

NBER WORKING PAPER SERIES

THE EFFECTS OF MARIJUANA LIBERALIZATIONS:
EVIDENCE FROM MONITORING THE FUTURE

Angela K. Dills
Sietse Goffard
Jeffrey Miron

Working Paper 23779
<http://www.nber.org/papers/w23779>

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
September 2017

This project requested and received IRB approval from Harvard University. Monitoring the Future requests that authors allow them to review papers prior to publication. The views expressed herein are those of the authors and do not necessarily reflect the views of the National Bureau of Economic Research.

At least one co-author has disclosed a financial relationship of potential relevance for this research. Further information is available online at <http://www.nber.org/papers/w23779.ack>

NBER working papers are circulated for discussion and comment purposes. They have not been peer-reviewed or been subject to the review by the NBER Board of Directors that accompanies official NBER publications.

© 2017 by Angela K. Dills, Sietse Goffard, and Jeffrey Miron. All rights reserved. Short sections of text, not to exceed two paragraphs, may be quoted without explicit permission provided that full credit, including © notice, is given to the source.

The Effects of Marijuana Liberalizations: Evidence from Monitoring the Future
Angela K. Dills, Sietse Goffard, and Jeffrey Miron
NBER Working Paper No. 23779
September 2017
JEL No. K14

ABSTRACT

By the end of 2016, 28 states had liberalized their marijuana laws: by decriminalizing possession, by legalizing for medical purposes, or by legalizing more broadly. More states are considering such policy changes even while supporters and opponents continue to debate their impacts. Yet evidence on these liberalizations remains scarce, in part due to data limitations.

We use data from Monitoring the Future's annual surveys of high school seniors to evaluate the impact of marijuana liberalizations on marijuana use, other substance use, alcohol consumption, attitudes surrounding substance use, youth health outcomes, crime rates, and traffic accidents. These data have several advantages over those used in prior analyses.

We find that marijuana liberalizations have had minimal impact on the examined outcomes. Notably, many of the outcomes predicted by critics of liberalizations, such as increases in youth drug use and youth criminal behavior, have failed to materialize in the wake of marijuana liberalizations.

Angela K. Dills
Western Carolina University
1 University Way
Cullowhee, NC 28723
angeladills@gmail.com

Jeffrey Miron
Department of Economics
Harvard University
Cambridge, MA 02138
and NBER
miron@fas.harvard.edu

Sietse Goffard
Consumer Financial Protection Bureau
1700 G St NW
Washington, DC 20552
sietsekiengoffard@gmail.com

I. Introduction

Since the 1970s, more than 28 states have liberalized their laws toward marijuana possession, production, and sale. In the 1970s, 11 states decriminalized possession of small amounts, and since 2002, 10 more have decriminalized. Since 1996, 24 states have legalized marijuana for medical purposes, and since 2012, 8 states have legalized more fully.¹ All these policy changes reflect state laws; marijuana remains illegal under federal law. Since much drug law enforcement is state or local, however, these state-level policy changes potentially affect marijuana use and related outcomes.²

Supporters and opponents make strong claims about these marijuana liberalizations. Advocates believe that liberalizations reduce crime, raise tax revenue, lower expenditure on criminal justice enforcement, enhance traffic safety, improve public health, and stimulate the economy. Critics argue that liberalizations increase crime, raise criminal justice expenditure, spur youth marijuana use, reduce teen educational performance, undermine public health, and diminish traffic safety.³

¹ The District of Columbia also “legalized” in 2015, but their legalization fell far short of permitting retail trade. Our analysis does not include the District.

² We refer to the new marijuana policies in Colorado and Washington State as marijuana legalization, even though a more accurate description would be re-legalization. See discussion below under background and history.

³ The debate in Colorado, for example, included claims from opponents that legalizing marijuana would increase youth drug use (Ferner 2012, Walters, 2014); violent crime (Meese and Stimson, 2014; Healey, 2014); and addiction and traffic accidents (Sabet, 2014). On the other hand, advocates have asserted that marijuana legalization will reduce consumption of alcohol and other, more dangerous drugs, help end mass incarceration, diminish black market trade, and undermine illicit criminal organizations (Nadelman 2014; Osterman 2013). In addition, proponents believe that a surge in crime would be unlikely because, over the past decade or so, marijuana has already become somewhat accessible to the public in certain states, so any potential impact on crime should have already taken place. Other prominent politicians support marijuana legalization and/or decriminalization because they see growing evidence that the drug does not in fact lead to the deleterious outcomes with which it is often associated. Nevada Senator Harry Reid, for instance, recently commented, “If you’d asked me this question a dozen years ago, it would have been easy to answer — I would have said no, because [marijuana] leads to other stuff. But I can’t say that anymore” (Demirjian, 2014).

Existing evidence on medical marijuana laws is somewhat mixed. Sabia et al. (2017) estimate declines in body weight post medical marijuana laws using data from the Behavior Risk Factor Surveillance System (BRFSS). Using the National Survey on Drug Use and Health (NSDUH), Williams et al. (2017) also find no increase in adolescent marijuana use from medical marijuana laws. Smart (2015) also uses NSDUH and finds that states with larger increases in registered medical marijuana users experience increased adolescent marijuana use, traffic fatalities, and alcohol poisoning. Anderson and Rees (2014) and Anderson, Hansen, and Rees (2015) suggest little effect of medical marijuana laws on adolescent marijuana use and related outcomes. MacCoun et al (2009), Anderson et al (2013, 2015), and Hall and Lynskey (2016) also review much of this literature. The existing evidence on decriminalizations is thin and suggests little effect on consumers. MacCoun et al. (2009) also review the decriminalization literature. They argue that one reason for the lack of response is that consumers do not realize that the penalties have changed.

We add to this literature by examining the effects of state marijuana liberalizations on marijuana use and related outcomes utilizing a different data source: *Monitoring the Future's* annual surveys of high school students (hereafter MTF). This dataset has several attractive features. The sample begins in 1977, so we can examine both early and recent liberalizations. MTF tracks a broad range of outcomes including substance use, crime, health, behavior, and attitudes. MTF is widely cited and highly regarded in the public health community. MTF samples high school students, a group of particular concern when it comes to marijuana consumption. MTF data do have their own limitations: MTF

surveys only youths in public and private high schools; the data are self-reports; and students or their parents can opt out, possibly creating selection bias.

Previous work typically relies on the NSDUH or YRBS/BRFSS. The NSDUH captures some information on marijuana use, but though the survey is conducted annually, state-level data are only reported as two year averages. Data from the Youth Risk Behavior Survey (YRBS) are collected every two years; moreover, key states such as Washington and Oregon do not currently participate.⁴ Some states conduct their own surveys, but these tend to be sporadic and use differing methodologies.

We consider a variety of outcomes potentially affected by state marijuana liberalizations: marijuana and other substance use, perceived riskiness and disapproval of drug and alcohol use, health outcomes, criminal behavior, and driving under the influence. Our study relies on restricted-use data that sample high school seniors from 1977 to 2015. The length of the sample includes variation in marijuana laws from early decriminalization laws, medical marijuana laws, and some recreational marijuana laws.

Our results suggest that marijuana liberalizations have had little or no impact on teen marijuana use and related outcomes. Generally, marijuana liberalizations have been associated with outcomes that most observers would regard as beneficial, such as reduced marijuana, alcohol, and other drug use; reduced desirability of consuming these substances; and reduced access to these substances on school property. We emphasize, however, that virtually all our estimated impacts are small and statistically insignificant, so the first-order description of our results is, “no effect.”

⁴ Both states, however, participated in the late 1990s in years surrounding their passage of medical marijuana laws. See, for example, the analysis in Anderson, Hansen, and Rees (2015)

II. Background on Marijuana's Legal Status in the United States

The first anti-marijuana laws in the United States date from 1911, when Massachusetts banned marijuana, followed in 1913 by California, Maine, Wyoming, and Indiana.⁵ Other states followed suit over the next two decades; by 1933, 27 had criminalized marijuana.⁶ The main factors generating these new laws seem to have been anti-Mexican sentiment (whipped up by popular notions that marijuana was a social ill brought by Mexican laborers) and fear that marijuana would engender criminal or even murderous tendencies in its users.

At the federal level, marijuana was legal in the United States until 1937, when Congress passed the Marijuana Tax Act, effectively criminalizing marijuana and prohibiting its possession or sale under federal law. Only those who paid a hefty excise tax were permitted to use marijuana for medical and industrial uses. In the 1950s, a series of federal laws, including the Boggs Act of 1952 and the Narcotics Control Act of 1956, strengthened penalties against marijuana use and imposed mandatory jail sentences for drug-related offenses.

Attitudes began to change in the late 1960s; in 1970 Congress repealed most mandatory penalties for drug-related offenses, based on the view that mandatory minimums had done little to curb drug use (Schlosser 1994). The 1972 Shafer Commission, appointed by President Nixon and operating under the National Commission

⁵ <http://www.canorml.org/background/caloriginsmjproh.pdf>

⁶ The states were Utah (1915), Vermont (1915), Wyoming (1915), Texas (1919 or 1931), Colorado (1917), Nevada (1917), Rhode Island (1918), Iowa (1923), Nevada (1923), Oregon (1923), Washington (1923), Arkansas (1923), New Mexico (1923), Louisiana (1924 or 1927?), Idaho (1927), New York (1927), Kansas (1927), Montana (1927), Nebraska (1927), Illinois (1931), North Dakota (1933), and Oklahoma (1933).
<http://www.druglibrary.org/olsen/dpf/whitebread05.html>;
<http://medicalmarijuana.procon.org/view.timeline.php?timelineID=000026#1900-1949>.

on Marijuana and Drug Abuse, advised Congress to reduce penalties for marijuana use and possession and to seek alternative methods to discourage heavy drug use (Smith 2014).

The release of the report marks the beginning of three waves of marijuana liberalizations. In 1973 Oregon became the first state to decriminalize marijuana. Under decriminalization, possession of small amounts carries no criminal record or prison time and is instead treated more like a traffic fine, even though production and distribution are still illegal. Colorado, Alaska, Ohio, and California followed suit in 1975 (Smith 2014), and by the end of the 1970s, ten states had decriminalized. More recently, Connecticut (2011), Delaware (2015), Illinois (2016), Maine (2009), Massachusetts (2008), Nevada (2002), Oregon (1995), Rhode Island (2012), and Vermont (2013) decriminalized, bringing the total to 21 as of this writing.

By the end of the 1970s, it seemed that decriminalization and perhaps legalization might sweep the country, but various events such as the arrival of crack cocaine and the election of Ronald Reagan led to a new drug war. First Lady Nancy Reagan's famous "Just Say No" campaign aimed to expose the perils of youth drug use and helped maintain a negative public perception of marijuana. National approval of marijuana legalization, as measured by annual Gallup surveys, rose from 12% to 28% between 1969 and 1977 but then fell and hovered around 23% during the next decade. Few major changes in state marijuana policies occurred between 1982 and 1995. National drug policy with respect to other substances saw increased strictness and enforcement. In passing the Anti-Drug Abuse Act of 1986, Congress established harsh mandatory minimum sentences for drug

trafficking; two years later, it mandated five-year minimum sentences for first-time possession of five grams of crack cocaine.

