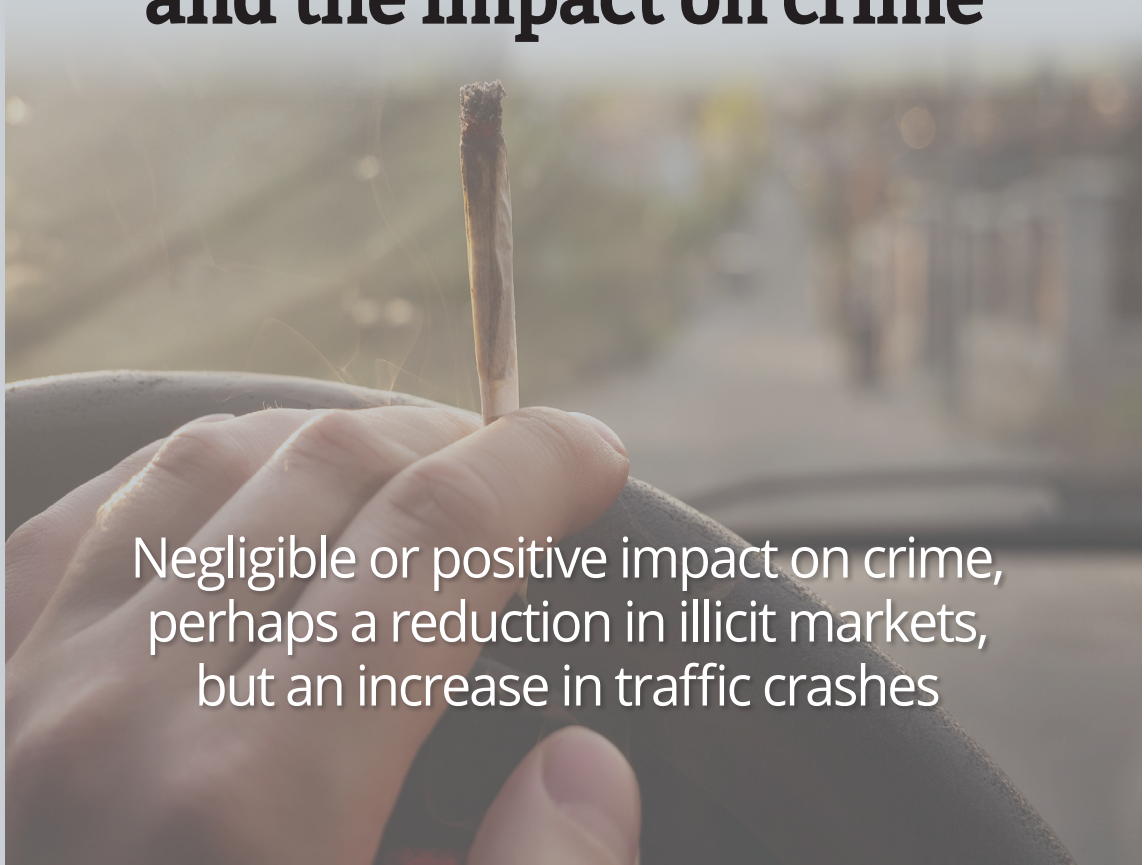


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Marijuana legalization and the impact on crime



Negligible or positive impact on crime,
perhaps a reduction in illicit markets,
but an increase in traffic crashes

By Jeremiah Mosteller



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The Badger Institute recently launched an effort to better understand the impact of policy changes made by states that have decriminalized or legalized the possession or sale of cannabis (a broad term that includes marijuana and related products).¹ We are seeking to pull together all of the “real facts” to answer the pressing questions citizens and leaders are asking about such policy changes. Our recent publication reported that Wisconsin is quickly drifting toward the practical decriminalization of cannabis – even without a formal legal or policy change.²

In this second report, we will explore the public safety impacts of reforms in other states. The many studies we reviewed and compiled during our research display a complex but sufficiently clear series of public safety tradeoffs when it comes to cannabis reform:

- The weight of the research on the crime impact of both medical and adult use legalization reaches a similar conclusion – that it has either no impact or a beneficial impact on property and violent crime.
- Initial research indicates that full legalization will help reduce the size of the illicit market, but these findings are far from conclusive, given the limited research base.
- Both decriminalization and adult-use legalization will likely result in increased traffic fatalities or crashes, but such a relationship does not appear to exist in places that only allow the medical use of cannabis.

