAMA Pediatrics* 173, no. 2 (Feb. 2019).

theory, marijuana legalization should actually decrease teen use rather than lead to an increase in use.

Still, many medical professionals are concerned that recreational marijuana legalization will increase teen use. In an interview with *USA Today*, emergency room physician Clay Whiting expressed his concern, stating "[g]reater access means great trials by younger people."[66] Indeed, among younger adults, recreational marijuana legalization has been followed by a significant increase in use.[67] To test the relationship between recreational marijuana legalization and teen use, we illustrated three different measures of marijuana use from the NSDUH among youth ages 12 to 17 years old. For a detailed description of our methodology, please see our working paper on the topic. [68]

> *While these findings do not support the claim that marijuana legalization reduces teen use, we find no evidence to suggest that legalization increases teen use.*

Figures 2-4 illustrate the prevalence of past month marijuana use, past year marijuana use, and marijuana first-time use (or "initiation") in the nine states that had provided recreational marijuana access for at least three years by 2020 (Alaska, California, Colorado, District of Columbia, Maine, Massachusetts, Nevada, Oregon, and Washington).[69] According to our results, there is no visible relationship between recreational marijuana legalization and the past month teen use, past year teen use, or first use rates among teens. However, the rate of increase among adult marijuana users remains unchanged following recreational marijuana legalization.

66 Trevor Hughes, Stephanie Innes, and Jayne O'Donnell, "Is Marijuana Linked to Psychosis, Schizophrenia? It's Contentious, but Doctors, Feds Say Yes," *USA Today*, December 27, 2019, www.usatoday.com/story/news/nation/2019/12/15/weed-psychosis-high-thc-cause-suicide-schizophrenia/4168315002/ (accessed 7 Jan. 2020).

67 Substance Abuse and Mental Health Services Administration. (2021). "Key substance use and mental health indicators in the United States: Results from the 2020 National Survey on Drug Use and Health" (HHS Publication No. PEP21-07-01-003, NSDUH Series H-56). Rockville, MD: Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration.

68 Jacob James Rich et al., "Effect of cannabis liberalization on suicide and mental illness following recreational access: a state-level longitudinal analysis in the USA" *medRxiv*, 17 June, 2022, https://doi.org/10.1101/2020.09.25.20201848 (accessed 17 June, 2022).