The second wave of liberalizations began in 1996, when California legalized marijuana for medical purposes. As of March 2017, twenty-eight states and the District of Columbia permit medical marijuana, though the scope of these laws varies widely across states. Oregon, for example, allows patients to possess up to 24 ounces of usable medicinal marijuana in addition to 24 plants. Montana, on the other hand, permits possession of just one ounce of medical marijuana and four plants.⁷ Similarly, the conditions for which physicians can legally prescribe marijuana vary widely. California, for example, allows “the use of marijuana in the treatment of cancer, anorexia, AIDS, chronic pain, spasticity, glaucoma, arthritis, migraine or any other illness for which marijuana provides relief,” resulting in its recommendation for hundreds of indications; New Hampshire allows medical marijuana if the patient has both “(a) a chronic or terminal disease; and (b) symptoms or treatment results that include at least one of the following: cachexia or wasting syndrome, severe pain that has not responded to previously prescribed medication or surgical measures for more than 3 months; severe nausea, severe vomiting, seizures, or severe, persistent muscle spasms.” Many medicalization states have rules in between these extremes.⁸

⁷ <http://medicalmarijuana.procon.org/view.resource.php?resourceID=000881>

⁸ See <https://legiscan.com/NH/text/HB573/id/709869>. We do not count states that only allow CBD; see <http://www.ncsl.org/research/health/state-medical-marijuana-laws.aspx>. Williams et al. (2016) describes differences across states’ medical marijuana laws. In their sample, they find that fourteen of the twenty-four states enroll almost all medical marijuana participants. Less regulated states enroll more medical marijuana users.

The third wave of marijuana liberalizations began in 2012 and consists of the eight state legalizations for recreational use. Colorado and Washington legalized in November, 2012, with retail stores opening in January 2014 in Colorado and July 2014 in Washington. Alaska and Oregon legalized in November 2014; retail stores opened in Oregon on October 1, 2015 but have not yet opened in Alaska. California, Nevada, Massachusetts, and Maine legalized in November 2016, but licensed retailers have yet to open.⁹

Table 1 summarizes these laws. Considerable variation exists within each category (as noted above regarding medical marijuana laws). Even across states with similar laws, moreover, enforcement can differ. We take no account of enforcement differences in our empirical analysis below, mainly because measurement is problematic.

Despite the substantial liberalization of state marijuana laws over the past several decades, federal marijuana prohibition continues. In some periods, moreover, federal authorities have pushed back against state marijuana liberalizations. Attorney General Eric Holder, for example, stated in 2009 that the Justice Department would stop raiding medical marijuana dispensaries;¹⁰ but by 2012 the Justice Department had raided more than 100.¹¹

⁹ Retail sales are not yet legal in California; <https://www.merryjane.com/news/california-marijuana-dispensaries-are-already-illegally-selling-recreational-pot>. Retail sales are predicted in Nevada by July 1, 2017; <http://www.thecannabist.co/2017/02/09/nevada-recreational-marijuana-start/73373/>. Massachusetts has delayed retail sales until at least the summer of 2018; https://www.nytimes.com/2016/12/31/us/massachusetts-pot-legalization.html?_r=0. Maine's law only allows growing your own; <http://www.pressherald.com/2017/01/30/recreational-marijuana-is-now-legal-in-maine-heres-what-you-need-to-know/>

¹⁰ <http://www.nytimes.com/2009/03/19/us/19holder.html>. The memo says that the department would not focus “federal resources in your States on individuals whose actions are in clear and unambiguous compliance with existing state laws providing for the medical use of marijuana”

¹¹ <http://www.rollingstone.com/politics/news/obamas-war-on-pot-20120216>. A number of dispensaries were raided in September 2012 in California;

Over the past four years, however, federal authorities have taken minimal action against state legalizations. In August 2013, Attorney General Eric Holder informed the governors of Colorado and Washington that the Department of Justice would permit them to implement their legalization ballot initiatives (Reilly, 2013). According to Holder, the Department of Justice reserved the right to file a preemption lawsuit at a later date (Reilly, 2013). In the same month, Deputy Attorney General James Cole issued a memo to U.S. attorneys across the country. The memo established eight top priorities for federal prosecutors enforcing marijuana laws (Cole, 2013).¹² Beyond these priorities, prosecution for marijuana offenses would left mostly to state authorities. Whether this will continue under the Trump administration is unclear. Attorney General Jeff Sessions has signaled a desire for the Justice Department to resume crackdowns on the sale and use of recreational marijuana, even in states that have fully legalized, setting up a possible showdown between the federal government and state authorities.

The legal status of medical marijuana is similar. At the federal level, marijuana remains a Schedule I substance under the Controlled Substances Act (National Conference of State Legislatures, 2015). This means that marijuana has no accepted medical use under federal law, and its distribution is a federal offense. However, federal enforcement has been relatively weak.

<http://latimesblogs.latimes.com/lanow/2012/09/feds-target-71-medical-marijuana-dispensaries-in-la-county.html>.

¹² Cole declared that the Department of Justice would focus on preventing: the distribution of marijuana to minors; marijuana revenue going to criminal enterprises, gangs, and cartels; the transportation or diversions of marijuana from states where it is legal under state law to other states; state-authorized marijuana activity being used as a “cover up” for the trafficking of other illegal drugs or illegal activity; violence and the use of firearms in the cultivation and distribution of marijuana; drugged driving and adverse effects on public health; the cultivation of marijuana on public lands; and the possession or use of marijuana on federal property (Cole, 2013).

In October 2009, the Obama administration encouraged federal prosecutors not to prosecute medical marijuana offenses as long as those violations complied with state law (National Conference of State Legislatures, 2015). In December 2014 Congress quietly and surprisingly codified this rule, effectively lifting America's decades-long prohibition on medical marijuana. Tucked deep inside a 1,600-page last minute federal spending measure, this provision prohibited federal drug agents from raiding medical marijuana retail operations in states where medical marijuana was legal (Halper, 2014). This Rohrabacher-Farr Amendment was renewed on May 5, 2017 with the Rohrabacher-Blumenauer Amendment.¹³ It remains unclear whether the Trump administration will change this stance; Attorney General Jeff Sessions declared in his Senate confirmation hearing that he recognized the medicinal benefits of marijuana and did not wish to interfere in states where it can be medically prescribed.¹⁴

III. Data and Estimation

We analyze individual level data on high school seniors using a restricted-use data set provided by *Monitoring the Future*. The data cover the period 1977-2015 and the full sample includes 10,000 to 16,000 observations per year. MTF uses a multi-stage random sampling procedure, first sampling particular geographic areas, then selecting one or more schools in each area, then sampling classes within each school. The sampling procedure is designed to provide a nationally representative sample; the survey is administered in 120 to 146 public and private high schools. Our estimation method accounts for this multistage design by incorporating the strata and clustering variables provided by MTF.

¹³ <http://www.dailymail.co.uk/news/article-4479676/Trump-crack-medical-marijuana.html>

¹⁴ <http://fortune.com/2017/01/10/jeff-sessions-marijuana-confirmation-hearing/>

The sample includes the 48 coterminous states, excluding the District of Columbia. Of the survey states adopting recreational marijuana, Washington appears in the sample every year, Colorado appears in all except 2014, and Oregon appears in all years except 1995-2001 and 2011-2014. The states lending variation to estimating the effects of recreational marijuana are primarily Washington and Colorado. Not every state is represented in each year. Populous states are represented every year: California, Florida, Georgia, Illinois, Massachusetts, Michigan, Missouri, New Jersey, New York, Ohio, Pennsylvania, Texas, Virginia, and Washington. Less populous states are represented less often. Of the 39 sample years, some states appear in ten or fewer years: Delaware (9), Montana (5), Nevada (7), New Hampshire (7), North Dakota (9), and South Dakota (8). The MTF samples up to about 350 twelfth graders in each school.¹⁵ Schools participate for two consecutive years with half the sampled schools replaced in any given year. In states with representation, we observe, on average 332 students; a state's sampled students plausibly all attend the same school.

Table 1 indicates the policy variation available in our sample.¹⁶ Students are randomly assigned to complete one of six possible forms. Some variables are available on all forms; we focus on these because they include the main variables on substance use. Other variables are available on a more limited number of forms, reducing the sample size. Given the limited variation in recreational marijuana laws, these form-specific questions may limit the power of our estimates.

One concern about MTF data, as with other surveys, is that respondents may underreport their smoking, drinking, and substance use even though the poll is

¹⁵ http://www.monitoringthefuture.org/pubs/monographs/mtf-vol2_2014.pdf.

¹⁶ Privacy concerns with the data sample prohibit state-specific plots of data.

anonymous. The survey is administered in the classroom, by University of Michigan staff members, on paper forms in the spring of each year. Surveys are anonymous, with twelfth graders' names and addresses collected separately from the survey forms to allow surveyers to administer follow-up surveys in later years.¹⁷

We note that most individuals in MTF's sample are too young for legal marijuana laws to apply directly, since every state with legalized recreational marijuana requires that consumers be at least 21. Even decriminalization laws generally apply only to those 21 and over.¹⁸ High school students might nevertheless rely on older friends, siblings, or parents to purchase legal marijuana, or they might access it via underground channels or by obtaining fake IDs. In many states, laws against youth marijuana use are poorly enforced, so the risk of being disciplined remains low. Thus, even though recreational marijuana laws are not directly relevant for most high school seniors, liberalizations might still impact their consumption and behavior in meaningful ways. In addition, many concerns about marijuana liberalizations focus especially on youth access and consumption.

To examine the impacts of state marijuana liberalizations, we estimate equations of the form

$$outcome_{ist} = \beta marijuana\ law_{st} + X'\delta + \theta_s + \tau_t + \varphi_s t + \varepsilon_{ist}$$

where $outcome_{ist}$ is an outcome such as marijuana use for individual i , living in state s , in year t . We denote marijuana laws in three ways. First, we include two variables: one indicating whether the state has decriminalized marijuana and one indicating whether the

¹⁷ <http://www.monitoringthefuture.org/pubs/monographs/mtf-overview2015.pdf>

¹⁸ Medical marijuana laws are an exception. Generally speaking, patients with a doctor's prescription need not be 21 to legally procure medicinal marijuana.

state has either adopted a medical marijuana law or legalized recreational use. This specification is driven by our data use agreement with Monitoring the Future, which precludes estimating the effect of recreational laws separate from the other legal changes until a larger number of states have adopted recreational marijuana laws. All states adopting recreational marijuana laws had adopted medical marijuana laws first. In our second specification, we include a binary variable indicating whether the state has passed any form of marijuana liberalization law (decriminalization, medicalization, full legalization, or any combination thereof). In our third specification, we include variables indicating how many such laws the state has enacted. Significant heterogeneity exists within these legal classifications; marijuana policy resembles a spectrum more than a set of rigid categories.¹⁹ By grouping laws under a common label, we treat marijuana policies in a given classification as equivalent despite differences in the leniency and inclusiveness of state laws.

The vector X includes individual respondent characteristics and state-level, time-varying characteristics. We include state fixed effects, θ_s ; year dummies, τ_t ; and state-specific linear trends, ϕ_{st} . The errors, ε_{ist} , account for the multi-level sampling structure of the MTF survey data.

The outcomes we consider are measures of marijuana and other substance use, disapproval of substance use, perceived riskiness of substance use, self-reported health behaviors, self-reported driving under the influence, and self-reported criminal activity.

¹⁹ Mississippi, Nebraska, and New York, for example, have all formally decriminalized marijuana, but residents in each of those states are authorized to possess different amounts of marijuana and face different punishments for consuming the drug. In short, though any two states may be coded similarly, there are nuances among states.

The individual-level controls are respondent's race, sex, whether over or under 18, urbanicity of their residence, and socioeconomic background. The state-level measures are the percentage of the population age 14 and under, age 25 to 54, age 55 and over, white, and black. We include indicators for whether the state has the death penalty, a shall-issue gun law, a zero tolerance law, graduated drivers' licensing and whether the state lowered its maximum legal blood alcohol content to 0.08. We also include real per capita personal income, the minimum legal drinking age, and the real state beer tax.

IV. Results

Tables 2 through 16 present our main results, displaying the estimated impact of marijuana liberalizations on marijuana and other substance use, driving under the influence, healthy behaviors, driving safety, the ease of obtaining various substances, illness and perceived self-esteem, friends' substance use, friends' disapproval of substance use or DUI, self-reported criminal behavior, perceived riskiness of substance use, and disapproval of substance use.