Methodology & Sources Matters

Throughout this report we are establishing a high standard for what facts and research we include in our evaluations. We have not included evidence from questionable sources or those with a clear agenda and have considered only research that is academic, peer-reviewed, and original. We have also

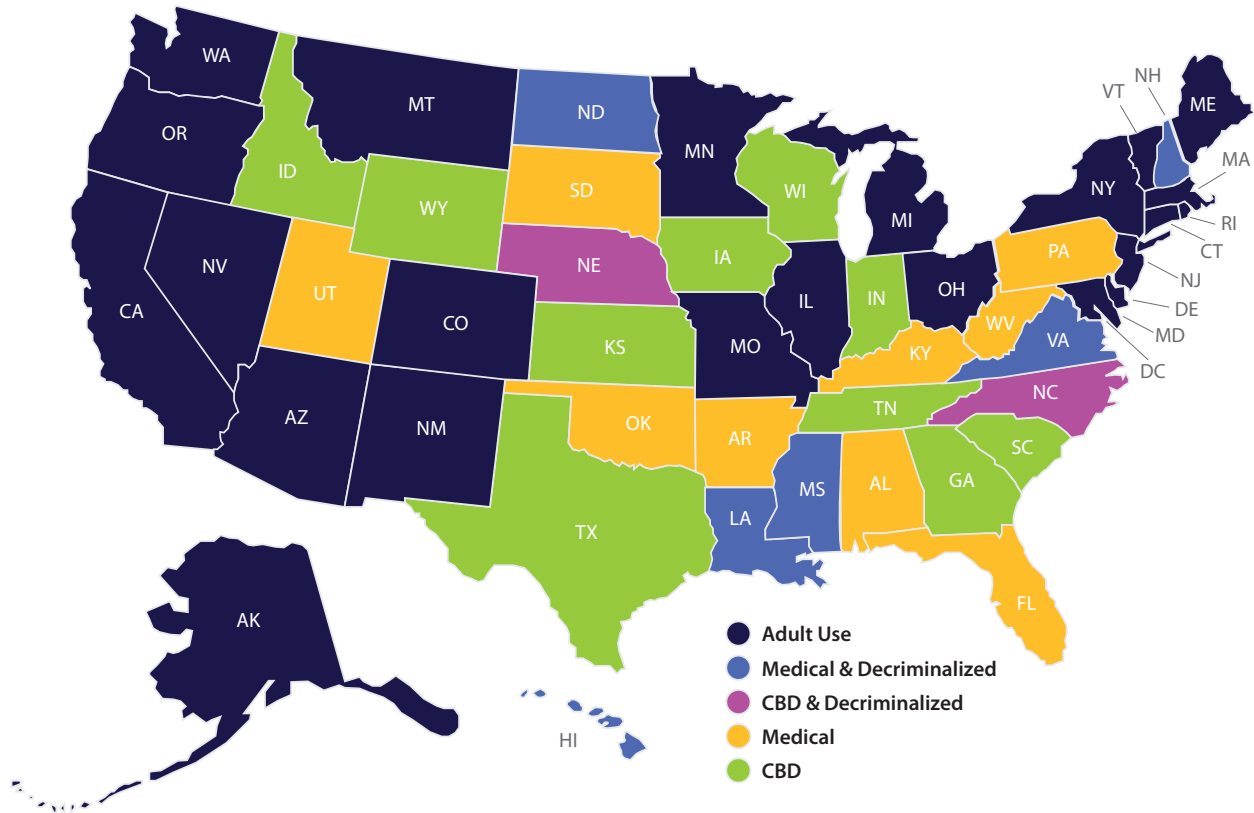
separated the four main policy choices – prohibition, decriminalization, medical use, and adult use – so that good or bad outcomes in one policy landscape will not affect the outcomes we report for others. This methodology resulted in some solid conclusions but also identified areas where there are still unanswered questions.

The Status Quo in Wisconsin and Nationally

The landscape of state policies and laws regarding the possession, use, and sale of cannabis is complex and fast-moving. Much has changed since the first movers of Oregon, California, and Colorado were the first to decriminalize, allow its medical use, and legalize respectively.³ Today, 24 states allow the adult use of cannabis, 38 allow medical use, and 31 states have decriminalized some small amount of personal possession.⁴

This means that an ever-growing percentage of the American population lives in a state that has implemented either a medical (72 percent) or adult use (47 percent) cannabis program.⁵ These state programs are in direct conflict with federal law, which still prohibits the manufacture, distribution, and possession of marijuana as a Schedule I drug.⁶ Congress did recently take action to provide physicians with a safe harbor that allows them to discuss the “currently known potential harms and benefits of marijuana and marijuana derivatives ... as a treatment,” but that is the only legal change Congress has made in response to these state actions so far.⁷

Wisconsin is one of the fewer than 10 states that have not adopted any state-level decriminalization, medical use, or adult use legislation. Three neighboring states have now adopted laws that allow the adult use and possession of cannabis and that establish commercial markets for such products. Wisconsin’s current law explicitly allows cannabidiol (a non-intoxicating derivative of cannabis) to be sold by a phar-



macy or physician and possessed by medical patients with a certification from their doctor.⁸ Citizens in many parts of the state may also see products labeled “Delta 8” (or Δ8) being sold in local stores.⁹ These products are intoxicating and are only able to be sold in some places because of the ambiguity created by federal legislation adopted by Congress in 2018 to legalize the production of hemp and Wisconsin’s reliance on federal law for its own controlled substance regulations.¹⁰ Some Wisconsin localities have begun to adopt ordinances banning the sale or possession of such products entirely or by someone under the age of 21.¹¹ These diverse legal approaches and the different levels of enforcement we explored in our prior study create a patchwork of approaches across the state.

