

What research shows about marijuana legalization and rates of use

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Marijuana use among adults in the Badger State has been steadily increasing in recent years, while youth use has been on the decline.¹ In this third installment in our “real facts” series, we explored the impacts of other states’ cannabis policy choices on marijuana use among both adults and youth. Our basic findings:

- The legalization of cannabis for both adult and medical use increases adult use.
- The impact of adult-use legalization on youth use is disputed, but the available evidence shows that these policies have not caused a dramatic increase in teen use of cannabis.
- The impact of medical use legalization in other states has resulted in reduced or stable teen use of cannabis.

Adult Cannabis Use

The natural experiments created by states adopting different forms of legalization show that increased availability of marijuana from legal sources increases the number of adults using the substance and the frequency of use among current users. This outcome appears to be fueled by both a change in legal status and the establishment of a commercial market, but current research has not yet explored which may have a greater impact on adult consumption patterns.

Adult use: The impact of adult-use cannabis legalization on the use of the substance by adults has been extensively studied. This body of research reaches a near-unanimous conclusion that legalization increases cannabis use among

adults, including past month, past year, and frequent use.² The most recent study was completed by a group of researchers from the University of Minnesota and the University of Colorado led by Dr. Stephanie Zellers. They followed nearly 3,500 people, total, in Colorado and Minnesota, a population that included 212 sets of twins, to track the frequency of their cannabis use.³ They found that states with adult-use legalization saw a larger increase in cannabis use frequency and that a twin living in a legal state used cannabis 20% more frequently than their sibling.⁴ Another recent study utilized data collected as part of the PATH (Population Assessment of Tobacco and Health) Study to explore similar questions.⁵ Their results showed that the adoption and implementation of an adult-use cannabis law is associated with higher odds that non-cannabis users become both infrequent and weekly users.⁶

A sizable body of research also explores the related factor of how an individual’s proximity to a cannabis dispensary impacts their likelihood to use cannabis. These studies find that proximity to a dispensary is a major driver of any given individual’s prevalence of cannabis use.⁷ For example, a recent study completed by the RAND Corporation found that the density of licensed cannabis dispensaries within a 4-mile radius in Los Angeles County was associated with increased daily and monthly use among adults.⁸ A different study from Washington State found that monthly use increased if someone lived within 18.4 miles of a retailer but frequent use only increased if someone lived within 0.8 miles of a retailer.⁹ The outcome of increased cannabis use appears to be present whether researchers focus on the related but distinct factors of the density of retailers in a local area or an

individual’s actual distance from a dispensary.