69 Ibid.

FIGURE 2: PAST-MONTH MARIJUANA USE BEFORE AND AFTER RECREATIONAL LEGALIZATION

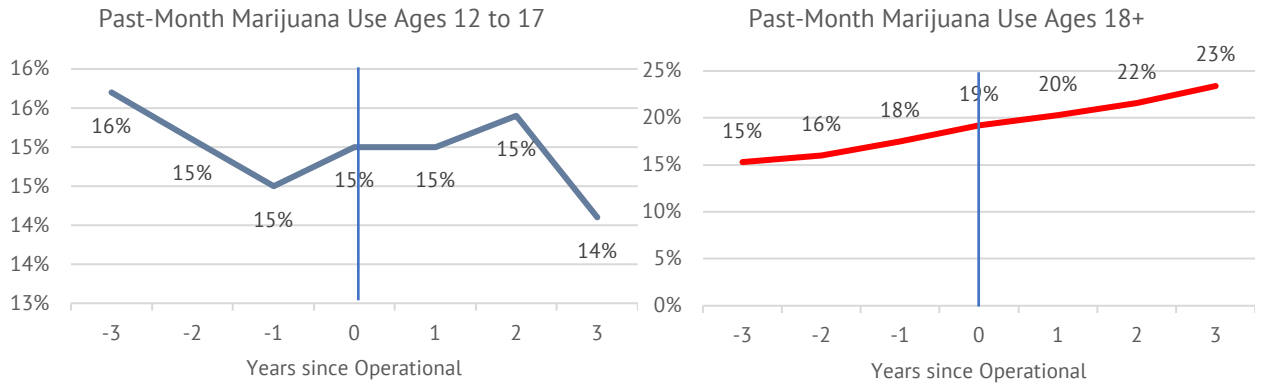


FIGURE 3: PAST-YEAR MARIJUANA USE BEFORE AND AFTER RECREATIONAL LEGALIZATION

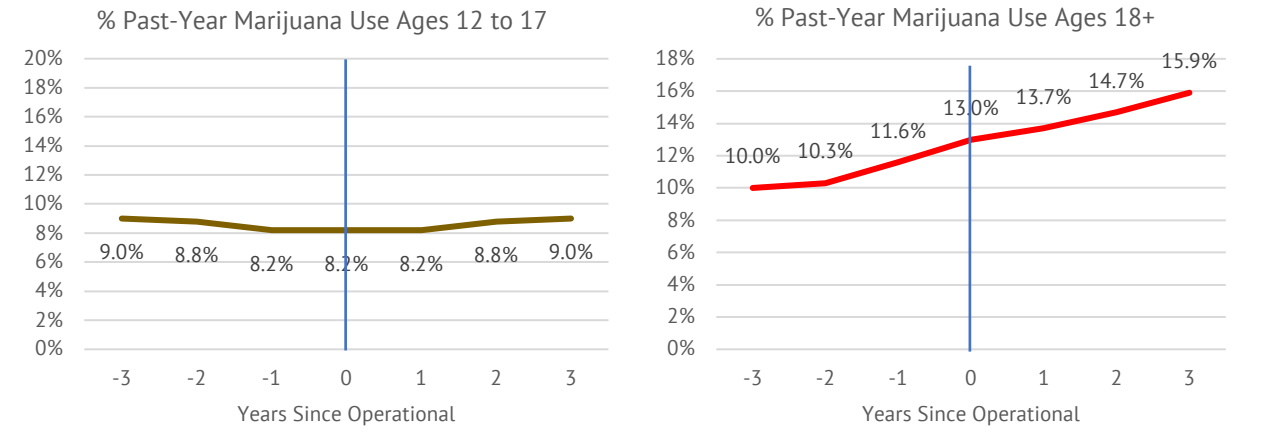
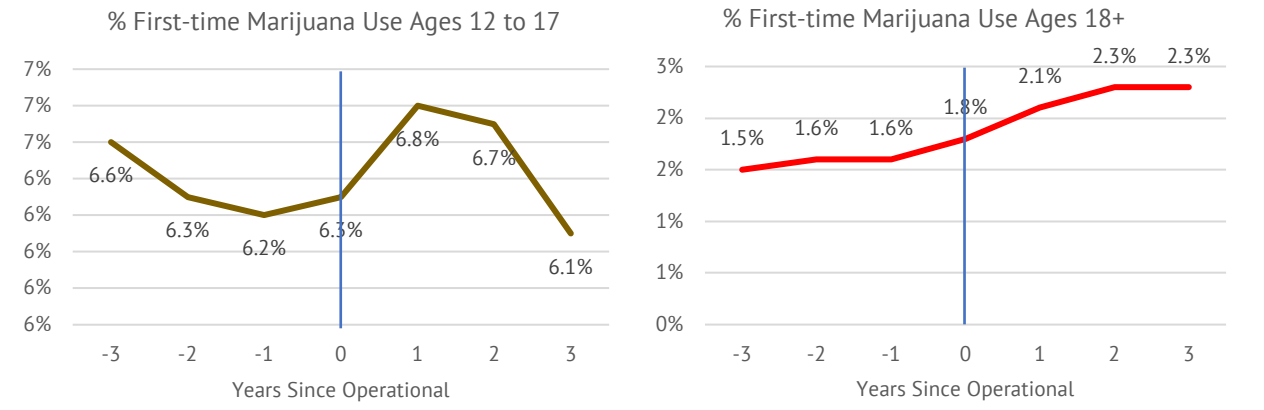


FIGURE 4: FIRST-TIME MARIJUANA USE BEFORE AND AFTER RECREATIONAL LEGALIZATION



While these findings do not support the claim that marijuana legalization reduces teen use, we find no evidence to suggest that legalization increases teen use. One potential reason explaining our conflicting outcomes with the literature is the lack of marijuana legalization throughout the entire U.S., which would preserve much of the illicit market that is willing to sell marijuana to children. Over our time series, only nine states have legalized recreational marijuana, with many doing so only in the past few years. Thus, these findings merit future research as the sample size expands with time.

To further investigate the relationship between marijuana legalization and changes in use, we undertook a final statistical analysis comparing drug use data from the NSDUH to the medical and recreational legalization dates at the state level. For a detailed description of our methodology, see our working paper on the adjusted model and the Appendix describing the variables.[70] According to Table 3, marijuana legalization of all forms is generally associated with increases in adult marijuana use. Specifically, recreational marijuana legalization increases both past-month and past-year use among all adult age groups. Interestingly, medical marijuana legalization is only associated with increases in past-month use among adults above the age of 26. However, no form of marijuana legalization is consistently associated with increases in youth use. Specifications 2 and 3 show significant relationships between youth marijuana use and legalization, but Specification 3 shows that this relationship collapses after controlling for time effects. This is an important consideration, because the descriptive statistics in Table 1 show that youth use was generally higher in the later period of the study, which could inappropriately correlate youth use with recent events, such as marijuana legalization. Moreover, we find that marijuana legalization increases adult use, but not youth use.

[70] Jacob James Rich et al., "Effect of cannabis liberalization on suicide and mental illness following recreational access: a state-level longitudinal analysis in the USA" *medRxiv*, 17 June, 2022, https://doi.org/10.1101/2020.09.25.20201848 (accessed 17 June, 2022).