Violent and Property Crime

Economists and other academics have argued for decades from a purely theoretical perspective that the prohibition of cannabis likely is fueling additional crime by pushing cannabis markets underground, but it was not until recently that research methods allowed for this hypothesis to be tested.¹² The findings of this research cannot be classified as a “consensus,” but tend to indicate that prohibition and the use of law enforcement resources to enforce prohibition are at the very least impeding opportunities to effectively address other types of crime. There is also some evidence that prohibition is fueling increased crime in some areas of some communities.¹³

Many researchers have been able to investigate the question in recent years as state policies have changed. They have looked at the impacts on crime of legal medicinal use, legal adult use, and decriminalization.

Medicinal: The impact of allowing the legal use of cannabis for medical use has been extensively studied by academics as the number of states in this category has grown over recent decades. All this research finds that medical marijuana legalization has either no impact or a positive impact on property and violent crime.¹⁴ The most recent study was completed by Jacob Kaplan and Li Sian Goh from the University of Pennsylvania. In this research, they reviewed national crime data and concluded that medical cannabis legalization had no impact on the total number of assaults or serious injury from assaults in the first 24 states to legalize medicinal use.¹⁵ Another innovative study from Evelina Gavrilova found that medical marijuana legalization has a strong, beneficial impact on violent crime in states and counties on the Mexico border.¹⁶ This second study tends to indicate that medical cannabis markets are disrupting or reducing the business of cartels and gangs involved in bringing illicit cannabis into the United States.

Adult-use: The research for full adult-use legalization is less conclusive but still points to a beneficial impact on crime.¹⁷ The most recent paper by Alexis Harper and Cody Jorgensen

utilized national crime data and looked specifically at the trends in crime rates for certain “index crimes”¹⁸ between 2000 and 2019 nationally and in Colorado and Washington. Their research “found that legalizing marijuana in Colorado and Washington was generally not associated with subsequent index crime variations.”¹⁹ Two studies by Guangzhen Wu of the University of Utah using similar data and methodologies display the “mixed” nature of the research. A 2020 study looking at Colorado found that cannabis legalization reduced crime in the state and six neighboring states while a 2021 study focused on Oregon found a slight increase in violent crime and a substantial increase in property crime within the state.²⁰ The weight of the research on the crime impact of adult use legalization reaches a similar conclusion as the research on medical cannabis legalization – that it has either no impact or a beneficial impact on property and violent crime.

Decriminalization: Research on the impact of mere decriminalization without some form of legalization is severely lacking, and we were only able to locate two studies that segment out states with this type of policy.²¹ Both of these studies found that decriminalization does not affect crime rates or the number of crimes occurring within a state.²²

Effectiveness of Solving Crimes

One of the potentially most compelling arguments by proponents of legalization is that such a policy change will allow law enforcement to focus on more serious property and violent crimes. While there is no true metric in the available data for how many crimes are solved, we do have a close substitute in the “clearance rate” metric reported by nearly every law enforcement agency.²³ Evidence on the impact of marijuana legalization on clearance rates for violent and property crime is limited but the weight of initial results indicates that it improves these rates.²⁴ For example, a study from David A. Makin looking at the impact of legalization in Colorado and Washington found that the policy change improves clearance rates both in the short run and long term.²⁵ These findings are restricted solely to adult-use legalization as there have been no studies we could locate that analyze this factor for medical legalization or decriminalization.

Impact of Dispensaries

There is a need to distinguish between the statewide impacts of legalization – a legal change – on crime and the impact the establishment of the market through “dispensaries” may have in individual communities. There is substantial evidence to indicate that the existence of a medical or adult-use marijuana dispensary in a local neighborhood does increase overall crime rates or the occurrence of at least some types of crime.²⁶ The research findings are particularly strong when looking at just property and disorder crimes. This is not

a surprising finding given that some researchers have reached a similar conclusion regarding establishments that sell liquor or other types of alcohol.²⁷ The same policy, in other words, can have a statewide positive impact but negatively impact certain neighborhoods simultaneously.

Size of Illicit Market

One of the biggest potential benefits of adult-use cannabis legalization is its potential to undermine the revenue of cartels and gangs by reducing the demand for black market products and in turn reducing the amount of violent crime experienced in the communities where these organizations currently operate. Studying any illegal activity can be nearly impossible, given that individuals involved in such activity will not be willing to admit their involvement in most cases, but two sets of researchers have attempted to find innovative ways to explore the impact of legal cannabis access on the illicit market.²⁸ Professor John Worrall and two colleagues from the University of Texas at Dallas utilized U.S. Postal Service drug seizure data to discover that such seizures significantly declined in states with adult-use cannabis but increased in states with a medical cannabis market.²⁹ Angélica Meinhofer utilized a different methodology that allowed her to explore the impact of cannabis legalization on illicit cannabis product prices. She found that such prices declined by 9.2% in states that adopt adult-use cannabis legalization – likely as sellers attempt to retain or recoup market share lost to the regulated market.³⁰

Given the lack of research on the impact here in the United States, we also sought to explore any research from Canada related to this topic. Research from our neighbor to the north concluded that the establishment of a legal market reduced the demand for illicit cannabis products.³¹

But we know from the general principles of economics that consumers will continue to purchase products from their legacy providers if it can save them substantial sums of money, so there are many factors beyond just merely legalizing medical or adult-use markets that could impact these reforms’ ability to undermine the illicit market. These could include factors that impact price, such as tax rates and regulatory burden as well as those that impact convenience such as a locality’s zoning regulations or opt-out from the market.³² We will discuss some of these factors in a future report focused on those topics.