For every outcome we examine, the estimated coefficients on marijuana liberalizations tend to be small and statistically insignificant, with few consistent patterns of positive or negative effects. We examine 132 outcomes. Bear in mind that, with this many outcomes, we would expect roughly 13 of the coefficients to be statistically significant at the 10 percent level, even if the true effect is zero. We estimate that medicalization and legalization statistically significantly improved 8 outcomes and

worsened 9 outcomes; decriminalization statistically significantly improved 20 outcomes and worsened 4 outcomes.²⁰

We comment briefly on a few specific results.

Marijuana liberalizations appear, if anything, to have reduced the use of cocaine and heroin. They do not appear to have significantly impacted the consumption of marijuana itself, even if liberalization may have made marijuana easier to obtain in some places. Marijuana liberalization seems to have slightly increased ease of obtaining psychedelics, amphetamines, and sedatives and barbituates. Liberalization, particularly decriminalization, if anything, has increased the perceived riskiness of crack cocaine, the hallucinogen salvia, and narcotics; however, liberalization policies have had no consistent or significant effect on the perceived riskiness of marijuana or other drugs.

Marijuana decriminalization has tended to increase friends' perceived disapproval of substance use, particularly with regards to heavy alcohol consumption and occasional or regular marijuana use. Decriminalization is also associated with lower self-reported disapproval of crack cocaine and higher disapproval of heavy alcohol consumption.

Liberalizations appear, if anything, to improve traffic safety, though the share of accidents involving marijuana or hashish does not change significantly following medicalization/legalization or decriminalization. Decriminalization seems to reduce days of illness. Medicalization/legalization shows some association with increased petty crimes such as shoplifting; decriminalization may have reduced adolescent fighting at school or

²⁰ For ease of exposition, we label as “improved” the outcomes that most policy discussions would regard as desirable, such as decreased drug use, setting aside discussion of whether policy should attempt to reduce drug use.

work. Otherwise, liberalizations have had little impact on self-reported criminal or healthy behaviors.

Estimates using either an indicator for whether a state has any liberalization or a count of the number of liberalizations paint a similar picture. Under a null hypothesis or “no effect”, we observe slightly more than the expected number of improvements post-liberalizations and slightly fewer than the expected number of declines. These results are presented in the Appendix.²¹

V. Discussion

As multiple states have legalized the possession and sale of marijuana for medical and/or recreational purposes, the debate over the merits and pitfalls of legalization has witnessed strong claims from both supporters and opponents. Results in the existing academic literature remain mixed. We add to this literature with the use of a difference data set, Monitoring the Future’s surveys of high school seniors, and the examination of a wide variety of outcomes. Our analysis provides little support for either side’s claims, especially for the views that liberalizations generate substantial increases in youth marijuana or other alcohol and drug use, or in outcomes potentially related to use.

While we provide no evidence here for why the policy changes have not had more substantial impacts, we speculate briefly on the underlying explanation. The most obvious hypothesis is that, despite substantial resources devoted to enforcement, marijuana laws exert only minor impact on use, so removal of these laws merely ratifies *de jure* what is

²¹ We estimate the full set of tables using indicators for medicalization and for decriminalization for only the years prior to the first recreational marijuana law in 2013. These results are similar to the ones presented here. We find that medical marijuana laws and decriminalization laws had little or no effect on a wide variety of adolescent outcomes.

already true *de facto*. This is particularly likely if adoption of liberalizations is endogenous, so that states where enforcement is waning are also states that liberalize these laws.

Under this interpretation, our results do not imply that marijuana prohibition can never have a substantial impact on marijuana use and related outcomes; perhaps vigorous enforcement would have larger effects. Our results do suggest that, given current attitudes and enforcement toward marijuana, further liberalizations seems unlikely to have dramatic affects in any direction.

References

Anderson, D. Mark, Benjamin Hansen, and Daniel I. Rees. 2015. Medical Marijuana Laws and Teen Marijuana Use. *American Law and Economics Review* 17(2): 495-528.

Anderson, D. Mark, Benjamin Hansen, and Daniel I. Rees. 2013. Medical Marijuana Laws, Traffic Fatalities, and Alcohol Consumption. *Journal of Law and Economics* 56(2): 333-369.

Anderson DM, Rees DI. The legalization of recreational marijuana: how likely is the worst-case scenario? *Journal of Policy Analysis and Management*. 2014; 33: 221-232.

Cole, James. "Memorandum: Guidance Regarding Marijuana Enforcement." US Department of Justice. <http://www.justice.gov/iso/opa/resources/3052013829132756857467.pdf>

"Current Population Survey." U.S. Census Bureau. 6 December 2014. https://www.census.gov/mp/www/cat/people_and_households/current_population_survey.html

"Current Population Statistics." U.S. Bureau of Labor Statistics. 6 December 2014. < <http://www.bls.gov/cps/demographics.htm>>

Demirjian, Karoun. 2014. "Legalized medicinal pot has new supporter: Harry Reid." *Las Vegas Sun*, Thursday, January 16. Accessed August 23, 2017: <https://lasvegassun.com/news/2014/jan/16/legalizing-medicinal-marijuana/>

Ferner, Matt. "Gov. John Hickenlooper Opposes Legal Weed." *HuffingtonPost.com*. Sept. 12, 2012.

"Full Text: Colorado Amendment 20." National Families in Action. Last updated March 2012. <http://www.nationalfamilies.org/guide/colorado20-full.html>

Hall, Wayne and Michael Lynskey. 2016. Evaluating the public health impacts of legalizing recreational cannabis use in the United States. *Addiction* 111(10): 1764-1773

Halper, Evan. "Congress Quietly Ends Federal Government's Ban on Medical Marijuana." *LA Times*. Dec. 16, 2014.

Healey, Jack. "After 5 Months of Legal Sale, Colorado Sees the Downside of a Legal High." *New York Times*, May 31, 2014

Healy, Jack. "Nebraska and Oklahoma Sue Colorado over Marijuana Law." *New York Times*. Published December 18, 2014. Web.

<http://www.nytimes.com/2014/12/19/us/politics/nebraska-and-oklahoma-sue-coloradoover-marijuana-law.html?_r=0>

"High School: Youth Risk Behavior Survey." *Center for Disease Control and Prevention*. December 5, 2014. <http://nccd.cdc.gov/youthonline/App/Default.aspx>

MacCoun, Robert, Rosalie L. Pacula, Jamie Chriqui, Katherine Harris, and Peter Reuter, "Do Citizens Know Whether Their State Has Decriminalized Marijuana? Assessing the Perceptual Component of Deterrence Theory." *Review of Law and Economics*, 2009. 5(1): 347—371.

Meese, Edwin, and Charles Stimson. "The Case Against Legalizing Marijuana in California." Heritage Foundation. Oct. 3, 2010.

Nadelman, Ethan. "Marijuana Legalization: Not If, But When." HuffingtonPost.com. Nov. 3, 2010

National Conference of State Legislatures. "State Medical Marijuana Laws." Jan. 29, 2015. <http://www.ncsl.org/research/health/state-medical-marijuana-laws.aspx>

Osterman, Kelsey. "Gary Johnson: Legalizing Marijuana Will Lead to Lower Overall Substance Abuse." *RedAlertPolitics.com*. April 24, 2013.

Pacula RL, Powell D, Heaton P, Sevigny EL. Assessing the effects of medical marijuana laws on marijuana use: The devil is in the details. *JPAM*. 2015; 34(1): 7–31.

Sabet, Kevin. "Colorado Will Show Why Legalizing Marijuana Is a Mistake." *Washington Times*, Jan. 17, 2014.

Sabia JJ, Swigert J, Young T. The effect of medical marijuana laws on body weight. *Health Economics*. 2017; 26: 6-34.

Smart R. The kids aren't alright but older adults are just fine: effects of medical marijuana market growth on substance use and abuse. <http://dx.doi.org/10.2139/ssrn.2574915>. Published November 25, 2015. Accessed July 31, 2017.

Walters, John. "The Devastation That's Really Happening in Colorado." *Weekly Standard*, July 10, 2014.

Williams AR, Olfson M, Kim JH, Martins SS, Kleber HD. Older, less regulated medical marijuana programs have much greater enrollment rates than newer 'medicalized' programs. *Health Affairs*. 2016; 35(3): 480-488.

Williams AR, Santaella-Tenorio J, Mauro CM, Levin FR, Martin SS. (2017) Loose regulation of medical marijuana programs associated with higher rates of adult marijuana use but not cannabis use disorder. *Addiction*. Jun 10. doi: 10.1111/add.13904

Table 1: Marijuana Laws by State through 2015 - first month of law effective

State	Recreational Marijuana	Recreational retail stores	Medical Marijuana	Decriminalization
Alaska [§]	October 2015	October 2016	March 1999	June 1975
Arizona			May 2011	
California			November 1996	January 1976
Colorado	January 2013	January 2014	June 2001	July 1975
Connecticut			October 2012	June 2011
Delaware			June 2011	January 2016
DC	March 2015		August 2010	August 2014
Hawaii			January 2001	August 2016
Illinois			January 2014	
Maine			January 2000	May 1976
Maryland			June 2014	October 2014
Massachusetts			January 2013	November 2008
Michigan			December 2008	
Minnesota			June 2014	July 1976
Mississippi				July 1977
Montana			November 2004	
Nebraska				January 1979
Nevada			October 2001	January 2002
New Hampshire			August 2013	
New Jersey			October 2010	
New Mexico			July 2007	
New York			July 2014	July 1977
North Carolina				July 1977
Ohio				July 1976
Oregon [§]	July 2015	October 2015	December 1998	October 1973
Rhode Island			January 2006	April 2013
Vermont			July 2004	June 2013
Washington	January 2013	July 2014	November 1998	November 2012

Grayed dates denote changes that do not appear in our sample. Alaska and Hawaii are not part of the Monitoring the Future sample.

[§]Alaska recriminalized marijuana in November 1990 and decriminalized again in September 2004 when the state Supreme Court refused to hear a related appeal. Oregon also recriminalized marijuana effective October 1997; voters vetoed this legislation, decriminalizing again in November 1998.

TABLE 2: Effect of liberalizing marijuana laws on the substance use participation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Alcohol		Cigarettes		Marijuana		Cocaine		Heroin	
	Lifetime	Past Month	Lifetime	Past Month	Lifetime	Past Month	Lifetime	Past Month	Lifetime	Past Month
Medical and/or Legal	-0.0112 (0.0117)	-0.0201 (0.0142)	-0.00820 (0.0119)	9.03e-05 (0.00971)	-0.0175 (0.0142)	-0.00170 (0.0111)	-0.0138** (0.00626)	-0.00475* (0.00272)	-0.00221 (0.00192)	-0.00226** (0.00112)
Decriminalization	0.0160 (0.0145)	0.0168 (0.0179)	-0.00513 (0.0139)	-0.00495 (0.0136)	0.00979 (0.0175)	0.00744 (0.0151)	-0.0170* (0.00901)	-0.00863** (0.00380)	0.000711 (0.00228)	-0.000632 (0.00103)
Observations	383,995	457,353	471,180	470,738	468,102	466,623	471,028	470,678	472,573	472,589
R-squared	0.085	0.095	0.079	0.045	0.051	0.046	0.041	0.022	0.003	0.002
Outcome Mean	0.838	0.567	0.605	0.279	0.481	0.228	0.096	0.027	0.012	0.003

Regressions include year dummies, state fixed effects, and state-specific linear trends. All regressions also include the percent aged 14 and under, the percent aged 25-54, the percent aged 55 and over, the percent white, the percent black; indicators for whether the state has the death penalty, shall issue gun law, BAC legal limit of 0.08, zero tolerance law, graduate driver's licensing; real per capita personal income, and the real state beer tax. Standard errors account for the survey sampling strategy.