PART 5

THE POTENTIAL BENEFITS OF MARIJUANA LEGALIZATION

Although marijuana use can lead to addiction, opponents of legalization often ignore marijuana's ability to treat various ailments. For example, the relationship between marijuana use and the treatment of chronic pain is completely neglected in Berenson's analysis. He downplays the analgesic effect of marijuana on treating pain, claiming that "except for a few narrow conditions such as cancer-related wasting, neither cannabis nor THC has ever been shown to work in randomized clinical trials."[71] This is not true. For example, Lynch and Campbell find in a review of 18 randomized controlled trials that 15 of the 18 trials showed a significant benefit of cannabinoids in pain management, compared to placebo.[72] Several other studies also support this claim that marijuana use is in fact associated with a reduction in chronic pain among patients.[73] Additionally, NASEM released a comprehensive study surveying the current literature on the applications and side-effects

71 Berenson, xviii.

72 Mary E. Lynch and Fiona Campbell, "Cannabinoids for Treatment of Chronic Non-cancer Pain; a Systematic Review of Randomized Trials," *British Journal of Clinical Pharmacology* 72, no. 5 (2011).

73 Emily Stockings et al., "Cannabis and Cannabinoids for the Treatment of People with Chronic Noncancer Pain Conditions," *Pain* 159, no. 10 (2018); Shannon M. Nugent et al., "The Effects of Cannabis Among Adults With Chronic Pain and an Overview of General Harms," *Annals of Internal Medicine* 167, no. 5 (Sept. 2017); Bjorn Jensen et al., "Medical Marijuana and Chronic Pain: A Review of Basic Science and Clinical Evidence," *Current Pain and Headache Reports* 19, no. 10 (Oct. 2015).

of marijuana in 2017. According to Berenson, NASEM finds that "[t]he only conditions cannabis or cannabinoids have been proven to threat are chemotherapy-associated nausea and spastic muscles associated with multiple sclerosis."[74]

This is also not true. On the first line of the conclusions section of the NASEM report where these findings are listed, the authors state "There is conclusive or substantial evidence that cannabis or cannabinoids are effective: For the treatment of chronic pain in adults."[75]

When Berenson does address marijuana's relationship with chronic pain, he tries to undermine the findings by stating that "pain studies don't usually compare the degree of relief to standard pain relievers like ibuprofen, only to a placebo."[76] However, more recent evidence suggests that the pain-relieving effect of marijuana is substantially greater than that of common over-the-counter drugs. Kevin A. Rea et al. state that cannabis compounds are "approximately thirty times more effective than aspirin" in providing anti-inflammatory treatment.[77]

> *"... more recent evidence suggests that the pain-relieving effect of marijuana is substantially greater than that of common over-the-counter drugs."*

Other studies indicate that there may be broad medical applications for marijuana. In addition to the conditions stated to be treated by marijuana in the NASEM study, Whiting et al. find "moderate-quality evidence to support the use of cannabinoids for the treatment of chronic pain and spasticity," and less reliable evidence of their effectiveness in treating nausea, vomiting, sleep disorders, and Tourette syndrome.[78] Another study suggests that inhaled cannabis is successful in treating neuropathic pain.[79] The vaping of cannabis has also

74 Berenson, 75.

75 *The Health Effects of Cannabis and Cannabinoids: The Current State of Evidence and Recommendations for Research*, report, The National Academies of Sciences, Engineering, and Medicine (Washington, DC: National Academies Press, 2017), 13.

76 Berenson, 75.

77 Kevin A. Rea et al., "Biosynthesis of Cannflavins A and B from Cannabis Sativa L," *Phytochemistry* 164 (2019), 162.

78 Penny F. Whiting et al., "Cannabinoids for Medical Use," *JAMA* 313, no. 24 (June 2015), 2468.

79 Mark S. Wallace et al., "Efficacy of Inhaled Cannabis on Painful Diabetic Neuropathy," *The Journal of Pain* 16, no. 7 (2015); D. I. Abrams et al., "Cannabis in Painful HIV-associated Sensory Neuropathy: A Randomized Placebo-controlled Trial," *Neurology* 68, no. 7 (Nov. 2007).

been shown to reduce pain and improve sleep patterns in patients.[80] Lastly, Epidiolex, a pure cannabinoid drug, has been shown to drastically decrease the incidence of epilepsy in patients and was approved by the Food and Drug Administration (FDA) for such treatments.[81]

This is not to say that there is an overwhelming consensus regarding the efficacy of cannabis in treating conditions like pain. One recent study from Australia, which Berenson cites in his book, conversely finds "no evidence that cannabis use improved patient outcomes … [and that people] who used cannabis had greater pain and lower self-efficacy in managing pain."[82] The findings of this study complicate the literature significantly by not only presenting an inconclusive finding regarding the relationship between cannabis and pain, but evidence of a positive relationship between the two. It should be noted, however, that this study focused on chronic pain patients who were already using opioids to treat their pain and relied on self-reported data. Regardless, the literature supporting the efficacy of marijuana as a treatment is much vaster than Berenson acknowledges.