Propensity to Commit Violence

It bears mentioning that this research on the impacts on crime of legal medicinal use, legal adult use, and decriminalization asks a specific set of questions from a specific perspective, that of crime researchers: How does a change in the legal regime concerning cannabis affect crime? This is a separate and distinct question from that of how the use of

cannabis by individuals affects their individual propensity for violence. That is a question asked from a different perspective, that of health researchers, and it produces different answers, which will be examined in a future publication in this series. Reconciling the two sets of answers is beyond the scope of this project and constitutes an ongoing matter for researchers.

Road Safety & Traffic Fatalities

A different but equally important factor in public safety is the impact of a policy on the safety of drivers, pedestrians, and others who use our roadways. We know that the main psychoactive substance in cannabis – tetrahydrocannabinol (THC) – does diminish a user’s ability to drive.³³ However, this subject is complicated because of the process by which the human body metabolizes THC.³⁴ Unlike alcohol, researchers have so far been unable to identify a definitive association between a mere detection of THC, the amount consumed, and someone’s level of impairment,³⁵ but higher levels of consumption in laboratory tests do cause increased impairment.³⁶

Recent research shows that reported driving under the influence of any substance has declined in recent years, but it remains a serious concern because more than 10% of American adults admit that they drove while under the influence of some substance at some point during the past year.³⁷ A similar trend exists when looking specifically at cannabis – there is a downward trend in the percentage of adults who reported using the substance in the past year and that they drove while under its influence.³⁸ But the relevant analysis for our purposes is the impact that certain policy choices around cannabis have on traffic fatalities and safety on roads, and it is no surprise given the other outcomes explored in the rest of this paper that the conclusions vary across the three possible policy changes.

Adult-use: The body of research on the impact of adult-use cannabis on road safety is highly disputed, so we sought to locate every credible study on the topic to ensure an accurate picture of the outcomes. The overwhelming majority of studies in this area indicate or conclude that traffic fatalities and other negative traffic outcomes increase after adult-use legalization.³⁹ This should not be a surprising conclusion given that similar impacts have been seen when states expand access to alcohol.⁴⁰ The most recent study on the topic was completed by Lisa Powell and Samantha Marinello at the University of Illinois-Chicago, who looked at death certificate data for all U.S. deaths to determine the impact of recreational markets in the seven states that opened markets prior to 2019. They found that this policy change and establishment of the market was associated with an average 10% increase in motor vehicle deaths that was largely driven by larger increases in Colorado, Oregon, Alaska, and California.⁴¹

Medical: There are slightly fewer studies examining the potential impact of medical cannabis legalization on road safety, but we were still able to locate nine studies using different methodologies to explore this question. There are some conflicts in the results, but the weight of the evidence concludes that establishing a medical cannabis market will likely reduce traffic fatalities but will – at worst – have no impact on road safety.⁴² A study by Cameron Ellis and Martin Grace at Temple University utilizes a dataset containing auto insurance premium information from the top 17 major auto insurers as a proxy for property damage and health outcomes. They found that auto insurance premiums declined by an average of \$22 in states that legalized medical cannabis and that the impact is significantly higher in ZIP codes near a dispensary.⁴³ This resulted in a total savings of \$1.5 billion in all states that have allowed the medical use of cannabis.⁴⁴

Decriminalization: There is even less research on mere decriminalization, and the number of studies is so small that we caution against any serious reliance on its conclusions. The authors of these studies find that such a policy change is associated with increased vehicle crashes at least among certain gender and age groups.⁴⁵

Conclusion

Our findings here show that there is a real possibility for cannabis reform to result in public safety gains for the Badger State but the tradeoffs that must be accepted are a significant reduction in safety on the state’s highways and roads and an increase in minor property and nuisance crimes near cannabis dispensaries if the state were to establish a commercial market for either medical or adult-use products.



About the author

Jeremiah Mosteller is an attorney and criminal justice policy expert who serves as a policy director at Americans for Prosperity and a visiting fellow at the Badger Institute.

Endnotes

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⁶ 21 U.S.C. § 841(a) (2023).

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¹⁰ See Agriculture Improvement Act of 2018, H.R. 2 § 7129, 7605, 10113 (2018) (authorizing the production of hemp products as long as the "delta-9 tetrahydrocannabinol concentration [is] not more than 0.3 percent on a dry weight basis."); See also Amber Otis & Steve McCarthy, Delta-8 Tetrahydrocannabinol (THC), Wisconsin Legislative Council (2021), https://docs.legis.wisconsin.gov/misc/lc/issue_briefs/2021/cannabis/ib_delta8_ao_sm_2021_07_22.