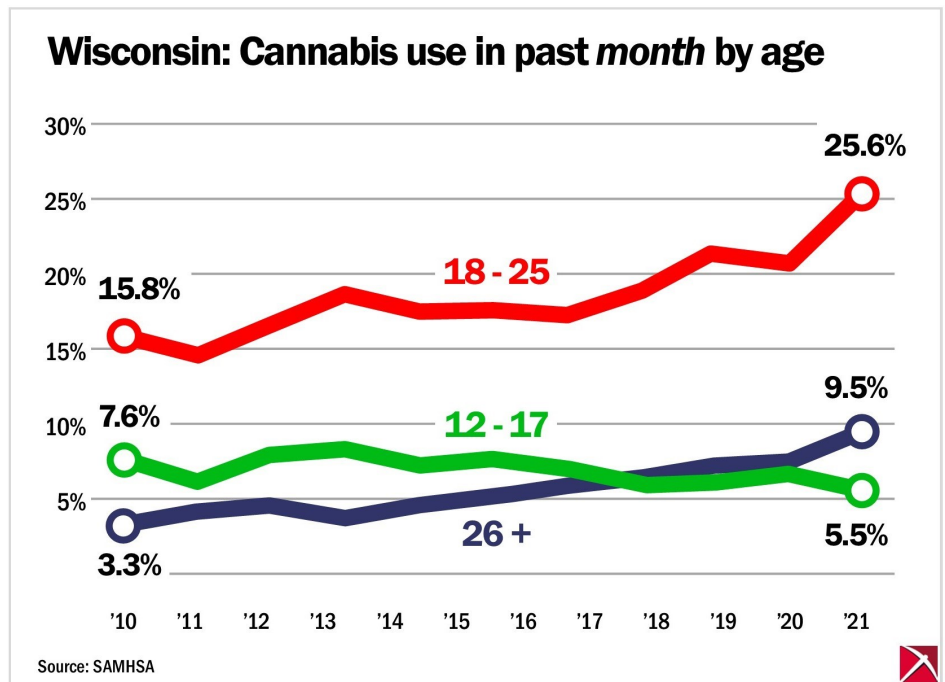
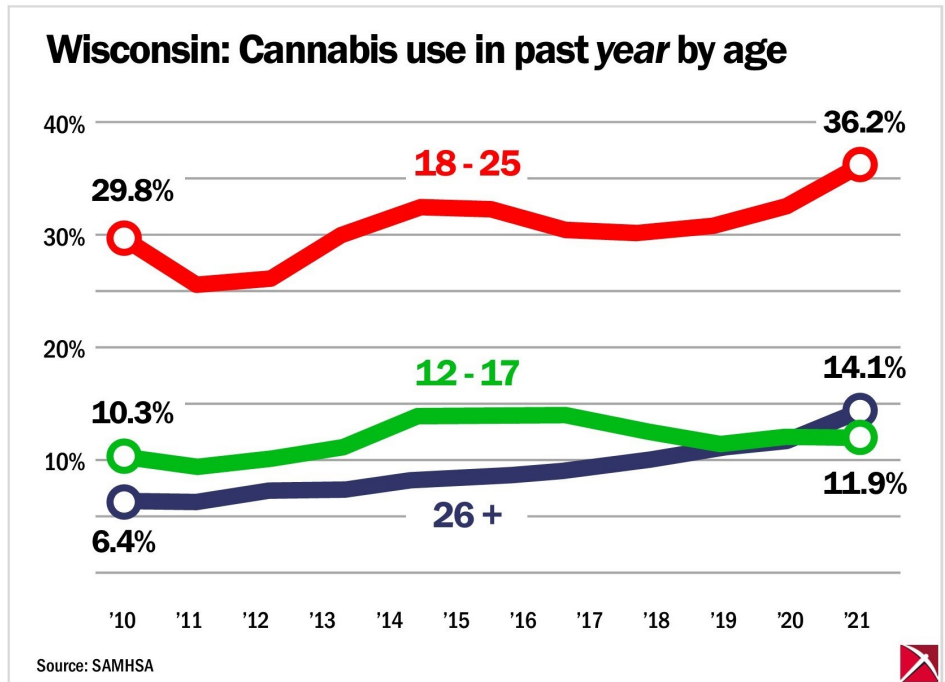
Medical: The impact of medical cannabis legalization has been studied less than adult-use legalization, but the body of research unanimously finds that it increases cannabis use among adults – with some studies finding results across all adults and others only finding an impact among particular demographic groups.¹⁰ The most recent study completed on the topic utilizes data from the National Survey on Drug Use and Health to analyze the impact of states legalizing medical marijuana use and sales.¹¹ The researchers found that adults residing in medical marijuana states reported higher lifetime marijuana use after controlling for other factors.¹² Another study utilizing the same data source specifically broke out select age groups by gender and found that such legal changes only appeared to impact marijuana use by adult males and had no impact on marijuana use among adult females.¹³

Youth Cannabis Use

While no state would presumably ever legalize the use of cannabis by minors for non-medical purposes, there has been extensive – though still inconclusive – research into the impact of the legal use of cannabis in a state on usage by younger Americans. Dozens of studies have explored this question for both medical and adult-use legalization, but the findings are both complex and sometimes contradictory. This is why we endeavored to review all the research and data on this topic rather than cherry-pick studies as many advocates and others have done in the past. Analyzing these results closely is important because our country has made significant strides in recent decades toward reducing adolescent use of alcohol, tobacco, and drugs, with all three being at their lowest points in

decades over the last two years.¹⁴

Adult use: This topic is one of the most extensively studied in the body of research given its importance, but this has still not resulted in a scientific consensus on the impact of such a policy on youth use of cannabis products. We located 31 studies that approached this issue from different methodologies – over 35% found no impact of adult-use legalization on youth use, almost 23% found that it reduced



cannabis use, and the remaining 42% found that it increased use.¹⁵ A similar distribution of results is also seen in other published reviews of the literature that contain a subset of these same studies.¹⁶