TABLE 3: Effect of liberalizing marijuana laws on the number of times in the past month the respondent used the substance.

	(1)	(2)	(3)	(4)	(5)
	Alcohol	Cigarettes	Marijuana	Cocaine	Heroin
Medical and/or Legal	-0.162 (0.176)	-0.0810 (0.0924)	-0.165 (0.206)	-0.0467 (0.0303)	-0.0322* (0.0189)
Decriminalization	-0.0961 (0.267)	0.133 (0.167)	0.209 (0.306)	-0.0600** (0.0290)	-0.0215* (0.0123)
Observations	457,353	470,738	466,623	470,678	472,589
R-squared	0.062	0.044	0.037	0.006	0.002
Outcome Mean	3.909	1.939	2.706	0.141	0.024

Regressions include year dummies, state fixed effects, and state-specific linear trends. All regressions also include the percent aged 14 and under, the percent aged 25-54, the percent aged 55 and over, the percent white, the percent black; indicators for whether the state has the death penalty, shall issue gun law, BAC legal limit of 0.08, zero tolerance law, graduate driver's licensing; real per capita personal income, and the real state beer tax. Standard errors account for the survey sampling strategy.

TABLE 4: Effect of liberalizing marijuana law on friends' substance use.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	How many of your friends...(1="None"; 2="A Few"; 3="Some"; 4="Most"; 5="All")						
	smoke cigarettes	drink alcohol	get drunk	smoke marijuana	take LSD	take psychedelics	take amphetamines
Medical and/or Legal	-0.0294 (0.0388)	-0.0293 (0.0487)	-0.0134 (0.0486)	0.00192 (0.0447)	0.00195 (0.0274)	0.0143 (0.0279)	0.0389 (0.0311)
Decriminalization	-0.000313 (0.0553)	0.0184 (0.0671)	-0.0428 (0.0642)	-0.0590 (0.0603)	-0.0434 (0.0365)	-9.44e-05 (0.0419)	0.0115 (0.0399)
Observations	123,388	122,350	122,520	123,214	79,165	79,238	79,182
R-squared	0.107	0.084	0.051	0.075	0.034	0.031	0.046
Outcome Mean	2.598	3.552	2.705	2.497	1.364	1.336	1.495
	take tranquilizers	take cocaine	take crack cocaine	take heroin	take narcotics	take inhalants	take quaaludes
Medical and/or Legal	-0.0110 (0.0206)	-0.0607*** (0.0224)	0.00734 (0.0189)	-0.0453** (0.0189)	-0.0381 (0.0265)	-0.00471 (0.0252)	-0.0342 (0.0362)
Decriminalization	-0.00311 (0.0302)	-0.0270 (0.0323)	-0.0282 (0.0336)	0.00906 (0.0211)	-0.0344 (0.0349)	-0.0184 (0.0275)	0.0408 (0.0646)
Observations	78,835	122,002	94,287	78,550	78,654	78,449	69,924
R-squared	0.034	0.063	0.021	0.011	0.020	0.020	0.047
Outcome Mean	1.275	1.381	0.242	1.158	1.295	1.260	1.278

Regressions include year dummies, state fixed effects, and state-specific linear trends. All regressions also include the percent aged 14 and under, the percent aged 25-54, the percent aged 55 and over, the percent white, the percent black; indicators for whether the state has the death penalty, shall issue gun law, BAC legal limit of 0.08, zero tolerance law, graduate driver's licensing; real per capita personal income, and the real state beer tax. Standard errors account for the survey sampling strategy.

TABLE 5: Effect of liberalizing marijuana laws on easy of obtaining substances

	(1)	(2)	(3)	(4)	(5)
How difficult do you think it would be for you to get each of the following types of drugs, if you wanted some? (1=Probably Impossible; 2=Very Difficult; 3=Fairly Difficult; 4=Fairly Easy; 5=Very Easy)					
	marijuana	LSD	psychedelics	amphetamines	sedatives, barbituates
Medical and/or Legal	-0.00940 (0.0319)	0.0534 (0.0373)	0.0885* (0.0506)	0.166*** (0.0545)	0.0930** (0.0454)
Decriminalization	0.0680 (0.0450)	0.0409 (0.0500)	0.148** (0.0697)	0.157** (0.0706)	0.103 (0.0712)
Observations	182,835	133,759	84,172	100,915	100,272
R-squared	0.040	0.080	0.075	0.080	0.070
Outcome Mean	4.39	2.97	2.86	3.57	3.19
	tranquilizers	cocaine	heroin	narcotics	
Medical and/or Legal	0.0548 (0.0419)	-0.0503 (0.0517)	-0.00270 (0.0473)	0.0413 (0.0478)	
Decriminalization	0.00250 (0.0601)	0.0701 (0.0707)	0.00558 (0.0669)	0.110 (0.0740)	
Observations	100,354	84,599	100,393	100,372	
R-squared	0.132	0.056	0.034	0.039	
Outcome Mean	3.10	3.16	2.62	2.93	

Regressions include year dummies, state fixed effects, and state-specific linear trends. All regressions also include the percent aged 14 and under, the percent aged 25-54, the percent aged 55 and over, the percent white, the percent black; indicators for whether the state has the death penalty, shall issue gun law, BAC legal limit of 0.08, zero tolerance law, graduate driver's licensing; real per capita personal income, and the real state beer tax. Standard errors account for the survey sampling strategy.

TABLE 6: Effects of liberalizing marijuana laws on perceived riskiness

	(1)	(2)	(3)	(4)
How much do you think people risk harming themselves if they...				
1=No Risk; 2=Slight Risk; 3=Moderate Risk; 4=Great Risk; (5=Can't Say, Drug Unfamiliar - coded as missing)				
	try powder cocaine 1 or 2 times	take powder cocaine occasionally	take powder cocaine regularly	try PCP one or two times
Medical and/or Legal	0.00879 (0.0289)	-0.000982 (0.0206)	0.00555 (0.0161)	-0.0394 (0.0377)
Decriminalization	0.0767 (0.0599)	0.0667 (0.0417)	0.0240 (0.0341)	0.0824 (0.0849)
Observations	109,223	109,213	109,156	46,685
R-squared	0.015	0.016	0.031	0.022
Outcome Mean	3.295	3.648	3.869	3.321
	try crack cocaine one or two times	take crack cocaine occasionally	take crack cocaine regularly	smoke one or more packs of cigarettes per day
Medical and/or Legal	-0.0115 (0.0274)	-0.0120 (0.0187)	-0.00683 (0.0157)	0.00264 (0.0149)
Decriminalization	0.0684 (0.0509)	0.0800** (0.0366)	0.0140 (0.0363)	0.0104 (0.0250)
Observations	108,389	108,413	108,370	227,966
R-squared	0.020	0.020	0.031	0.034
Outcome Mean	3.455	3.738	3.887	3.620
	try marijuana once or twice	smoke marijuana occasionally	smoke marijuana regularly	try crystal meth once or twice
Medical and/or Legal	0.0126 (0.0296)	-0.0157 (0.0316)	-0.0127 (0.0271)	-0.0238 (0.0373)
Decriminalization	-0.000528 (0.0394)	0.0211 (0.0461)	0.0641 (0.0452)	0.0657 (0.0781)
Observations	225,437	225,212	225,119	38,942
R-squared	0.083	0.099	0.108	0.025
Outcome Mean	2.115	2.695	3.343	3.456

Regressions include year dummies, state fixed effects, and state-specific linear trends. All regressions also include the percent aged 14 and under, the percent aged 25-54, the percent aged 55 and over, the percent white, the percent black; indicators for whether the state has the death penalty, shall issue gun law, BAC legal limit of 0.08, zero tolerance law, graduate driver's licensing; real per capita personal income, and the real state beer tax. Standard errors account for the survey sampling strategy.

TABLE 7: Effects of liberalizing marijuana laws on perceived riskiness

	(1)	(2)	(3)	(4)
How much do you think people risk harming themselves (physically or in other ways) if they...				
1=No Risk; 2=Slight Risk; 3=Moderate Risk; 4=Great Risk; (5=Can't Say, Drug Unfamiliar - coded as missing)				
	try one or two drinks of an alcoholic beverage	take one or two drinks nearly every day	take four or five drinks nearly every day	have five or more drinks once or twice each weekend
Medical and/or Legal	0.0256 (0.0247)	0.0300 (0.0240)	0.0285 (0.0205)	0.0156 (0.0264)
Decriminalization	-0.0567 (0.0352)	0.0342 (0.0375)	0.0391 (0.0295)	0.0350 (0.0400)
Observations	188,799	221,732	221,541	221,563
R-squared	0.076	0.059	0.056	0.054
Outcome Mean	1.756	2.810	3.538	3.127
	try adderall once or twice	use adderall occasionally	try salvia once or twice	use salvia occasionally
Medical and/or Legal	-0.0276 (0.146)	-0.0513 (0.122)	0.167 (0.161)	0.572** (0.252)
Decriminalization	0.256 (0.250)	0.128 (0.243)	0.258 (0.328)	0.894** (0.440)
Observations	7,884	7,873	5,366	2,803
R-squared	0.080	0.060	0.080	0.080
Outcome Mean	2.685	3.072	2.736	3.054
	try narcotics once or twice	use narcotics occasionally	use narcotics regularly	
Medical and/or Legal	0.0505 (0.138)	0.123 (0.102)	0.0814 (0.0846)	
Decriminalization	0.554*** (0.196)	0.136 (0.168)	0.135 (0.119)	
Observations	8,331	8,342	8,340	
R-squared	0.045	0.046	0.064	
Outcome Mean	3.041	3.437	3.713	

Regressions include year dummies, state fixed effects, and state-specific linear trends. All regressions also include the percent aged 14 and under, the percent aged 25-54, the percent aged 55 and over, the percent white, the percent black; indicators for whether the state has the death penalty, shall issue gun law, BAC legal limit of 0.08, zero tolerance law, graduate driver's licensing; real per capita personal income, and the real state beer tax. Standard errors account for the survey sampling strategy.

TABLE 8: Effects of liberalizing marijuana laws on respondent disapproval

	(1)	(2)	(3)	(4)
	Do you disapprove of people (who are 18 or older) doing each of the following? 1=Don't Disapprove; 2=Disapprove; 3=Strongly Disapprove)			
	smoking one or more packs of cigarets per day	trying marijuana once or twice?	smoking marijuana occasionally	smoking marijuana regularly
Medical and/or Legal	-0.00814 (0.0207)	0.0174 (0.0245)	-0.00195 (0.0270)	-0.0109 (0.0239)
Decriminalization	-0.0168 (0.0300)	0.0155 (0.0368)	-0.0186 (0.0394)	-0.0179 (0.0364)
Observations	216,099	216,743	216,500	216,297
R-squared	0.043	0.073	0.071	0.061
Outcome Mean	2.056	1.776	2.001	2.329
	trying one or two drinks of alcohol	drinking 1-2 drinks almost every day	drinking 4-5 drinks almost every day	drinking 5+ drinks once or twice on the weekends?
Medical and/or Legal	0.0181 (0.0207)	0.0222 (0.0197)	0.0285* (0.0171)	0.0350 (0.0239)
Decriminalization	-0.0191 (0.0323)	0.0195 (0.0338)	0.0556** (0.0256)	0.00791 (0.0360)
Observations	182,615	216,120	216,279	216,155
R-squared	0.077	0.048	0.054	0.058
Outcome Mean	1.346	1.992	2.493	2.029

Regressions include year dummies, state fixed effects, and state-specific linear trends. All regressions also include the percent aged 14 and under, the percent aged 25-54, the percent aged 55 and over, the percent white, the percent black; indicators for whether the state has the death penalty, shall issue gun law, BAC legal limit of 0.08, zero tolerance law, graduate driver's licensing; real per capita personal income, and the real state beer tax. Standard errors account for the survey sampling strategy.