Currently, cannabis is considered a Schedule I drug under the Controlled Substances Act of 1970—meaning that it is completely prohibited under federal law. In order for a substance to be classified under Schedule I, the substance must have a high potential for abuse and no medicinal benefit. The first criterion can be arbitrarily assessed, although most studies of relative harm suggest that marijuana has much less abuse potential than alcohol, amphetamines, cocaine, and opioids—the latter three of which have all been approved for various medical applications.[83] But in regard to marijuana, the second criterion of no medical benefit is for all intents and purposes false, unless you apply the strict definition of requiring FDA approval.

Such considerations have led the Department of Health and Human Services (HHS) to recommend the rescheduling of marijuana from Schedule I to Schedule III.[84] After considering the eight factors determinative of control under the Controlled Substances Act, the FDA concluded that marijuana has legitimate medical applications and is of less risk to

80 M. A. Ware et al., "Smoked Cannabis for Chronic Neuropathic Pain: A Randomized Controlled Trial," *Canadian Medical Association Journal* 182, no. 14 (Oct. 2010).

81 Orrin Devinsky et al., "Open-label Use of Highly Purified CBD (Epidiolex®) in Patients with CDKL5 Deficiency Disorder and Aicardi, Dup15q, and Doose Syndromes," *Epilepsy & Behavior* 86 (Sept. 2018).

82 Gabrielle Campbell et al., "Effect of Cannabis Use in People with Chronic Non-cancer Pain Prescribed Opioids: Findings from a 4-year Prospective Cohort Study," *The Lancet Public Health* 3, no. 7 (July 2018), 349.

83 David J. Nutt, Leslie A. King, and Lawrence D. Phillips, "Drug Harms in the UK: A Multicriteria Decision Analysis," *The Lancet* 376, no. 9752 (Nov. 2010).

84 Drug Enforcement Administration, Department of Justice "Schedules of Controlled Substances: Rescheduling of Marijuana," 21 May, 2024.

users as drugs currently listed in Schedule II, such as opioids and cocaine.[85] Due to marijuana's initial Schedule I designation, pharmaceutical companies have had to find creative ways to bypass the de facto ban on clinical trials. This is why dronabinol, a synthetic form of THC that is sourced from sesame oil instead of marijuana and avoids the Schedule I designation, was invented and approved by the FDA in 1985.[86] However, if marijuana is rescheduled, such maneuverers would be unnecessary, and more medical research would be permitted.

> *"After considering the eight factors determinative of control under the Controlled Substances Act, the FDA concluded that marijuana has legitimate medical applications..."*

It is widely known that marijuana use can promote hunger, which is quite helpful when treating the loss of appetite common in AIDS patients and cancer patients undergoing chemotherapy.[87] A natural derivative of marijuana would have sufficed to treat loss of appetite, but the DEA enforcement of Schedule I prevented clinical trials. Before the Marihuana [*sic*] Tax Act of 1937 effectively began the federal prohibition of marijuana, the American Medical Association (AMA) actively opposed the act. The AMA sent Dr. William C. Woodward to testify before Congress, claiming that "[prohibition] loses sight of the fact future investigations may show that there are substantial medical uses for cannabis."[88] The medical literature has verified Dr. Woodward's concerns for multiple applications, but the U.S. still wrestles with a bureaucratic hurdle that is halting the progress of medicine.

85 U.S. Department of Health and Human Services "Basis for the Recommendation to Reschedule Marijuana Into Schedule III of the Controlled Substances Act," 29 Aug., 2023.

86 Leslie Mendoza Temple, "Medical marijuana and pain management," *Disease-a-Month* 62, issue 9 (Sep. 2016).

87 Janet E. Joy, Stanley J. Watson, and John A. Benson, *Marijuana and Medicine: Assessing the Science Base* (Washington, D.C.: National Academy Press, 1999).

88 Taxation of Marihuana, hearings before the House Committee on Ways and Means, 75th Cong. (1937) (testimony of William Woodward).