¹¹ See e.g. MARSHFIELD, WIS., Possession and use of marijuana, synthetic marijuana and drug paraphernalia, Mun. Code § 10-39 (2023) available at https://www.ci.marshfield.wi.us/government/municipal_code.php (restricting to above 21 years of age); WOOD COUNTY, WIS., Prohibition of Possession Of Marijuana, Synthetic Cannabinoids And Drug Paraphernalia, Ordinance #236 (2022), available at <https://www.woodcountymi.gov/Departments/Clerk/Ordinances.aspx> (restricting to above 21 years of age).

¹² See e.g. Harold Winter, *THE ECONOMICS OF CRIME* (2008); Christopher J. Coyne & Abigail R. Hall, Four Decades and Counting: The Continued Failure of the War on Drugs, *Cato Institute* (2017), <https://www.cato.org/policy-analysis/four-decades-counting-continued-failure-war-drugs>; Jeffrey A. Miron, Violence and the U.S. Prohibition of Drugs and Alcohol, *National Bureau of Economic Research* (1999), <https://www.nber.org/papers/w6950>.

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¹⁶ Gavrilova, *supra* note 14.

¹⁷ Alexis J. Harper and Cody Jorgensen, *Crime in a Time of Cannabis: Estimating the Effect of Legalizing Marijuana on Crime Rates in Colorado and Washington Using the Synthetic Control Method*, *J. Drug Issues* 1 (2022) (finding that cannabis legalization in Colorado and Washington had no impact on the rates of murder, robbery, aggravated assault, burglary, or theft); Guangzhen Wu, et al., *The Spillover Effect of Recreational Marijuana Legalization on Crime: Evidence From Neighboring States of Colorado and Washington State*, *50 J. Drug Issues* 392 (2020) (finding that legalization of marijuana in Colorado caused a spillover effect on neighboring states and reduced the rates of property crime and assaults); Davide Dragone, et al., *Crime and the legalization of recreational marijuana*, *159 J. Econ Behav. Org.* 488 (2019) (finding a 15-30% decline in rapes and a 10-20% decline in property crime across Washington after the state legalized marijuana); Shana L Maier & Emily L. Koppenhofer, *The Implications of Marijuana Decriminalization and Legalization on Crime in the United States*, *44 Contemp. Drug Probs.* 125 (2017) (finding that the legal status of marijuana in a state fails to predict its property or violent crime rates); But see Guangzhen Wu & Dale W. Willits, *The Impact of Recreational Marijuana Legalization on Simple Assault in Oregon*, *37 J. Interpers. Violence* 23180-23201 (2022) (finding that legalization of recreational cannabis in Oregon led to a significant increase in simple assault); Guangzhen Wu, et al., *Effects of recreational marijuana legalization on clearance rates for violent crimes: Evidence from Oregon*, *100 Int'l J. Drug Pol'y* 1 (2022) (finding that recreational legalization in Oregon was associated with a marginal increase in violent crime); Ruibin Lu, et al., *The Cannabis Effect on Crime: Time-Series Analysis of Crime in Colorado and Washington State*, *38 Just. Q.* 565 (2021) (finding that marijuana legalization in Colorado and Washington caused an initial, short-term increase in property crime but had no long-term impact on property or violent crime); Guangzhen Wu, et al., *Impact of recreational marijuana legalization on crime: Evidence from Oregon*, *72 J. Criminal Just.* 1 (2021) (finding a slight increase in violent crime and a substantial increase in property crime after Oregon legalized marijuana by comparing the state to 19 non-legalized states); See also French, *supra* note 14 (finding that body of existing research shows that adoption of adult-use cannabis laws has no impact on crime); Angela Dills, et al., *The Effect of State Marijuana Legalizations: 2021 Update*, *Cato Institute* (2021), <https://www.cato.org/policy-analysis/effect-state-marijuana-legalizations-2021-update>.

¹⁸ The index crimes included in this study included murder, robbery, aggravated assault, burglary, larceny, and motor vehicle theft.

¹⁹ Harper, *supra* note 17.

²⁰ Wu, *supra* note 17 (2020); Wu, *supra* note 17 (2021).

²¹ Only the states of Nebraska and North Carolina have such a policy at the time this report was drafted.

²² Kaplan, *supra* note 15 (finding that decriminalization of cannabis had no impact on the number of assaults in 24 states but did reduce the number resulting in serious injury by 18%); Maier, *supra* note 17 (finding that the decriminalization of marijuana in a state fails to predict its property or violent crime rates); Huber, *supra* note 15 (finding that “depenalization” of cannabis possession has little effect on non-drug crime).

²³ A “clearance” means that law enforcement has arrested someone for a crime and does not take into account whether that individual was found guilty in court or sentenced to any punishment.