TABLE 9: Effects of liberalizing marijuana laws on respondent disapproval

	(1)	(2)	(3)
Do you disapprove of people (who are 18 or older) doing each of the following? 1=Don't Disapprove; 2=Disapprove; 3=Strongly Disapprove)			
	trying cocaine powder once or twice	using cocaine powder occasionally	using cocaine powder regularly
Medical and/or Legal	0.0218 (0.0201)	-0.0111 (0.0217)	-0.00804 (0.0148)
Decriminalization	-0.00342 (0.0275)	-0.00264 (0.0371)	0.00519 (0.0204)
Observations	166,114	80,284	165,538
R-squared	0.029	0.019	0.024
Outcome Mean	2.525	2.599	2.758
	trying crack cocaine once or twice	using crack cocaine occasionally	using crack cocaine regularly
Medical and/or Legal	-0.0287 (0.0224)	-0.0370* (0.0205)	-0.0236 (0.0201)
Decriminalization	0.0245 (0.0343)	0.00389 (0.0320)	0.0219 (0.0360)
Observations	80,194	80,166	79,912
R-squared	0.015	0.023	0.031
Outcome Mean	2.547	2.664	2.722

Regressions include year dummies, state fixed effects, and state-specific linear trends. All regressions also include the percent aged 14 and under, the percent aged 25-54, the percent aged 55 and over, the percent white, the percent black; indicators for whether the state has the death penalty, shall issue gun law, BAC legal limit of 0.08, zero tolerance law, graduate driver's licensing; real per capita personal income, and the real state beer tax. Standard errors account for the survey sampling strategy.

TABLE 10: Effect of liberalizing marijuana laws on friends' disapproval of substance use and driving under the influence

	(1)	(2)	(3)	(4)	(5)	(6)
	How do you think your CLOSE FRIENDS feel (or would feel) about YOU doing each of the following things? 1=Don't Disapprove; 2=Disapprove; 3 = Strongly Disapprove					
	Smoking one or more packs of cigarettes per day	trying marijuana once or twice	smoking marijuana occasionally	smoking marijuana regularly	trying LSD once or twice	trying amphetamines once or twice
Medical and/or Legal	0.0309 (0.0302)	0.0275 (0.0354)	0.0287 (0.0356)	0.00874 (0.0344)	0.0216 (0.0317)	0.0257 (0.0307)
Decriminalization	0.0525 (0.0503)	0.0766 (0.0567)	0.101* (0.0612)	0.128** (0.0599)	0.0354 (0.0528)	0.0385 (0.0483)
Observations	68,632	68,571	68,438	68,354	68,299	68,313
R-squared	0.058	0.073	0.069	0.060	0.029	0.033
Outcome Mean	2.180	1.890	2.032	2.302	2.518	2.414
	taking one or two drinks nearly every day	taking four or five drinks nearly every day	having five+ drinks once or twice each weekend	driving a car after having 1-2 drinks	driving a car after having 5 or more drinks	
Medical and/or Legal	0.0135 (0.0312)	0.0178 (0.0277)	0.0540 (0.0371)	0.0485 (0.0296)	0.0292 (0.0225)	
Decriminalization	0.108** (0.0489)	0.0885* (0.0498)	0.0569 (0.0562)	0.155** (0.0662)	0.0639* (0.0371)	
Observations	68,266	68,167	68,165	53,637	53,617	
R-squared	0.059	0.067	0.064	0.090	0.057	
Outcome Mean	2.141	2.440	1.894	2.247	2.682	

Regressions include year dummies, state fixed effects, and state-specific linear trends. All regressions also include the percent aged 14 and under, the percent aged 25-54, the percent aged 55 and over, the percent white, the percent black; indicators for whether the state has the death penalty, shall issue gun law, BAC legal limit of 0.08, zero tolerance law, graduate driver's licensing; real per capita personal income, and the real state beer tax. Standard errors account for the survey sampling strategy.

TABLE 11: Effect of liberalizing marijuana laws on the driving under the influence

	(1)	(2)	(3)	(4)
	In the last two weeks, how many times (if any) have you driven after...			
	drinking alcohol	drinking 5 or more drinks in a row	smoking marijuana	using other illicit drugs
Medical and/or Legal	0.0366 (0.0450)	0.0182 (0.0418)	-0.114 (0.102)	0.0404 (0.0487)
Decriminalization	0.0107 (0.0829)	-0.0343 (0.0744)	0.193 (0.162)	0.0433 (0.0438)
Observations	54,560	54,213	22,702	22,676
R-squared	0.047	0.036	0.023	0.012
Outcome Mean	0.399	0.262	0.471	0.077
	In the last two weeks, how many times (if any) have you been a passenger in a car when...			
	the driver had been drinking	you think the driver had 5 or more drinks	the driver had been smoking marijuana	the driver had been using other illicit drugs
Medical and/or Legal	-0.0226 (0.0552)	-0.000444 (0.0478)	-0.121 (0.116)	-0.00409 (0.0530)
Decriminalization	-0.0632 (0.0865)	-0.0728 (0.0621)	0.141 (0.173)	0.0756 (0.0464)
Observations	54,523	54,270	22,690	22,625
R-squared	0.034	0.028	0.022	0.013
Outcome Mean	0.599	0.338	0.622	0.106

Regressions include year dummies, state fixed effects, and state-specific linear trends. All regressions also include the percent aged 14 and under, the percent aged 25-54, the percent aged 55 and over, the percent white, the percent black; indicators for whether the state has the death penalty, shall issue gun law, BAC legal limit of 0.08, zero tolerance law, graduate driver's licensing; real per capita personal income, and the real state beer tax. Standard errors account for the survey sampling strategy.

TABLE 12: Effect of liberalizing marijuana laws on vehicle accidents and tickets

	(1)	(2)	(3)	(4)
<i>Panel A: Tickets for moving violations</i>				
	Within the last 12 months, how many times, if any, have you received a ticket (or been stopped and warned) for moving violations?	How many of these tickets or warnings occurred after you were		
		drinking alcohol beverages	smoking marijuana or hashish	using other illegal drugs
Medical and/or Legal	-0.00483 (0.0186)	0.00652 (0.0113)	0.00465 (0.0124)	-0.00541 (0.00644)
Decriminalization	-0.0562*** (0.0212)	-0.0196 (0.0213)	0.000283 (0.0170)	-0.0175** (0.00836)
Observations	452,761	127,066	126,279	125,690
R-squared	0.064	0.037	0.015	0.006
Outcome Mean	0.463	0.149	0.084	0.025
<i>Panel B: Traffic accidents</i>				
	During the last 12 months, how many accidents have you had while you were driving?	How many of these accidents occurred after you were...		
		drinking alcoholic beverages	smoking marijuana or hashish	using other illegal drugs
Medical and/or Legal	0.00668 (0.0113)	0.00582 (0.00839)	-0.00745 (0.00771)	-0.000977 (0.00534)
Decriminalization	-0.00460 (0.0153)	-0.00730 (0.0161)	0.0149 (0.0131)	0.000625 (0.00683)
Observations	448,238	106,474	105,596	105,156
R-squared	0.023	0.032	0.015	0.006
Outcome Mean	0.314	0.094	0.049	0.016

Regressions include year dummies, state fixed effects, and state-specific linear trends. All regressions also include the percent aged 14 and under, the percent aged 25-54, the percent aged 55 and over, the percent white, the percent black; indicators for whether the state has the death penalty, shall issue gun law, BAC legal limit of 0.08, zero tolerance law, graduate driver's licensing; real per capita personal income, and the real state beer tax. Standard errors account for the survey sampling strategy.

TABLE 13: Effect of liberalizing marijuana laws on days of illness and negative self-esteem

	(1)	(2)	(3)	(4)
	past month, days out of school sick	last 30 days, principal component of days with each of 14 symptoms; bigger is more sick	last 30 days, sum of days with each of 14 symptoms	negative self-esteem (principal component of 8 variables; bigger is more negative self-esteem)
Medical and/or Legal	-0.00209 (0.0349)	-0.0951 (0.0870)	-1.240 (1.303)	0.107** (0.0465)
Decriminalization	-0.0599 (0.0497)	-0.557*** (0.144)	-8.629*** (2.155)	-0.270*** (0.0840)
Observations	459,622	55,753	58,592	180,822
R-squared	0.019	0.043	0.049	0.025
Outcome Mean	0.997	32.495	0.042	-0.030

Regressions include year dummies, state fixed effects, and state-specific linear trends. All regressions also include the percent aged 14 and under, the percent aged 25-54, the percent aged 55 and over, the percent white, the percent black; indicators for whether the state has the death penalty, shall issue gun law, BAC legal limit of 0.08, zero tolerance law, graduate driver's licensing; real per capita personal income, and the real state beer tax. Standard errors account for the survey sampling strategy. Column (1) analyzes responses to the question "During the last four weeks, how many whole days of school have you missed because of illness?" Columns (2) analyzes the sum of the number of days the respondent reported having each of 14 symptoms in the last 30 days. The fourteen illnesses asked about are: headache, sore throat, sinus congestion, coughing, chest colds, coughing up phlegm or blood, shortness of breath, wheezing or gasping, trouble remembering things, difficulty thinking or concentrating, trouble learning new things, trouble sleeping, trouble getting started in the morning, stayed home most or all of a day because you were not feeling well. Column (3) uses the first principal component of the 14 symptom questions. Column (4) uses the first principal component of 8 questions relating to self-esteem.

TABLE 14: Effect of liberalizing marijuana laws on health behaviors

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	eat breakfast	eat at least some green vegetables	How often do you... eat at least some fruit	exercise vigorously	get at least 7 hours of sleep	get less sleep than you think you should	principal component of healthy behaviors (positively correlated with first 5 variables)	2nd principal component of healthy behaviors (mostly getting too little sleep)
	(1=Never; 2=Seldom; 3=sometime; 4=most days; 5= nearly every day; 6=every day)							
Medical and/or Legal	-0.0513 (0.0533)	-0.0427 (0.0386)	-0.0328 (0.0427)	-0.00769 (0.0471)	0.0531 (0.0411)	-0.0453 (0.0434)	-0.0185 (0.0471)	-0.0636* (0.0341)
Decriminalization	-0.0362 (0.0866)	-0.00222 (0.0688)	-0.00276 (0.0725)	0.0727 (0.0955)	-0.120* (0.0683)	-0.0117 (0.0831)	0.00719 (0.0822)	0.0480 (0.0588)
Observations	88,325	88,078	87,859	87,726	88,004	87,914	86,757	86,757
R-squared	0.039	0.065	0.053	0.068	0.042	0.038	0.071	0.057
Outcome Mean	3.664	4.015	4.179	3.873	3.881	4.179	0.042	-0.030

Regressions include year dummies, state fixed effects, and state-specific linear trends. All regressions also include the percent aged 14 and under, the percent aged 25-54, the percent aged 55 and over, the percent white, the percent black; indicators for whether the state has the death penalty, shall issue gun law, BAC legal limit of 0.08, zero tolerance law, graduate driver's licensing; real per capita personal income, and the real state beer tax. Standard errors account for the survey sampling strategy.