PART 6

CONCLUSION

Alex Berenson's *Tell Your Children* does not paint a complete or accurate picture regarding the benefits and consequences of marijuana use. Contrary to the case Berenson tries to make, the relevant literature seems to suggest that marijuana is a useful medicine in the treatment of conditions like chronic pain, strengthening the argument for at least minimal cannabis legalization to allow research into more effective derivatives and safer consumption of the cannabis plant. Berenson is correct to report NASEM's findings that frequent marijuana use is associated with an increased likelihood of developing schizophrenia, though this disease remains rare among users. However, studies do show that the drug may be effective in palliating other mental illnesses such as PTSD. Regarding violence, a preponderance of the literature seems to suggest that using marijuana increases the likelihood that one will display aggressive behavior, bolstering Berenson's claims. However, other factors such as alcohol use may confound this relationship. Additionally, the legalization of recreational and medical marijuana is associated with decreases in homicide rates, casting doubt that marijuana use leads to violence in the aggregate.[89] Overall, the studies surveying marijuana's relationship with these variables present a much more nuanced and complicated literature than Berenson sets out to depict in his book and certainly do not suggest that marijuana has contributed to broad societal ills.

[89] Davide Dragone et al., "Crime and the legalization of recreational marijuana," *Journal of Economic Behavior & Organization* 159 (March 2019); Robert G. Morris et al., "The Effect of Medical Marijuana Laws on Crime: Evidence from State Panel Data, 1990-2006," *PLoS ONE* 9, vol. 3 (26 March, 2014).

While Berenson's deliberately chosen "tiny and nonrandom sample of the marijuana-linked violence that occurs every day" certainly helps in painting a picture of chaos and suffering caused by marijuana use, the academic evidence suggests otherwise.[90] To Berenson, "[n]othing is more powerful than personal experience."[91] We vehemently disagree. While relying on personal experience to tell a story is agreeing with Berenson's training as a journalist, this practice is hardly a good way to make policy. This is not to say we wish to devalue anyone's particular experience—we just to prefer to not omit the experiences of everybody else accounted for in the data. Consequently, we find that Berenson's characterization of marijuana use is insufficient to model policy.

While Berenson's deliberately chosen "tiny and nonrandom sample of the marijuana-linked violence that occurs every day" certainly helps in painting a picture of chaos and suffering caused by marijuana use, the academic evidence suggests otherwise.

To give Berenson his due, there is a strong positive relationship between marijuana use and mental illness. Although marijuana use does not seem to correlate with mental illness in a dose-dependent way at the state level, deciphering the relationship between marijuana use and reported mental illness should be a priority of future research in order to determine whether marijuana use causes conditions like depression or if people with depression are just more likely to self-medicate with marijuana.[92]

Regarding marijuana legalization, these challenges are incredibly manageable and come with many advantages. Jeffrey Miron estimates that the entire U.S. would save about $10 billion a year in law enforcement cost while receiving an additional $60 billion in annual tax revenue after legalizing marijuana.[93] According to Grand View Research, Miron's tax revenue estimate is approximately double the size of the 2023 market in regulated states

90 Berenson, 181.

91 Ibid, 228.

92 Jacob James Rich et al., "Effect of cannabis liberalization on suicide and mental illness following recreational access: a state-level longitudinal analysis in the USA" *medRxiv*, 17 June, 2022, https://doi.org/10.1101/2020.09.25.20201848 (accessed 17 June, 2022).

93 Jeffrey A. Miron, *The Budgetary Effects of Ending Drug Prohibition*, report no. Tax and Budget Bulletin, Cato Institute, vol. 83, Tax and Budget Bulletin (Washington, DC: Cato Institute), 2018.

throughout the country, which might mean that it is an overestimate.[94] However, there would still be substantial reductions in drug crime arrest rates, allowing law enforcement to focus their resources on crimes of much higher priority.[95] And if marijuana was to be removed from Schedule I complete prohibition, medical research would be permitted and likely expand the numerous applications of cannabis in medicine. The Department of Justice's proposal to move marijuana to Schedule III would allow most medical research, but fail to legalize recreational access and maximize government tax receipts. Given these benefits—and the lack of any association between marijuana legalization with mental illness and violence—we conclude that the legalization of marijuana has little reason for opposition.

> *Throughout* Tell Your Children*, Alex Berenson puts forth an unfounded attack on marijuana that ignores a significant portion of the relevant academic literature.*

Throughout *Tell Your Children*, Alex Berenson puts forth an unfounded attack on marijuana that ignores a significant portion of the relevant academic literature. The book is so misguided that Berenson even finds himself praising Harry Anslinger, the first commissioner of the Federal Bureau of Narcotics. Anslinger was a notorious racist. Anslinger infamously blamed marijuana use on "Negroes, Hispanics, Filipinos, and entertainers" and believed that "[t]heir Satanic music, jazz and swing, results from marijuana use." Allegedly this was a problem for Anslinger because "marijuana causes white women to seek sexual relations with Negroes, entertainers, and others."[96] Although Berenson resolutely disavows Anslinger as a "racist jerk," he asserts that "eighty-five years ago [Anslinger] was right about marijuana" when referencing the former drug czar's testimony on marijuana's effect on mental illness and crime.[97] Proper statistical evidence and the body of medical literature yields that Berenson, like Anslinger, is simply wrong.