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²⁷ Tate Twinam, *Danger zone: Land use and the geography of neighborhood crime*, 100 *J. Urban Econ.* 104 (2017); Debra M. Furr-Holden, et al., *Not in My Back Yard: A Comparative Analysis of Crime Around Publicly Funded Drug Treatment Centers, Liquor Stores, Convenience Stores, and Corner Stores in One Mid-Atlantic City*, 77 *J. Stud. Alcohol Drugs* 17 (2016); Heather R. Britt, et al., *Neighborhood Level Spatial Analysis of the Relationship Between Alcohol Outlet Density and Criminal Violence*, 12 *Envtl. Ecological Stat.* 411 (2005); Kwabena Gyimah-Brempong, *Alcohol Availability and Crime: Evidence from Census Tract Data*, 68 *S. Econ. Ass'n* 2 (2001).

²⁸ John L. Worrall, et al., *Marijuana Legalization and U.S. Postal Inspection Service Seizures: An Exploration of Black Market Activity*, 47 *Amer. J. Criminal Just.* 617 (2022) (finding that marijuana seizures by the Postal Service significantly decline in states that legalize adult-use marijuana); Angélica Meinhofer & Adrian Rubli, *Illegal drug market responses to state recreational cannabis laws*, 116 *Addiction* 3433 (2021) (finding that average illicit cannabis prices declined 9.2% in states that adopt adult-use cannabis legalization); See also Jeffrey P. Prestemon, et al., *Cannabis legalization by states reduces illegal growing on US national forests*, 164 *Ecological Econ.* 1 (2019) (finding that the legalization of adult-use cannabis is associated with a reduction in the number of illegal cannabis grow operations in national forests).

²⁹ Worrall, *supra* note 28.

³⁰ Meinhofer, *supra* note 28.

³¹ Bohdan Horak & Christoph Frei, *Cannabis Legalization: Do Banking Transactions Reflect a Shift Away from the Illegal Market?*, *Applied Econ. Letters* (2023) (finding that cannabis legalization had a significant impact on the cash and bank transfer spending of individuals who purchased products from legal cannabis dispensaries); Andrew Hathaway, et al., *How Well Is Cannabis Legalization Curtailing the Illegal Market? A Multi-wave Analysis of Canada's National Cannabis Survey*, 55 *J. Canadian Stud.* 307 (2021) (finding that legalization reduced the probability of users purchasing from “dealers” by approximately a third or 37%).

³² See generally Samantha Goodman, et al., *Reasons for Purchasing Cannabis From Illegal Sources in Legal Markets: Findings Among Cannabis Consumers in Canada and U.S. States, 2019–2020*, 83 *J. Studies Alcohol Drugs* 392 (2022) (finding that price and inconvenience were the two biggest factors reported by those who purchased cannabis illegally after the creation of a legal market); Geoff Lawrence and Spence Purnell, *Marijuana Taxation and Black Market Crowd-Out*, Reason Foundation (2020), <https://reason.org/wp-content/uploads/marijuana-taxation-black-market-crowd-out.pdf> (“As demonstrated by alcohol and cigarettes, excessive taxation can influence consumers’ decisions to patronize the black market.”)

³³ Eric L. Sevigny, *Cannabis and driving ability*, 38 *Current Opinion Psychology* 75 (2021); Godfrey D. Pearlson, et al., *Cannabis and Driving*, 12 *Frontiers Psychiatry* 1 (2021); See also Youngki Woo, et al., *Wreck on the Highway: Intersectionality of Driver Culpability, Tetrahydrocannabinols, Other Intoxicants and Fatalities in Washington State*, 2673 *J. Transportation Res. Board* 127 (2019) (finding that delta-9-THC positively predicted speeding, but not other driver errors while carboxy-THC – which is non-psychoactive – was a significant predictor of both speeding and driver errors); Richard P. Compton, *Marijuana-Impaired Driving: A Report to Congress*, National Highway Traffic Safety Administration (2017), <https://www.nhtsa.gov/sites/nhtsa.gov/files/documents/812440-marijuana-impaired-driving-report-to-congress.pdf> (Noting that “marijuana has been show to impair critical driving related skills including psychomotor abilities like reaction time, tracking ability, and target detection, cognitive skills like judgment, anticipation, and divided attention, and executive functions.”).

³⁴ Michael W. DeGregorio, et al., *A comprehensive breath test that confirms recent use of inhaled cannabis within the impairment window*, 11 *Sci. Reports* 1 (2021).

³⁵ Thomas D. Marcotte, et al., *Driving Performance and Cannabis Users’ Perception of Safety: A Randomized Clinical Trial*, 79 *JAMA Psychiatry* 201 (2022) (finding that driving performance was “indistinguishable from the placebo group at 4.5 hours.”); Thomas R. Arkell, et al., *The failings of per se limits to detect cannabis-induced driving impairment: Results from a simulated driving study*, 22 *Traffic Inj. Prevention* 102 (2021); Brett C. Ginsburg, *Strengths and limitations of two cannabis-impaired driving detection methods: a review of the literature*, 45 *Amer. J. Drug Alcohol Abuse* 610 (2019).

³⁶ Rebecca L. Hartman, *Cannabis effects on driving lateral control with and without alcohol*, 154 *Drug Alcohol Depend.* 25 (2015); Michael G Lenné, et al., *The effects of cannabis and alcohol on simulated arterial driving: Influences of driving experience and task demand*, 42 *Accid. Anal. & Prev.* 859 (2010); See also Rebecca L Hartman & Marilyn A Huestis, *Cannabis Effects on Driving Skills*, 59 *Clin. Chem.* 478 (2013) (summarizing the literature and finding that cannabis results in slower driving speeds but increased lane weaving and impaired reaction times and vehicle control).