Three studies published within a short period display the diversity of findings in this area well. The first, a study that followed 900 high school students in Massachusetts as the state legalized the substance, found that there was no statistically significant change in cannabis use within the past 30 days for either males or females within that group of high school students after the state legalized it in 2016.¹⁷ The second utilized more than 21,000 responses to a survey that was fielded four times by federal agencies to analyze the impact of the first seven states legalizing cannabis – Alaska, California, Colorado, Maine, Nevada, Oregon, and Washington – for adult use on its use by youth in those states.¹⁸ They found that the adoption of these laws was associated with increased odds of non-cannabis users aged 12–21 years old becoming infrequent users but not weekly users when compared to both medical cannabis and non-legalizing states.¹⁹ Yet another study utilized more than 1 million responses to the annual Youth Risk Behavior Survey to analyze the impact of the same policy change in all of the states referenced above except Maine.²⁰ The researchers found that adult-use legalization did not impact the percentage of teens who used marijuana but did reduce the rate of use among teens who already used it by 16 percent.²¹

While these three studies are just the tip of the iceberg when it comes to all the research findings we have compiled, they are a representative sample that displays how the findings deviate both between and within the methodologies, jurisdictions studied, and the year in which the research was published. There is no clear factor that can necessarily be used to dispute one group of studies given that the mixed nature of the findings occurs every year that research has been published and even the same authors have found conflicting results in subsequent research they have done on this same topic.

With this dispute in the research, we also pulled together the raw data from states to explore the question ourselves and the outcome can be seen in Appendix A. It shows that most

states have seen teen use of cannabis decline both post-legalization and after they have established their commercial market. Therefore, we cannot identify with certainty what the outcome would be of adopting similar policies in the Badger State.

Medical: Conversely, the impact of medical cannabis legalization on youth cannabis use in a state has been less extensively studied but there are still 20 studies on the topic with more findings that it will not impact youth use (45%) or will reduce it (35%) rather than increase it (20%).²² Similar to adult use, all other literature reviews and the raw data (see Appendix B) support a conclusion of no impact or reduced use as well.²³ One of the most recent studies exploring this question from Johns Hopkins, Harvard and Brandeis universities utilized more than one million data points from 46 states.²⁴ They concluded that the reported use of cannabis in the past 30 days was lower in states with a medical marijuana market and that cannabis use among 9th graders was significantly reduced by the adoption of such laws.²⁵ The lower level of contradiction within the research gives us the confidence to say what is likely to happen in the Badger State under such a policy – reduced or stable teen cannabis use – rather than just what is unlikely to happen (as we did above).

Conclusion

The research shows that more adults will use cannabis if it is legal to use in any form. When it comes to youth use of cannabis, the research is still highly disputed, but the available research and data indicate there have not been dramatic increases in youth use of the substance when it becomes legal. Any stronger conclusion is hard to reach based on the available evidence.



About the author

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CANNABIS: REAL FACTS

Appendix A: Youth Cannabis Use in States with Established Adult-Use Markets²⁶

State	Legalization	Teen Monthly Use (Legalization)	Market Opened	Teen Monthly Use (Market Open)	Teen Monthly Use (Current)	Change from Legalization	Change from Market Open
Washington	2012	8.90%	2014	10.20%	9.60%	0.70%	-0.60%
Colorado	2012	12.30%	2014	12.60%	6.8%	-5.5%	-5.8%
Alaska	2014	7.90%	2016	10.43%	6.47%	-1.43%	-3.96%
Oregon	2014	11.00%	2015	9.42%	9.87%	-1.13%	0.45%
California	2016	7.33%	2018	7.05%	8.67%	1.34%	1.62%
Nevada	2016	8.65%	2017	8.82%	7.45%	-1.20%	-1.37%
Maine	2016	9.70%	2020	9.83%	8.58%	-1.12%	-1.25%
Massachusetts	2016	8.68%	2018	9.33%	6.50%	-2.18%	-2.83%
Michigan	2018	7.87%	2019	7.42%	8.58%	0.71%	1.16%
Illinois	2019	7.01%	2020	7.08%	8.78%	1.77%	1.70%
Montana	2020	9.06%	2022				
Vermont	2020	10.90%	2022				
Arizona	2020	6.38%	2021	7.49%			
New Jersey	2020	7.06%	2022				
New Mexico	2021	9.26%	2022				
Connecticut	2021	4.74%	2023				
New York	2021	7.11%	2022				
Virginia	2021	5.41%	TBD				
Rhode Island	2022		2022				
Maryland	2022		2023				
Missouri	2022		2023				
Minnesota	2023		2025				
Delaware	2023		TBD				
Ohio	2023		2024				