94 "U.S. Cannabis Market Size & Trends," Grand View Research, https://www.grandviewresearch.com/industry-analysis/us-cannabis-market (accessed 16 Dec. 2024).

95 David A. Makin et al., "Marijuana Legalization and Crime Clearance Rates: Testing Proponent Assertions in Colorado and Washington State," *Police Quarterly* 22, no. 1 (July 2018).

96 Robert Solomon, "Racism and Its Effect on Cannabis Research," *Cannabis and Cannabinoid Research* 5, no. 1 (2020), 3.

97 Berenson, 178.

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All views expressed are the authors' and do not represent the opinions of the federal judiciary.

APPENDIX: METHODOLOGY FOR EVALUATING THE RELATIONSHIP BETWEEN MARIJUANA USE, VIOLENCE, MENTAL ILLNESS, AND REGULATED ACCESS

This analysis departs from the working paper Rich et al. (2022) procedure by replacing the policy indicator variables with the natural log transform of prevalence estimates, the suicide rate with various outcomes, and removing the alcohol-related control variables. To estimate the relationship between marijuana and mental illness, ordinary least squares regression models are used for the prevalence of each outcome variable (Y)—homicide rate per 100,000 population (years 1999-2022; ICD-10 codes X85-Y09.9, Y87.1, U01-U02), major depressive episode prevalence (2006-2020), suicidal ideation prevalence (2009-2020), serious mental illness prevalence (2009-2020), thoughts of suicide prevalence (2009-2020), and any mental illness prevalence (2009-2020)—using the following equations:

$$\text{Specification 1: } Y_{it} = \beta_0 + \beta_x x_{it} + \beta_\sigma \boldsymbol{X}_{it} + \lambda_t + \gamma_i + \delta_i T + \epsilon_{it}$$
$$\text{Specification 2: } Y_{it} = \beta_0 + \beta_x x_{it} + \beta_\sigma \boldsymbol{X}_{it} + \lambda_t + \gamma_i + \epsilon_{it}$$
$$\text{Specification 3: } Y_{it} = \beta_0 + \beta_x x_{it} + \lambda_t + \gamma_i + \epsilon_{it}$$

In the working paper, the exposure (x_{it}) refers to a vector where the indicator variable mml refers to laws which permit medical marijuana access and the indicator variable rml refers to laws which permit recreation marijuana access, both at the state level. Other exposures of interest (x_{it}) are prevalence estimates of those reporting past-month marijuana use (years 2003-2020), past-year marijuana use (years 2003-2020), and major depressive

episodes. In each model, β_0 is a constant term and $\boldsymbol{X}$ is a vector of control variables for the state unemployment rate (1999-2022) and state per capita income (1999-2022). All models employ state fixed effects (γ_i) and time effects (λ_t), with state linear time trends ($\delta_i T$) in Specification 1.

TABLE 1: DESCRIPTIVE STATISTICS

	Illegal mean (SD)	**Regulated** mean (SD)	***P***
n	804	420	
Outcomes			
Homicide Rate	6.09 (4.27)	5.33 (3.92)	0.003
Major Depression (12-17)	0.10 (0.03)	0.12 (0.03)	0.000
Major Depression (18up)	0.07 (0.01)	0.07 (0.01)	0.000
Serious Mental Illness (18 up)	0.04 (0.01)	0.05 (0.01)	0.000
Any Mental Illness (18 up)	0.19 (0.02)	0.20 (0.02)	0.000
Suicidal Thoughts (18 up)	0.04 (0.01)	0.04 (0.01)	0.000
Marijuana Use			
Past-Month (12-17)	0.07 (0.01)	0.09 (0.02)	0.000
Past-Month (18-25)	0.17 (0.04)	0.24 (0.06)	0.000
Past-Month (26 up)	0.04 (0.01)	0.09 (0.03)	0.000
Past-Month (18 up)	0.06 (0.02)	0.11 (0.04)	0.000
Past-Year (12-17)	0.13 (0.02)	0.15 (0.03)	0.000
Past-Year (18-25)	0.29 (0.05)	0.37 (0.06)	0.000
Past-Year (26 up)	0.08 (0.02)	0.13 (0.05)	0.000
Past-Year (18 up)	0.11 (0.02)	0.17 (0.05)	0.000
Control Variables			
Unemployment rate	0.06 (0.02)	0.06 (0.02)	0.001
Mean income ($)	38,398.72 (9,166.62)	47,103.68 (11,709.02)	0.000

Logarithmic transformations are employed on continuous outcome and predictor variables, so their coefficients are elasticities, meaning that a 1% change in the predictor is associated with the estimate percentage change in the outcome. The estimates for the policy indicators are transformed by exponentiation, subtracting 1, and multiplying by 100, which translates to an estimate percentage change in the outcome when the policy is in effect. All model standard errors are clustered by state to improve robustness and the results are weighted by state population. Variables are marked with time (t) or state (i) subscripts when applicable. Following Anderson et al. (2014), if the exposure of interest is

significant ($P < 0.05$) for all three specifications, we conclude that there is a predictive relationship between the exposure and the outcome.