³⁷ Matthew G. Myers, et al., *Driving under the influence of cannabis, alcohol, and illicit drugs among adults in the United States from 2016 to 2020*, 140 *Addictive Behav.* 1 (2023).

³⁸ Myers, *supra* note 37.

³⁹ Kusum Adhikari, et al., *Revisiting the effect of recreational marijuana on traffic fatalities*, 115 *Int'l J. Drug Pol'y* 1 (2023) (finding that traffic fatalities increased by 2.2 per billion vehicle miles traveled after adult-use legalization but noting that the effect is lower in each new state adopting such a law); Samantha Marinello & Lisa Powell, *The impact of recreational cannabis markets on motor vehicle accident, suicide, and opioid overdose fatalities*, 320 *Soc. Sci. Med.* 1 (2023) (finding that recreational cannabis legalization in the first seven states was associated with an average 10% increase in motor vehicle deaths); Charles M. Farmer, et al., *Changes in Traffic Crash Rates After Legalization of Marijuana: Results by Crash Severity*, 83 *Alcohol Drugs* 461 (2022) (finding that crashes resulting in an injury increased 5.8% and fatal crashes increased 4.1% in the first five states with an adult-use cannabis market); Evelyn Vingilis, et al., *Systematic review of the effects of cannabis retail outlets on traffic collisions, fatalities and other traffic-related outcomes*, 22 *J. Transport Health* 1 (2021) (reviewing current research to find nine relevant studies, six of which showed an increase in adverse traffic outcomes post-legalization); Jayson D. Aydelotte, et al., *Fatal crashes in the 5 years after recreational marijuana legalization in Colorado and Washington*, 132 *Accident Anal. Prevent.* 1 (2019) (finding that legalization was associated with a slight increase in fatal crashes in both Colorado and Washington after both the laws passed and dispensaries opened) [Note: These same authors had a 2017 study that reached the opposite conclusion.]; Tyler J. Lane & Wayne Hall, *Traffic fatalities within US states that have legalized recreational cannabis sales and their neighbours*, 114 *Addiction* 847 (2019) (finding that traffic fatalities increase by 1 for each 1 million residents in Colorado,

Washington, Oregon, and their neighboring states following their implementation of adult-use cannabis sales but then states experienced a small, consistent decline); Jaeyoung Lee, et al., Investigation of associations between marijuana law changes and marijuana-involved fatal traffic crashes: A state-level analysis, 10 *J. Transp. Health* 194 (2018) (finding substantial increases in fatal traffic crashes following legalization); Johanna Marie Borst, et al., Driving under the influence: a multi-center evaluation of vehicular crashes in the era of cannabis legalization, *Trauma Surgery Acute Care* (2021), <https://tsaco.bmj.com/content/6/1/e000736> (finding that the number of adult motor vehicle crash patients with THC in their blood increased post-legalization of cannabis in San Diego County); Sarah B. 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Kamer, et al., Change in Traffic Fatality Rates in the First 4 States to Legalize Recreational Marijuana, *JAMA Internal Medicine* (2020), <https://jamanetwork.com/journals/jamainternalmedicine/article-abstract/2767643> (finding a slight increase of 2.1 traffic fatalities per billion vehicle miles traveled in Colorado, Washington, Oregon, and Alaska following adult-use legalization); But see Emily Kan, et al., Impact of recreational cannabis legalization on cannabis use, other substance use, and drug-related offending among justice-system-involved youth, 40 *Behav. Sci. L.* 292 (2022) (finding that there was no significant change in cannabis DUI rates in California pre- and post-legalization of cannabis); Marco H. Benedetti, et al., Self-reported driving after marijuana use in association with medical and recreational marijuana policies, 92 *Int'l J. Drug Pol'y* 1 (2021) (finding no evidence that drivers in states with recreational marijuana were more likely to drive after use); Jim Dewey, et al., State Marijuana Laws and Traffic Fatalities, 51 *Rev. Region. Stud.* 246 (2021) (finding no statistically significant association between traffic fatalities and adoption of adult-use cannabis laws); Taylor Lensch, et al., Cannabis use and driving under the influence: Behaviors and attitudes by state-level legal sale of recreational cannabis, 141 *Prevent. Med.* 1 (2020) (finding that cannabis users from states with recreational cannabis were less likely to drive after use when controlling for frequency of use); Collin Calvert & Darin Erickson, An examination of relationships between cannabis legalization and fatal motor vehicle and pedestrian-involved crashes, 21 *Traffic Injury Prev.* 521 (2020) (finding no impact on pedestrian-involved vehicle accidents or fatal crashed generally from Washington and Oregon legalizing recreational cannabis but a slight increase in fatal accidents overall in Colorado); Benjamin Hansen, et al., Early Evidence on Recreational Marijuana Legalization and Traffic Fatalities, 58 *Econ. Inquiry* 547 (2020) (finding that both states legalizing adult-use cannabis and those that did not saw similar increases in traffic fatalities); See also Lauren Dutra, et al., Cannabis legalization and driving under the influence of cannabis in a national U.S. Sample, 27 *Preventative Med. R. Med. R* 1 (2022) (finding that current cannabis users in recreational cannabis states were significantly less likely to drive within three hours of use than those in states without legalization); Christian Gunadi, Does expanding access to cannabis affect traffic crashes? County-level evidence from recreational marijuana dispensary sales in Colorado, 31 *Health Econ.* 2244 (2022) (finding that entry of recreational cannabis dispensaries in a Colorado county increased the number of marijuana-related hospital discharges by 46% in that county); Raha Hamzeie, et al., State-Level Comparison of Traffic Fatality Data in Consideration of Marijuana Laws, 2660 *J. Trans. Res. Board* 78 (2017) (finding that drivers in states with lenient cannabis laws were more likely to test positive for cannabis use after an accident); Gregory Leung & Jessica Dutra, Legal Access to Marijuana and Motor Vehicle Fatalities in the United States, 1990—2019, *SSRN* (2021), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3982642 (finding no change in traffic fatality rate following the legalization of adult-use cannabis in states before 2019); Jacob Vogler, State Marijuana Policies and Vehicle Fatalities, *SSRN* (2017), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3013701 (finding that legalizing recreational cannabis increased quarterly vehicle fatalities by 8%); See generally Samuel S. Monfort, Effect of recreational marijuana sales on police reported crashes in Colorado, Oregon, and Washington, *Insurance Institute for Highway Safety* (2018), <https://www.iihs.org/topics/bibliography/ref/2173>.