TABLE 15: Effect of liberalizing marijuana laws on self-reported criminal behavior

	(1)	(2)	(3)	(4)
	During the last 12 months, how often have you...			
	argued or had a fight with either of your parents	hit an instructor or supervisor	gotten into a serious fight in school or at work	taken part in a fight where a group of your friends were against another group
Medical and/or Legal	-0.0459 (0.0699)	-0.00240 (0.0117)	0.0255 (0.0229)	0.0241 (0.0325)
Decriminalization	0.168* (0.0867)	0.00300 (0.0147)	-0.0764** (0.0353)	0.0270 (0.0418)
Observations	99,392	102,771	102,786	102,741
R-squared	0.082	0.012	0.026	0.029
Outcome Mean	3.321	0.046	0.247	0.323
	hurt someone badly enough to need bandages or a doctor	used a knife or gun or some other thing (like a club) to get something from a person	taken something not belonging to you worth under \$50	taken something not belonging to you worth over \$50
Medical and/or Legal	-0.0166 (0.0251)	0.0317* (0.0165)	0.0548 (0.0464)	0.0557** (0.0274)
Decriminalization	-0.0233 (0.0298)	-0.0188 (0.0195)	0.0530 (0.0661)	-0.00128 (0.0303)
Observations	102,710	102,747	102,340	102,521
R-squared	0.051	0.017	0.043	0.028
Outcome Mean	0.189	0.056	0.686	0.182
	taken something from a store without paying for it	taken a car that didn't belong to someone in your family without permission of the owner	taken part of a car without permission of the owner	gone into some house or building when you weren't supposed to be there
Medical and/or Legal	0.111** (0.0527)	0.0250 (0.0200)	0.00268 (0.0173)	0.0492 (0.0363)
Decriminalization	-0.0636 (0.0627)	-0.0102 (0.0177)	-0.0122 (0.0186)	-0.0142 (0.0489)
Observations	102,457	102,753	102,636	102,576
R-squared	0.032	0.014	0.026	0.029
Outcome Mean	0.684	0.091	0.101	0.501

Regressions include year dummies, state fixed effects, and state-specific linear trends. All regressions also include the percent aged 14 and under, the percent aged 25-54, the percent aged 55 and over, the percent white, the percent black; indicators for whether the state has the death penalty, shall issue gun law, BAC legal limit of 0.08, zero tolerance law, graduate driver's licensing; real per capita personal income, and the real state beer tax. Standard errors account for the survey sampling strategy. Most questions have five possible answers: 1=Not at all; 2=Once; 3=Twice; 4=3 or 4 times; 5=5 or more times. The responses for the carrying a weapon to school question differ slightly: 1=None; 2=one day; 3=two days; 4=3-5 days; 5=6-9 days; 6=10 or more days. Variables are recoded to the midpoint of the category, when applicable, to generate a continuous variable. The two principal components variables use all of the variables in these two tables on self-reported criminal behavior.

TABLE 16: Effect of liberalizing marijuana laws on self-reported criminal behavior

	(1)	(2)	(3)
	During the last 12 months, how often have you...		
	set fire to someone's property on purpose	damaged school property on purpose	damaged property at work on purpose
Medical and/or Legal	0.00462 (0.0144)	0.0159 (0.0253)	-0.00397 (0.0174)
Decriminalization	0.000810 (0.0153)	-0.0521 (0.0318)	0.00234 (0.0218)
Observations	102,717	102,458	102,618
R-squared	0.013	0.037	0.028
Outcome Mean	0.038	0.247	0.115
	carrying a weapon such as a gun, knife, or club to school	first principal component of self-reported criminal behavior (bigger is more criminal)	second principal component of self-reported criminal behavior (bigger is more petty crimes)
Medical and/or Legal	0.0237 (0.0621)	0.0789 (0.0779)	0.172** (0.0845)
Decriminalization	-0.0872 (0.124)	-0.0438 (0.0907)	-0.197 (0.164)
Observations	41,987	97,217	38,035
R-squared	0.036	0.063	0.060
Outcome Mean	0.270	-0.106	-0.111

Regressions include year dummies, state fixed effects, and state-specific linear trends. All regressions also include the percent aged 14 and under, the percent aged 25-54, the percent aged 55 and over, the percent white, the percent black; indicators for whether the state has the death penalty, shall issue gun law, BAC legal limit of 0.08, zero tolerance law, graduate driver's licensing; real per capita personal income, and the real state beer tax. Standard errors account for the survey sampling strategy. Most questions have five possible answers: 1=Not at all; 2=Once; 3=Twice; 4=3 or 4 times; 5=5 or more times. The responses for the carrying a weapon to school question differ slightly: 1=None; 2=one day; 3=two days; 4=3-5 days; 5=6-9 days; 6=10 or more days. Variables are recoded to the midpoint of the category to generate a continuous variable. The two principal components variables use all of the variables in these two tables on self-reported criminal behavior.

TABLE A1: Effect of liberalizing marijuana laws on the substance use participation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Alcohol		Cigarettes		Marijuana		Cocaine		Heroin	
	Lifetime	Past Month	Lifetime	Past Month	Lifetime	Past Month	Lifetime	Past Month	Lifetime	Past Month
<i>Panel A: Any Marijuana Law</i>										
Any MJ Law	-0.0223*	-0.0281**	-0.0150	-0.00375	-0.0176	0.000146	-0.0134**	-0.00343	-0.00104	-0.00116
	(0.0115)	(0.0140)	(0.0111)	(0.00984)	(0.0137)	(0.0109)	(0.00626)	(0.00265)	(0.00171)	(0.000806)
Observations	383,995	457,353	471,180	470,738	468,102	466,623	471,028	470,678	472,573	472,589
R-squared	0.085	0.095	0.079	0.045	0.051	0.046	0.041	0.022	0.003	0.002
<i>Panel B: Number of Marijuana Laws</i>										
Num MJ Laws	-0.00266	-0.00752	-0.00865	-0.00310	-0.00705	0.000468	-0.0130***	-0.00527***	-0.00149	-0.00172**
	(0.00799)	(0.00972)	(0.00830)	(0.00706)	(0.00983)	(0.00806)	(0.00479)	(0.00203)	(0.00132)	(0.000752)
Observations	383,995	457,353	471,180	470,738	468,102	466,623	471,028	470,678	472,573	472,589
R-squared	0.085	0.095	0.079	0.045	0.051	0.046	0.041	0.022	0.003	0.002

Regressions include year dummies, state fixed effects, and state-specific linear trends. All regressions also include the percent aged 14 and under, the percent aged 25-54, the percent aged 55 and over, the percent white, the percent black; indicators for whether the state has the death penalty, shall issue gun law, BAC legal limit of 0.08, zero tolerance law, graduate driver's licensing; real per capita personal income, and the real state beer tax. Standard errors account for the survey sampling strategy.

TABLE A2: Effect of liberalizing marijuana laws on the number of times in the past month the respondent used the substance.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Alcohol		Cigarettes		Marijuana		Cocaine		Heroin	
Any MJ law?	-0.306*		-0.0668		0.185		-0.0347		-0.0158	
	(0.173)		(0.111)		(0.198)		(0.0230)		(0.0111)	
Number of MJ laws		-0.137		-0.00730		-0.0481		-0.0492**		-0.0298**
		(0.134)		(0.0752)		(0.155)		(0.0200)		(0.0126)
Observations	457,353	457,353	470,738	470,738	466,623	466,623	470,678	470,678	472,589	472,589
R-squared	0.062	0.062	0.044	0.044	0.037	0.037	0.006	0.006	0.002	0.002

Regressions include year dummies, state fixed effects, and state-specific linear trends. All regressions also include the percent aged 14 and under, the percent aged 25-54, the percent aged 55 and over, the percent white, the percent black; indicators for whether the state has the death penalty, shall issue gun law, BAC legal limit of 0.08, zero tolerance law, graduate driver's licensing; real per capita personal income, and the real state beer tax. Standard errors account for the survey sampling strategy.

TABLE A3: Effect of liberalizing marijuana law on friends' substance use.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<i>Panel A: Any Marijuana Law</i>	How many of your friends...(bigger = more)						
	smoke cigarettes	drink alcohol	get drunk	smoke marijuana	take LSD	take psychedelics	take amphetamines
Any MJ law?	-0.0110 (0.0404)	-0.0580 (0.0536)	-0.0703 (0.0521)	-0.0353 (0.0481)	-0.0179 (0.0270)	0.0588* (0.0305)	0.0471 (0.0316)
Observations	123,388	122,350	122,520	123,214	79,165	79,238	79,182
R-squared	0.107	0.084	0.051	0.075	0.034	0.031	0.046
	take tranquilizers	take cocaine	take crack cocaine	take heroin	take narcotics	take inhalants	take quaaludes
Any MJ law?	0.00980 (0.0224)	-0.0444* (0.0237)	0.00165 (0.0232)	-0.00667 (0.0170)	0.0151 (0.0279)	-0.0183 (0.0244)	0.00403 (0.0422)
Observations	78,835	122,002	94,287	78,550	78,654	78,449	69,924
R-squared	0.034	0.063	0.021	0.011	0.020	0.020	0.046
<i>Panel B: Number of Marijuana Laws</i>	How many of your friends...(bigger = more)						
	smoke cigarettes	drink alcohol	get drunk	smoke marijuana	take LSD	take psychedelics	take amphetamines
Number of MJ laws	-0.0197 (0.0297)	-0.0135 (0.0344)	-0.0208 (0.0346)	-0.0197 (0.0331)	-0.0190 (0.0195)	-0.00114 (0.0211)	0.0174 (0.0222)
Observations	123,388	122,350	122,520	123,214	79,165	79,238	79,182
R-squared	0.107	0.084	0.051	0.075	0.034	0.031	0.046
	take tranquilizers	take cocaine	take crack cocaine	take heroin	take narcotics	take inhalants	take quaaludes
Number of MJ laws	-0.0111 (0.0153)	-0.0447*** (0.0168)	-0.00652 (0.0155)	-0.0246* (0.0126)	-0.0428** (0.0188)	-0.0124 (0.0168)	-0.00412 (0.0346)
Observations	78,835	122,002	94,287	78,550	78,654	78,449	69,924
R-squared	0.034	0.063	0.021	0.011	0.020	0.020	0.046

Regressions include year dummies, state fixed effects, and state-specific linear trends. All regressions also include the percent aged 14 and under, the percent aged 25-54, the percent aged 55 and over, the percent white, the percent black; indicators for whether the state has the death penalty, shall issue gun law, BAC legal limit of 0.08, zero tolerance law, graduate driver's licensing; real per capita personal income, and the real state beer tax. Standard errors account for the survey sampling strategy.

TABLE A4: Effect of liberalizing marijuana laws on easy of obtaining substances

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
How difficult do you think it would be for you to get each of the following types of drugs, if you wanted some? (1=Probably Impossible; 2=Very Difficult; 3=Fairly Difficult; 4=Fairly Easy; 5=Very Easy)										
	marijuana		LSD		psychedelics		amphetamines		sedatives, barbituates	
Any MJ law?	-0.0252 (0.0336)		0.0199 (0.0401)		0.107** (0.0539)		0.0699 (0.0567)		0.0807 (0.0493)	
Number of MJ laws		0.0154 (0.0235)		0.0361 (0.0263)		0.0874** (0.0368)		0.124*** (0.0413)		0.0642* (0.0373)
Observations	182,835	182,835	133,759	133,759	84,172	84,172	100,915	100,915	100,272	100,272
R-squared	0.040	0.040	0.080	0.080	0.075	0.075	0.080	0.080	0.070	0.070
	tranquilizers		cocaine		heroin		narcotics			
Any MJ law?	-0.00339 (0.0422)		-0.0738 (0.0520)		-0.0453 (0.0478)		0.117** (0.0517)			
Number of MJ laws		0.0272 (0.0323)		-0.0136 (0.0370)		-0.0100 (0.0358)		0.0329 (0.0378)		
Observations	100,354	100,354	84,599	84,599	100,393	100,393	100,372	100,372		
R-squared	0.131	0.131	0.056	0.056	0.034	0.034	0.039	0.039		

Regressions include year dummies, state fixed effects, and state-specific linear trends. All regressions also include the percent aged 14 and under, the percent aged 25-54, the percent aged 55 and over, the percent white, the percent black; indicators for whether the state has the death penalty, shall issue gun law, BAC legal limit of 0.08, zero tolerance law, graduate driver's licensing; real per capita personal income, and the real state beer tax. Standard errors account for the survey sampling strategy.