Code and original source data are provided in the supplement and the results can be replicated in RStudio (2024.09.0+375).

TABLE 2: REGRESSION RESULTS ON THE RELATIONSHIPS BETWEEN MARIJUANA USE, MENTAL ILLNESS, AND VIOLENCE (AGES 18 AND ABOVE)

		Specification 1: Controls, FE, TE, TT				Specification 2: Controls, FE, TE				Specification 3: FE, TE				
Outcome	**Predictor**	**Est.**	***P***	**95% Low**	**High**	**Est.**	***P***	**95% Low**	**High**	**Est.**	***P***	**95% Low**	**High**	**Obs.**
Major Depression	Past-Year Use	0.233	0.000	0.159	0.307	0.272	0.000	0.205	0.340	0.279	0.000	0.212	0.347	765
Major Depression	Past-Month Use	0.140	0.000	0.083	0.197	0.157	0.000	0.104	0.210	0.165	0.000	0.112	0.218	765
Suicidal Thoughts	Past-Year Use	0.036	0.489	-0.066	0.138	0.142	0.005	0.043	0.241	0.125	0.015	0.025	0.225	612
Suicidal Thoughts	Past-Month Use	0.016	0.681	-0.061	0.094	0.068	0.060	-0.003	0.140	0.060	0.106	-0.013	0.133	612
Serious Mental Ill.	Past-Year Use	0.095	0.042	0.003	0.187	0.154	0.000	0.068	0.240	0.155	0.001	0.066	0.245	612
Serious Mental Ill.	Past-Month Use	0.100	0.008	0.027	0.174	0.127	0.000	0.060	0.194	0.128	0.000	0.060	0.197	612
Any Mental Illness	Past-Year Use	0.101	0.005	0.030	0.173	0.163	0.000	0.095	0.230	0.175	0.000	0.108	0.242	612
Any Mental Illness	Past-Month Use	0.050	0.075	-0.005	0.104	0.069	0.010	0.017	0.122	0.079	0.003	0.026	0.132	612
Major Depression	Rec. Legalization	1.666	0.365	-1.906	5.368	5.761	0.000	2.832	8.773	4.669	0.000	2.177	7.222	765
Major Depression	Medical Legalization	0.231	0.866	-2.434	2.970	0.019	0.986	-2.086	2.168	0.110	0.918	-1.967	2.232	
Suicidal Thoughts	Rec. Legalization	2.635	0.155	-0.984	6.386	4.575	0.009	1.146	8.121	1.498	0.277	-1.192	4.260	612
Suicidal Thoughts	Medical Legalization	1.645	0.288	-1.370	4.752	-1.676	0.202	-4.198	0.912	-2.769	0.034	-5.263	-0.209	
Serious Mental Ill.	Rec. Legalization	-0.055	0.981	-4.441	4.533	2.742	0.125	-0.753	6.360	1.085	0.492	-1.987	4.254	612
Serious Mental Ill.	Medical Legalization	2.181	0.199	-1.128	5.601	0.433	0.721	-1.926	2.848	-0.378	0.763	-2.805	2.109	
Any Mental Illness	Rec. Legalization	1.371	0.405	-1.831	4.678	4.814	0.000	2.153	7.543	4.230	0.000	2.218	6.283	612
Any Mental Illness	Medical Legalization	2.140	0.071	-0.185	4.519	0.664	0.512	-1.311	2.678	0.358	0.717	-1.570	2.325	
Past-Year Use	Major Depression	0.219	0.000	0.149	0.288	0.316	0.000	0.236	0.396	0.335	0.000	0.253	0.418	612
Past-Month Use	Major Depression	0.239	0.000	0.146	0.331	0.314	0.000	0.213	0.416	0.341	0.000	0.236	0.445	612
Past-Year Use	Suicidal Thoughts	0.032	0.491	-0.058	0.122	0.125	0.006	0.036	0.214	0.115	0.017	0.021	0.208	612
Past-Month Use	Suicidal Thoughts	0.025	0.682	-0.097	0.147	0.106	0.066	-0.007	0.219	0.095	0.112	-0.022	0.213	612
Past-Year Use	Serious Mental Ill.	0.073	0.045	0.002	0.144	0.141	0.001	0.060	0.223	0.148	0.001	0.060	0.236	612
Past-Month Use	Serious Mental Ill.	0.136	0.009	0.034	0.239	0.205	0.000	0.092	0.318	0.212	0.000	0.094	0.331	612