CANNABIS: REAL FACTS

Appendix B: Youth Cannabis Use in States with Established Medical Markets Only²⁷

State	Medical Legalization	Teen Monthly Use (Legalization)	Medical Market Opened	Teen Monthly Use (Market Open)	Teen Monthly Use (Current)	Change from Legalization	Change from Market Open
Hawaii	2000		2017	6.54%	4.87%		-1.67%
New Hampshire	2013	9.90%	2016	8.06%	5.44%	-4.46%	-2.62%
Louisiana	2015	5.33%	2019	4.99%	7.54%	2.21%	2.55%
Florida	2016	7.03%	2016	7.03%	3.90%	-3.13%	-3.13%
Pennsylvania	2016	6.25%	2018	5.31%	5.70%	-0.55%	0.39%
Arkansas	2016	5.59%	2019	5.82%	4.68%	-0.91%	-1.14%
North Dakota	2016	5.63%	2019	4.76%	4.72%	-1.69%	-0.04%
Ohio	2016	6.41%	2019	6.45%	7.48%	1.07%	1.03%
West Virginia	2017	5.45%	2021	5.82%			
Virginia	2017	5.48%	2022				
Oklahoma	2018	5.31%	2018	5.31%	9.74%	4.43%	4.43%
Utah	2018	4.46%	2020		3.05%	-1.41%	
South Dakota	2021	3.84%	2022				
Alabama	2021	3.96%	TBD				
Mississippi	2022		2023				

Endnotes

1: Substance Abuse Mental Health Services Administration, *National Survey on Drug Use and Health (NSDUH) State Data Releases*, Substance Abuse Mental Health Services Administration (2023), <https://www.samhsa.gov/data/nsduh/state-reports>.