TABLE A5: Effects of liberalizing marijuana laws on perceived riskiness

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
How much do you think people risk harming themselves (physically or in other ways) if they...								
1=No Risk; 2=Slight Risk; 3=Moderate Risk; 4=Great Risk; (5=Can't Say, Drug Unfamiliar - coded as missing)								
	try powder cocaine 1 or 2 times		take powder cocaine occasionally		take powder cocaine regularly		try PCP one or two times	
Any MJ law?	-0.00490 (0.0347)		-0.00364 (0.0267)		-0.00923 (0.0212)		0.0409 (0.0478)	
Number of MJ laws		0.0365 (0.0250)		0.0230 (0.0176)		0.0153 (0.0135)		-0.00447 (0.0345)
Observations	109,223	109,223	109,213	109,213	109,156	109,156	46,685	46,685
R-squared	0.015	0.015	0.016	0.016	0.031	0.031	0.022	0.021
	try crack cocaine one or two times		take crack cocaine occasionally		take crack cocaine regularly		smoke one or more packs of cigarettes per day	
Any MJ law?	-0.0359 (0.0326)		0.00232 (0.0238)		-0.00746 (0.0205)		0.00667 (0.0184)	
Number of MJ laws		0.0223 (0.0232)		0.0165 (0.0156)		0.00186 (0.0135)		0.00578 (0.0118)
Observations	108,389	108,389	108,413	108,413	108,370	108,370	227,966	227,966
R-squared	0.020	0.020	0.020	0.020	0.031	0.031	0.034	0.034
	try marijuana once or twice		smoke marijuana occasionally		smoke marijuana regularly		try crystal meth once or twice	
Any MJ law?	0.0188 (0.0326)		-0.0105 (0.0345)		-0.00455 (0.0307)		0.0884* (0.0481)	
Number of MJ laws		0.0134 (0.0216)		0.00426 (0.0237)		0.0181 (0.0221)		-0.00678 (0.0320)
Observations	225,437	225,437	225,212	225,212	225,119	225,119	38,942	38,942
R-squared	0.083	0.083	0.099	0.099	0.108	0.108	0.025	0.025

Regressions include year dummies, state fixed effects, and state-specific linear trends. All regressions also include the percent aged 14 and under, the percent aged 25-54, the percent aged 55 and over, the percent white, the percent black; indicators for whether the state has the death penalty, shall issue gun law, BAC legal limit of 0.08, zero tolerance law, graduate driver's licensing; real per capita personal income, and the real state beer tax. Standard errors account for the survey sampling strategy.

TABLE A6: Effects of liberalizing marijuana laws on perceived riskiness

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
How much do you think people risk harming themselves (physically or in other ways) if they...								
1=No Risk; 2=Slight Risk; 3=Moderate Risk; 4=Great Risk; (5=Can't Say, Drug Unfamiliar - coded as missing)								
	try one or two drinks of an alcoholic beverage		take one or two drinks nearly every day		take four or five drinks nearly every day		have five or more drinks once or twice each weekend	
Any MJ law?	0.0246 (0.0284)		0.0720*** (0.0271)		0.0574** (0.0232)		0.0649** (0.0285)	
Number of MJ laws		0.00259 (0.0183)		0.0319* (0.0183)		0.0301** (0.0153)		0.0238 (0.0199)
Observations	188,799	188,799	221,732	221,732	221,541	221,541	221,563	221,563
R-squared	0.076	0.076	0.059	0.059	0.056	0.056	0.054	0.054
	try adderall once or twice		use adderall occasionally		try salvia once or twice		use salvia occasionally	
Any MJ law?	0.00326 (0.183)		-0.103 (0.163)		-0.104 (0.197)		-0.199 (0.359)	
Number of MJ laws		0.134 (0.111)		0.0572 (0.0933)		0.216* (0.123)		0.517*** (0.198)
Observations	7,884	7,884	7,873	7,873	5,366	5,366	2,803	2,803
R-squared	0.080	0.080	0.060	0.060	0.079	0.080	0.078	0.079
	try narcotics once or twice		use narcotics occasionally		use narcotics regularly			
Any MJ law?	0.139 (0.151)		0.0682 (0.123)		0.00640 (0.105)			
Number of MJ laws		0.251*** (0.0942)		0.147** (0.0680)		0.115** (0.0526)		
Observations	8,331	8,331	8,342	8,342	8,340	8,340		
R-squared	0.044	0.045	0.046	0.047	0.063	0.064		

Regressions include year dummies, state fixed effects, and state-specific linear trends. All regressions also include the percent aged 14 and under, the percent aged 25-54, the percent aged 55 and over, the percent white, the percent black; indicators for whether the state has the death penalty, shall issue gun law, BAC legal limit of 0.08, zero tolerance law, graduate driver's licensing; real per capita personal income, and the real state beer tax. Standard errors account for the survey sampling strategy.

TABLE A7: Effects of liberalizing marijuana laws on respondent disapproval

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Do you disapprove of people (who are 18 or older) doing each of the following? (1=Don't Disapprove; 2=Disapprove; 3=Strongly Disapprove)							
	smoking one or more packs of cigarettes per day		trying marijuana once or twice?		smoking marijuana occasionally		smoking marijuana regularly	
Any MJ law?	-0.0112 (0.0227)		0.0346 (0.0268)		0.00160 (0.0284)		-0.0193 (0.0252)	
Number of MJ laws		-0.0102 (0.0155)		0.0201 (0.0181)		-0.00179 (0.0202)		-0.00854 (0.0181)
Observations	216,099	216,099	216,743	216,743	216,500	216,500	216,297	216,297
R-squared	0.043	0.043	0.074	0.074	0.071	0.071	0.061	0.061

	trying one or two drinks of alcohol		drinking 1-2 drinks almost every day		drinking 4-5 drinks almost every day		drinking 5+ drinks once or twice on the weekends?	
Any MJ law?	0.0257 (0.0227)		0.0456** (0.0224)		0.0354* (0.0186)		0.0428* (0.0259)	
Number of MJ laws		0.0101 (0.0151)		0.0259* (0.0147)		0.0364*** (0.0126)		0.0275 (0.0174)
Observations	182,615	182,615	216,120	216,120	216,279	216,279	216,155	216,155
R-squared	0.077	0.077	0.048	0.048	0.054	0.054	0.058	0.058

Regressions include year dummies, state fixed effects, and state-specific linear trends. All regressions also include the percent aged 14 and under, the percent aged 25-54, the percent aged 55 and over, the percent white, the percent black; indicators for whether the state has the death penalty, shall issue gun law, BAC legal limit of 0.08, zero tolerance law, graduate driver's licensing; real per capita personal income, and the real state beer tax. Standard errors account for the survey sampling strategy.

TABLE A8: Effects of liberalizing marijuana laws on respondent disapproval

	(1)	(2)	(3)	(4)	(5)	(6)
Do you disapprove of people (who are 18 or older) doing each of the following? 1=Don't Disapprove; 2=Disapprove; 3=Strongly Disapprove)						
	trying cocaine powder once or twice		using cocaine powder occasionally		using cocaine powder regularly	
Any MJ law?	0.00689 (0.0222)		-0.0227 (0.0260)		-0.0121 (0.0157)	
Number of MJ laws		0.0179 (0.0148)		-0.00209 (0.0179)		-0.000674 (0.0109)
Observations	166,114	166,114	80,284	80,284	165,538	165,538
R-squared	0.029	0.029	0.019	0.019	0.024	0.024
	trying crack cocaine once or twice		using crack cocaine occasionally		using crack cocaine regularly	
Any MJ law?	-0.0241 (0.0265)		-0.0345 (0.0242)		-0.0166 (0.0229)	
Number of MJ laws		-0.00611 (0.0176)		-0.0202 (0.0162)		-0.00853 (0.0162)
Observations	80,194	80,194	80,166	80,166	79,912	79,912
R-squared	0.015	0.015	0.022	0.022	0.031	0.031

Regressions include year dummies, state fixed effects, and state-specific linear trends. All regressions also include the percent aged 14 and under, the percent aged 25-54, the percent aged 55 and over, the percent white, the percent black; indicators for whether the state has the death penalty, shall issue gun law, BAC legal limit of 0.08, zero tolerance law, graduate driver's licensing; real per capita personal income, and the real state beer tax. Standard errors account for the survey sampling strategy.

TABLE A9: Effect of liberalizing marijuana laws on friends' disapproval of substance use and driving under the influence

	(1)	(2)	(3)	(4)	(5)	(6)
How do you think your CLOSE FRIENDS feel (or would feel) about YOU doing each of the following things?						
1=Don't Disapprove; 2=Disapprove; 3 = Strongly Disapprove						
<i>Panel A: Any Marijuana Law</i>						
	Smoking 1+ packs of cigarettes per day	trying marijuana once or twice	smoking marijuana occasionally	smoking marijuana regularly	trying LSD once or twice	try amphetamines once or twice
Any MJ law?	0.0628* (0.0341)	0.0823* (0.0430)	0.0988** (0.0430)	0.0514 (0.0419)	0.0700** (0.0349)	0.0858*** (0.0324)
Observations	68,632	68,571	68,438	68,354	68,299	68,313
R-squared	0.058	0.073	0.069	0.060	0.029	0.033
	taking 1-2 drinks nearly every day	taking 4-5 drinks nearly every day	five+ drinks once or twice each weekend	driving a car after having 1-2 drinks	driving a car after 5+ drinks	
Any MJ law?	0.0968*** (0.0361)	0.0656** (0.0305)	0.137*** (0.0424)	0.172*** (0.0388)	0.0806*** (0.0258)	
Observations	68,266	68,167	68,165	53,637	53,617	
R-squared	0.060	0.067	0.064	0.090	0.058	
<i>Panel B: Number of Marijuana Laws</i>						
	Smoking 1+ packs of cigarettes per day	trying marijuana once or twice	smoking marijuana occasionally	smoking marijuana regularly	trying LSD once or twice	try amphetamines once or twice
# of MJ laws	0.0262 (0.0235)	0.0396 (0.0270)	0.0440 (0.0272)	0.0381 (0.0268)	0.0247 (0.0235)	0.0324 (0.0233)
Observations	68,632	68,571	68,438	68,354	68,299	68,313
R-squared	0.058	0.073	0.069	0.060	0.029	0.033
	taking 1-2 drinks nearly every day	taking 4-5 drinks nearly every day	five+ drinks once or twice each weekend	driving a car after having 1-2 drinks	driving a car after 5+ drinks	
# of MJ laws	0.0345 (0.0236)	0.0283 (0.0226)	0.0485* (0.0279)	0.0599** (0.0249)	0.0271 (0.0174)	
Observations	68,266	68,167	68,165	53,637	53,617	
R-squared	0.059	0.067	0.064	0.090	0.057	

Regressions include year dummies, state fixed effects, and state-specific linear trends. All regressions also include the percent aged 14 and under, the percent aged 25-54, the percent aged 55 and over, the percent white, the percent black; indicators for whether the state has the death penalty, shall issue gun law, BAC legal limit of 0.08, zero tolerance law, graduate driver's licensing; real per capita personal income, and the real state beer tax. Standard errors account for the survey sampling strategy.