⁴⁰ See e.g. Jennifer Cook Middleton, et al., Effectiveness of Policies Maintaining or Restricting Days of Alcohol Sales on Excessive Alcohol Consumption and Related Harms, 39 *Amer. J. Prevent. Med.* 575 (2010); Garnett P. McMillan & Sandra Lapham, Effectiveness of Bans and Laws in Reducing Traffic Deaths, 96 *Amer. J. Public Health* 1944 (2006).

⁴¹ Marinello, *supra* note 39 at 12-14.

⁴² Cameron Ellis, et al., Medical cannabis and automobile accidents: Evidence from auto insurance, 31 *Health Econ.* 1805 (2022) (finding that legalization of medical cannabis has reduced auto insurance premiums by \$1.5 billion on account of reduced property damage and negative health outcomes from vehicle accidents); Dewey, *supra* note 39 (finding that implementation of medical cannabis laws is associated with a lower traffic fatality rate); Amanda C. Cook, et al., Marijuana Decriminalization, Medical Marijuana Laws, and Fatal Traffic Crashes in US Cities, 2010–2017, 110 *Amer. J. Public Health* 363 (2020) (finding that medical marijuana laws were associated with fewer fatal car crashes); Lee, *supra* note 39 (finding no increase in marijuana-related traffic crashes following the legalization of medical marijuana); But see David S. Fink, et al., Medical marijuana laws and driving under the influence of marijuana and alcohol, 115 *Addiction* 1944 (2020) (finding that driving under the influence of alcohol was not impacted by legalizing medical cannabis but that driving under the influence of cannabis was slightly more prevalent in states with a medical cannabis market); Benedetti, *supra* note 39 (finding that drivers in states that have legalized medical cannabis without recreational cannabis legalization were marginally more likely to drive after use); Eric Sevigny, The effects of medical marijuana laws on cannabis-involved driving, 118 *Accident Anal. Prevent.* 57 (2018) (finding that states with medical marijuana dispensaries saw between 87 and 113 more drivers on the road after using cannabis but merely allowing the medical use of cannabis did not increase this likelihood); See also Dutra (2022), *supra* note 39 (finding that current cannabis users were less likely to drive after use in medical cannabis states than states without legal cannabis except for frequent users who were equally likely); Vogler, *supra* note 39 (finding that medical marijuana legalization was associated with a significant reduction in traffic fatalities); Leung, *supra* note 39 (finding an almost 7% decrease in traffic fatalities for states that adopted medical cannabis reform before 2019).

⁴³ Ellis, *supra* note 42 at 1883-1887.

⁴⁴ Ellis, *supra* note 42 at 1887-1888.

⁴⁵ Cook, *supra* note 42 (finding that cannabis decriminalization had no impact on fatal crashes except for increasing them among male drivers aged 15-24 years old during the six months following this policy change); Lee, *supra* note 39 (finding that marijuana-related vehicle crashes increase in Massachusetts after the decriminalization of marijuana); See also Hamzeie, *supra* note 39 (finding that drivers in states with lenient cannabis laws were more likely to test positive for cannabis use after an accident); Robin A. Pollini, et al., The impact of marijuana decriminalization on California drivers, 150 *Drug Alcohol Dependence* 135 (2015) (finding conflicting results that THC-positivity rates of drivers at four roadside test sites did not change after decriminalization but that more fatally injured drivers statewide tested positive for cannabis after decriminalization).