2: Jeremy Mennis, et al., *Recreational cannabis legalization alters associations among cannabis use, perception of risk, and cannabis use disorder treatment for adolescents and young adults*, 138 *Addictive Behaviors* (2023) (finding that cannabis use among young adults increased following adult-use cannabis legalization); Stephanie M. Zellers, et al., *Impacts of recreational cannabis legalization on cannabis use: a longitudinal discordant twin study*, 118 *Addiction* 1 (2023); Alex Hollingsworth, et al., *Comparative Effects of Recreational and Medical Marijuana Laws On Drug Use Among Adults and Adolescents*, 65 *J. L. Econ.* 515 (2022) (finding that legalization of adult-use cannabis increased past-year marijuana use by 25% among adults in the first ten states); Kathak Vachhani, et al., *The relationship between cannabis use and legalization frameworks: A cross-sectional analysis using a nationally representative survey*, 156 *Prevent. Med.* 1 (2022) (finding that legalization of adult-use cannabis was associated with increased cannabis use); Christian Gunadi, et al., *Recreational cannabis legalization and transitions in cannabis use: findings from a nationally representative longitudinal cohort in the United States*, 117 *Addiction* 2651 (2022); Jason R. Kilmer, et al., *Cannabis Use Among Young Adults in Washington State After Legalization of Nonmedical Cannabis*, 112 *Amer. J. Public Health* 638 (2022) (finding that cannabis use increased in Washington among adults aged 21–25 years of age after the state legalized adult-use cannabis); Andrea H. Weinberger, et al., *A difference-in-difference approach to examining the impact of cannabis legalization on disparities in the use of cigarettes and cannabis in the United States, 2004–17*, *Addiction* (2022) (finding that cannabis legalization increased cannabis use among those aged 25 years old or older); Grant W. Neeley, et al., *Marijuana Policy Bundles in the American States Over Time and Their Impact on the Use of Marijuana and Other Drugs*, 46 *Eval. Rev.* 165 (finding that two alternative types of legalization policy models both increase the use of cannabis by adults); Renee D. Goodwin, et al., *Trends in cannabis use among adults with children in the home in the United States, 2004–2017: impact of state-level legalization for recreational and medical use*, 116 *Addiction* 2770 (2021) (finding that both past-month [5.8%] and daily [1.9%] cannabis use were higher for parents in states with a legal adults-use cannabis market); Silvia S. Martins, et al., *Racial and Ethnic Differences in Cannabis Use Following Legalization in US States With Medical Cannabis Laws*, 4 *JAMA Netw. Open* 1 (2021) (finding that adoption of a law legalizing adult-use cannabis in a state is associated with increased odds of cannabis use in the past year or month among Hispanic and White individuals but not Black individuals); Mayi Gnofam, et al., *Impact of Marijuana Legalization on Prevalence of Maternal Marijuana Use and Perinatal Outcomes*, 37 *Amer. J. Perinatology* 59 (2020) (finding that use of cannabis by pregnant women increased post-legalization); Meenakshi S. Subbaraman & William C. Kerr, *Subgroup trends in alcohol and cannabis co-use and related harms during the rollout of recreational cannabis legalization in Washington state*, 75 *Int'l J. Drug. Pol'y* 1 (2020) (finding that the percentage of adults using cannabis increased by 6.7% post-legalization in Washington); Magdalena Cerda, et al., *Association Between Recreational Marijuana Legalization in the United States and Changes in Marijuana Use and Cannabis Use Disorder From 2008 to 2016*, 77 *JAMA Psychiatry* 165 (2020) (finding that legalization of adult-use marijuana did not change marijuana use among adults 18–25 years old but did increase use, frequent use, and use disorder among adults 26 years and older); Marina Epstein, et al., *Evaluating the effect of retail marijuana legalization on parent marijuana use frequency and norms in U.S. States with retail marijuana legalization*, 111 *Addictive Behav.* 1 (2020) (finding that use of cannabis by parents increased in both states that legalize adult-use and those that do not post-legalization; the intensity of increased use was slightly higher in the states that did legalize adult-use cannabis); Davide Dragone, et al., *Crime and the legalization of recreational marijuana*, 159 *J. Econ Behav. Org.* 488 (2019) (finding an increase in marijuana use following legalization); Harold Bae & David Kerr, *Marijuana use trends among college students in states with and without legalization of recreational use: initial and longer-term changes from 2008 to 2018*, 115 *Addiction* 1115 (2020) (finding that cannabis use increased more among college students in states with adult-use legalization than states without); G. T. Wallace, et al., *Associations between marijuana use patterns and recreational legislation changes in a large Colorado college student sample*, 28 *Addiction Res. Theory* 211 (2020) (finding that both the frequency and recency of cannabis use were impacted by Colorado's legalization of adult-use cannabis); Elizabeth A. Stormshak, et al., *The impact of recreational marijuana legalization on rates of use and behavior: A 10-year comparison of two cohorts from high school to young adulthood*, 33 *Psychology Addictive Behav.* 595 (2019) (finding that past-month cannabis use increased in Oregon among adults); Rosanna Smart & Rosalie Liccardo Pacula, *Early evidence of the impact of cannabis legalization on cannabis use, cannabis use disorder, and the use of other substances: Findings from state policy evaluations*, 45 *Amer. J. Drug Alcohol Abuse* 644 (2019) (finding that adoption of adult-use cannabis laws resulted in increases in use among college students); Erik M. Everson, et al., *Post-Legalization Opening of Retail Cannabis Stores and Adult Cannabis Use in Washington State, 2009–2016*, 109 *Amer. J. Public Health* 1294 (2019) (finding that opening of Washington's adult-use cannabis market increased likelihood of frequent use among those who live within 0.8 miles of a dispensary and any use for those who lived within 18.4 miles of a dispensary); Jamie E. Parnes, et al., *Reefer madness or much ado about nothing? Cannabis legalization outcomes among young adults in the United States*, 56 *Int'l J. Drug Pol'y* 116 (2018) (finding that cannabis use increased among a cohort of 5,000 college students after Colorado legalized the substance); William C. Kerr, et al., *Changes in Marijuana Use Across the 2012 Washington State Recreational Legalization: Is Retrospective Assessment of Use Before Legalization More Accurate?*, 79 *J. Study Alcohol Drugs* 495 (2018) (finding that recreational legalization in Washington was associated with a 1.2% increase in the prevalence of past-year marijuana use but that it was not associated with an increase of simultaneous use with alcohol); Austin M. Miller, et al., *Recreational marijuana legalization and college student use: Early evidence*, 3 *SSM Population Health* 649 (2017) (finding that legalization of recreational cannabis use increased use by between 12–22% among students at one university); Barrett Wallace Montgomery, et al., *Estimating the effects of legalizing recreational cannabis on newly incident cannabis use*, *PLOS One* (2022), <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0271720> (finding that new cannabis use among those 21+ and never consuming the substance before increased after adult-use legalization); Rahi Abouk, et al., *Pain Management and Work Capacity: Evidence from Workers' Compensation and Marijuana Legalization*, __ *J. Pol'y Analysis Management* __ (2023) (finding that both monthly (27.8%) and annual (23.9%) reported use of marijuana increased after adoption of recreational legalization); *But see* Neal Doran, et al., *Post-legalization changes in marijuana use in a sample of young California adults*, 115 *Addictive Behaviors* 1 (2021) (finding the legalization of adult-use cannabis in California had no impact on the number of days individuals aged 18–24 years old used cannabis); Bin Yu, et al., *Marijuana legalization and historical trends in marijuana use among US residents aged 12–25: results from the 1979–2016 National Survey on drug use and health*, 20 *BMC Public Health* 1 (2020) (finding that legalization of adult-use cannabis was not associated with periods where cannabis use increased); *See also* Savannah G. Brenneke, et al., *Trends in can-*