		Specification 1: Controls, FE, TE, TT				Specification 2: Controls, FE, TE				Specification 3: FE, TE				
Past-Year Use	Any Mental Illness	0.169	0.006	0.048	0.289	0.275	0.000	0.159	0.391	0.304	0.000	0.185	0.424	612
Past-Month Use	Any Mental Illness	0.147	0.080	-0.017	0.312	0.207	0.011	0.047	0.367	0.240	0.004	0.076	0.403	612
Homicides	Past-Year Use	0.016	0.769	-0.094	0.126	-0.101	0.131	-0.232	0.030	-0.114	0.170	-0.276	0.049	918
Homicides	Past-Month Use	-0.037	0.397	-0.123	0.049	-0.138	0.004	-0.234	-0.043	-0.126	0.030	-0.240	-0.012	918
Homicides	Rec. Legalization	-9.261	0.001	-14.420	-3.791	-6.707	0.024	-12.174	-0.900	-13.551	0.000	-18.130	-8.716	1224
Homicides	Medical Legalization	-6.164	0.006	-10.321	-1.813	-9.511	0.000	-13.474	-5.367	-8.247	0.000	-12.344	-3.959	

TABLE 3: REGRESSION RESULTS ON THE RELATIONSHIPS BETWEEN MARIJUANA USE AND LEGALIZATION

		Specification 1: Controls, FE, TE, TT				Specification 2: Controls, FE, TE				Specification 3: FE, TE				
				95%				95%				95%		
Outcome	**Predictor**	**Est.**	***P***	**Low**	**High**	**Est.**	***P***	**Low**	**High**	**Est.**	***P***	**Low**	**High**	**Obs.**
Past-Year (12-17)	Rec. Legalization	1.966	0.413	-2.678	6.831	9.797	0.000	5.669	14.087	10.112	0.000	6.119	14.255	918
Past-Year (12-17)	Medical Legalization	2.075	0.128	-0.590	4.811	0.534	0.635	-1.653	2.770	1.424	0.217	-0.829	3.727	
Past-Year (18-25)	Rec. Legalization	6.210	0.000	2.915	9.610	10.553	0.000	7.884	13.288	8.616	0.000	6.111	11.180	918
Past-Year (18-25)	Medical Legalization	-0.246	0.818	-2.316	1.868	-1.411	0.112	-3.123	0.331	-1.532	0.072	-3.175	0.138	
Past-Year (26 up)	Rec. Legalization	8.675	0.000	3.862	13.711	20.406	0.000	15.738	25.262	17.657	0.000	13.619	21.839	918
Past-Year (26 up)	Medical Legalization	1.758	0.249	-1.214	4.819	1.155	0.349	-1.250	3.619	1.345	0.278	-1.076	3.826	
Past-Year (18 up)	Rec. Legalization	7.616	0.000	4.215	11.128	18.285	0.000	14.792	21.883	15.962	0.000	12.787	19.226	918
Past-Year (18 up)	Medical Legalization	0.542	0.610	-1.526	2.655	0.550	0.551	-1.248	2.381	0.672	0.461	-1.107	2.482	
Past-Month (12-17)	Rec. Legalization	2.296	0.503	-4.282	9.326	12.438	0.000	6.425	18.791	13.833	0.000	7.686	20.332	918
Past-Month (12-17)	Medical Legalization	2.215	0.233	-1.406	5.969	0.155	0.920	-2.830	3.233	1.454	0.327	-1.436	4.428	
Past-Month (18-25)	Rec. Legalization	5.232	0.014	1.021	9.619	15.956	0.000	11.978	20.075	12.049	0.000	8.438	15.781	918
Past-Month (18-25)	Medical Legalization	1.778	0.260	-1.297	4.949	0.331	0.808	-2.312	3.047	0.010	0.994	-2.542	2.628	
Past-Month (26 up)	Rec. Legalization	8.408	0.002	3.017	14.081	22.418	0.000	16.871	28.230	20.124	0.000	15.453	24.984	918
Past-Month (26 up)	Medical Legalization	4.113	0.025	0.503	7.854	5.429	0.000	2.357	8.595	6.159	0.000	3.167	9.239	
Past-Month (18 up)	Rec. Legalization	7.289	0.001	2.769	12.007	21.932	0.000	17.205	26.850	18.980	0.000	14.898	23.207	918
Past-Month (18 up)	Medical Legalization	2.918	0.047	0.038	5.881	3.851	0.004	1.242	6.528	4.141	0.001	1.640	6.703