TABLE A10: Effect of liberalizing marijuana laws on the driving under the influence

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	In the last two weeks, how many times (if any) have you driven after....							
	drinking alcohol		drinking 5 or more drinks in a row		smoking marijuana		using other illicit drugs	
Any MJ law?	0.00805 (0.0554)		-0.0300 (0.0467)		-0.0318 (0.109)		0.00851 (0.0554)	
# of MJ laws		0.0218 (0.0364)		0.000955 (0.0332)		0.00257 (0.0801)		0.0366 (0.0287)
Observations	54,560	54,560	54,213	54,213	22,702	22,702	22,676	22,676
R-squared	0.047	0.047	0.036	0.036	0.023	0.023	0.012	0.012
	In the last two weeks, how many times (if any) have you been a passenger in a car when...							
	the driver had been drinking		you think the driver had 5 or more drinks		the driver had been smoking marijuana		the driver had been using other illicit drugs	
Any MJ law?	-0.00958 (0.0660)		0.0180 (0.0480)		-0.0812 (0.140)		-0.0394 (0.0574)	
# of MJ laws		-0.0355 (0.0417)		-0.0253 (0.0342)		-0.0443 (0.0891)		0.0232 (0.0335)
Observations	54,523	54,523	54,270	54,270	22,690	22,690	22,625	22,625
R-squared	0.034	0.034	0.028	0.028	0.022	0.022	0.012	0.012

Regressions include year dummies, state fixed effects, and state-specific linear trends. All regressions also include the percent aged 14 and under, the percent aged 25-54, the percent aged 55 and over, the percent white, the percent black; indicators for whether the state has the death penalty, shall issue gun law, BAC legal limit of 0.08, zero tolerance law, graduate driver's licensing; real per capita personal income, and the real state beer tax. Standard errors account for the survey sampling strategy.

TABLE A11: Effect of liberalizing marijuana laws on vehicle accidents and tickets

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Panel A: Tickets for moving violations</i>								
	Within the last 12 months, how many times, if any, have you received a ticket (or been stopped and warned) for moving violations?		How many of these tickets or warnings occurred after you were					
			drinking alcohol beverages		smoking marijuana or hashish		using other illegal drugs	
Any MJ law?	-0.0465*** (0.0169)		-0.00942 (0.0133)		-0.0107 (0.0126)		-0.0131** (0.00663)	
Number of MJ laws		-0.0198 (0.0132)		-0.00167 (0.00934)		0.000377 (0.00899)		-0.00887* (0.00474)
Observations	452,761	452,761	127,066	127,066	126,279	126,279	125,690	125,690
R-squared	0.064	0.064	0.037	0.037	0.015	0.015	0.006	0.006

Panel B: Traffic accidents

	During the last 12 months, how many accidents have you had while you were driving?		How many of these accidents occurred after you were...					
			drinking alcoholic beverages		smoking marijuana or hashish		using other illegal drugs	
Any MJ law?	0.00823 (0.0116)		0.00332 (0.0106)		0.00445 (0.00806)		-0.000653 (0.00479)	
Number of MJ laws		0.00434 (0.00825)		0.00268 (0.00712)		-0.000916 (0.00610)		-0.000625 (0.00363)
Observations	448,238	448,238	106,474	106,474	105,596	105,596	105,156	105,156
R-squared	0.023	0.023	0.032	0.032	0.015	0.015	0.006	0.006

Regressions include year dummies, state fixed effects, and state-specific linear trends. All regressions also include the percent aged 14 and under, the percent aged 25-54, the percent aged 55 and over, the percent white, the percent black; indicators for whether the state has the death penalty, shall issue gun law, BAC legal limit of 0.08, zero tolerance law, graduate driver's licensing; real per capita personal income, and the real state beer tax. Standard errors account for the survey sampling strategy.

TABLE A12: Effect of liberalizing marijuana laws on days of illness and negative self-esteem

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	past month, days out of school sick		last 30 days, principal component of days with each of 14 symptoms; bigger is more sick		last 30 days, sum of days with each of 14 symptoms		negative self-esteem (principal component of 8 variables; bigger is more negative self-esteem)	
Any MJ law?	0.0152 (0.0347)		-0.177* (0.102)		-2.801* (1.557)		0.0143 (0.0564)	
Number of MJ laws		-0.0225 (0.0267)		-0.201*** (0.0711)		-2.938*** (1.054)		0.00641 (0.0400)
Observations	459,622	459,622	55,753	55,753	58,592	58,592	180,822	180,822
R-squared	0.019	0.019	0.043	0.043	0.049	0.049	0.025	0.025

Regressions include year dummies, state fixed effects, and state-specific linear trends. All regressions also include the percent aged 14 and under, the percent aged 25-54, the percent aged 55 and over, the percent white, the percent black; indicators for whether the state has the death penalty, shall issue gun law, BAC legal limit of 0.08, zero tolerance law, graduate driver's licensing; real per capita personal income, and the real state beer tax. Standard errors account for the survey sampling strategy. Column (1) analyzes responses to the question "During the last four weeks, how many whole days of school have you missed because of illness?" Columns (2) analyzes the sum of the number of days the respondent reported having each of 14 symptoms in the last 30 days. The fourteen illnesses asked about are: headache, sore throat, sinus congestion, coughing, chest colds, coughing up phlegm or blood, shortness of breath, wheezing or gasping, trouble remembering things, difficulty thinking or concentrating, trouble learning new things, trouble sleeping, trouble getting started in the morning, stayed home most or all of a day because you were not feeling well. Column (3) uses the first principal component of the 14 symptom questions. Column (4) uses the first principal component of 8 questions relating to self-esteem.

TABLE A13: Effect of liberalizing marijuana laws on health behaviors

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
			How often do you...					
	eat breakfast	eat at least some green vegetables	eat at least some fruit	exercise vigorously	get at least 7 hours of sleep	get less sleep than you think you should	principal component of healthy behaviors (positively correlated with first 5 variables)	2nd principal component of healthy behaviors (mostly getting too little sleep)
	(1=Never; 2=Seldom; 3=sometime; 4=most days; 5= nearly every day; 6=every day)							
<i>Panel A: Any Marijuana Law</i>								
Any MJ law?	0.0586 (0.0576)	0.0448 (0.0429)	0.0585 (0.0440)	0.0964* (0.0574)	0.0185 (0.0496)	-0.00754 (0.0525)	0.0873* (0.0505)	0.0117 (0.0426)
Observations	88,325	88,078	87,859	87,726	88,004	87,914	86,757	86,757
R-squared	0.039	0.065	0.053	0.068	0.042	0.038	0.071	0.057
<i>Panel B: Number of Marijuana Laws</i>								
# of MJ laws	-0.0539 (0.0431)	-0.0394 (0.0313)	-0.0283 (0.0337)	0.00453 (0.0406)	-0.00310 (0.0336)	-0.0415 (0.0365)	-0.0190 (0.0390)	-0.0342 (0.0273)
Observations	88,325	88,078	87,859	87,726	88,004	87,914	86,757	86,757
R-squared	0.039	0.065	0.053	0.068	0.042	0.038	0.071	0.057

Regressions include year dummies, state fixed effects, and state-specific linear trends. All regressions also include the percent aged 14 and under, the percent aged 25-54, the percent aged 55 and over, the percent white, the percent black; indicators for whether the state has the death penalty, shall issue gun law, BAC legal limit of 0.08, zero tolerance law, graduate driver's licensing; real per capita personal income, and the real state beer tax. Standard errors account for the survey sampling strategy.

TABLE A14: Effect of liberalizing marijuana laws on self-reported criminal behavior

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	During the last 12 months, how often have you...							
	argued or had a fight with either of your parents		hit an instructor or supervisor		gotten into a serious fight in school or at work		taken part in a fight where a group of your friends were against another group	
Any MJ law?	0.0481 (0.0684)		-0.00580 (0.0102)		-0.0489** (0.0241)		0.0201 (0.0300)	
Number of MJ laws		0.0420 (0.0468)		-0.00159 (0.00827)		-0.0146 (0.0173)		0.0192 (0.0232)
Observations	99,392	99,392	102,771	102,771	102,786	102,786	102,741	102,741
R-squared	0.081	0.081	0.012	0.012	0.026	0.026	0.029	0.029
	hurt someone badly enough to need bandages or a doctor		used a knife or gun or some other thing (like a club) to get something from a person		taken something not belonging to you worth under \$50		taken something not belonging to you worth over \$50	
Any MJ law?	-0.0282 (0.0221)		0.00983 (0.0133)		0.00340 (0.0446)		0.00393 (0.0239)	
Number of MJ laws		-0.0195 (0.0171)		0.0134 (0.0113)		0.0563 (0.0349)		0.0323* (0.0189)
Observations	102,710	102,710	102,747	102,747	102,340	102,340	102,521	102,521
R-squared	0.051	0.051	0.017	0.017	0.043	0.043	0.028	0.028
	taken something from a store without paying		taken a car (not your family's) without permission of the owner		taken part of a car without permission of the owner		gone into some house or building when you weren't supposed to be there	
Any MJ law?	0.0221 (0.0499)		0.0332** (0.0160)		-0.0222 (0.0154)		-0.0284 (0.0370)	
Number of MJ laws		0.0488 (0.0372)		0.00900 (0.0126)		-0.00258 (0.0112)		0.0257 (0.0270)
Observations	102,457	102,457	102,753	102,753	102,636	102,636	102,576	102,576
R-squared	0.032	0.032	0.014	0.014	0.026	0.026	0.029	0.029

Regressions include year dummies, state fixed effects, and state-specific linear trends. All regressions also include the percent aged 14 and under, the percent aged 25-54, the percent aged 55 and over, the percent white, the percent black; indicators for whether the state has the death penalty, shall issue gun law, BAC legal limit of 0.08, zero tolerance law, graduate driver's licensing; real per capita personal income, and the real state beer tax. Standard errors account for the survey sampling strategy. Most questions have five possible answers: 1=Not at all; 2=Once; 3=Twice; 4=3 or 4 times; 5=5 or more times. The responses for the carrying a weapon to school question differ slightly: 1=None; 2=one day; 3=two days; 4=3-5 days; 5=6-9 days; 6=10 or more days. Variables are recoded to the midpoint of the category, when applicable, to generate a continuous variable. The two principal components variables use all of the variables in these two tables on self-reported criminal behavior.

TABLE A15: Effect of liberalizing marijuana laws on self-reported criminal behavior

	(1)	(2)	(3)	(4)	(5)	(6)
	During the last 12 months, how often have you...					
	set fire to someone's property on purpose		damaged school property on purpose		damaged property at work on purpose	
Any MJ law?	0.000111 (0.0125)		-0.0321 (0.0241)		-0.0287 (0.0175)	
Number of MJ laws		0.00426 (0.00908)		-0.0116 (0.0178)		-0.00141 (0.0118)
Observations	102,717	102,717	102,458	102,458	102,618	102,618
R-squared	0.013	0.013	0.037	0.037	0.028	0.028
	carrying a weapon such as a gun, knife, or club to school		first principal component of self-reported criminal behavior (bigger is more criminal)		second principal component of self-reported criminal behavior (bigger is more petty crimes)	
Any MJ law?	-0.0387 (0.0815)		-0.0327 (0.0677)		-0.0595 (0.101)	
Number of MJ laws		0.00587 (0.0533)		0.0195 (0.0513)		0.0514 (0.0680)
Observations	41,987	41,987	97,217	97,217	38,035	38,035
R-squared	0.036	0.036	0.063	0.063	0.060	0.060

Regressions include year dummies, state fixed effects, and state-specific linear trends. All regressions also include the percent aged 14 and under, the percent aged 25-54, the percent aged 55 and over, the percent white, the percent black; indicators for whether the state has the death penalty, shall issue gun law, BAC legal limit of 0.08, zero tolerance law, graduate driver's licensing; real per capita personal income, and the real state beer tax. Standard errors account for the survey sampling strategy. Most questions have five possible answers: 1=Not at all; 2=Once; 3=Twice; 4=3 or 4 times; 5=5 or more times. The responses for the carrying a weapon to school question differ slightly: 1=None; 2=one day; 3=two days; 4=3-5 days; 5=6-9 days; 6=10 or more days. Variables are recoded to the midpoint of the category to generate a continuous variable. The two principal components variables use all of the variables in these two tables on self-reported criminal behavior.