nabis use among U.S. adults amid the COVID-19 pandemic, 100 Intl. J. Drug Pol'y 1 (2022) (finding marginal increases in marijuana use during the COVID pandemic but not differences based on state marijuana reforms); Deborah S. Hasin, et al., *Use of highly-potent cannabis concentrate products: More common in U.S. states with recreational or medical cannabis laws*, 229 Drug Alcohol Dependence 1 (2021) (finding that cannabis users in adult-use cannabis states were more likely to use high concentration products); Andrea H. Weinberger, et al., *Cannabis use among US adults with anxiety from 2008 to 2017: The role of state-level cannabis legalization*, 214 Drug Alcohol Dependence 1 (2020) (finding that cannabis use among individuals with high anxiety increased more significantly in states with adult-use cannabis over states with medical or no legal cannabis use); Zhuang Hao & Benjamin W. Cowan, *The Cross-Border Spillover Effects of Recreational Marijuana Legalization*, 58 Econ. Inquiry 642 (2020) (finding that marijuana possession arrests went up in counties bordering Colorado and Washington after legalization); Samantha Goodman, et al., *Prevalence and forms of cannabis use in legal vs. illegal recreational cannabis markets*, 76 Int'l J. Drug Pol'y 1 (2020) (finding daily [3.9%], weekly [6.6%], and monthly [8.2%] cannabis use was higher in states with adult-use legalization among over 17,000 Americans aged 16-65); Dhaval M. Dave, et al., *The Effects of Recreational Marijuana Legalization on Employment and Earnings*, National Bureau of Economic Research (2022), <https://www.nber.org/papers/w30813> (finding that adult prior-month marijuana use increased 3.4% after states adopted adult-use marijuana laws).

3: Zellers, *supra* note 2 at 111-112.

4: Zellers, *supra* note 2 at 114-115.

5: Gunadi, *supra* note 2 at 2652-2653.

6: Gunadi, *supra* note 2 at 2654-2657.

7: Bing Han & Yuyan Shi, *Associations of recreational cannabis dispensaries' availability, storefront signage and health benefit signs with cannabis use: findings from a representative adult sample in California, United States*, *Addiction* (forthcoming 2023), <https://onlinelibrary.wiley.com/doi/full/10.1111/add.16132> (finding that the density of recreational cannabis dispensaries within a 2 mile radius is associated with higher cannabis use); Eric R. Pedersen, et al., *Examining Associations Between Licensed and Unlicensed Outlet Density and Cannabis Outcomes From Preopening to Postopening of Recreational Cannabis Outlets*, 30 Amer. J. Addiction 122 (2021) (finding that the density of licensed cannabis dispensary within a 4-mile radius is associated with an increase in past-month use and near-daily use among young adults aged 21 or older but not cannabis use disorder); Christopher A. Ambrose, et al., *Geographical access to recreational marijuana*, 39 Contemp. Econ. Pol'y 778 (2021) (finding that when cannabis retailers open in a Washington community that more adults use cannabis or use cannabis more frequently; the trends were largely driven by those aged 18-26, women, and rural residents); Kelly C. Young-Wolff, et al., *Association of Cannabis Retailer Proximity and Density With Cannabis Use Among Pregnant Women in Northern California After Legalization of Cannabis for Recreational Use*, *JAMA Network* (2021), <https://jamanetwork.com/journals/jamanetworkopen/article-abstract/2776967> (finding that drive time to the nearest cannabis dispensary is associated with greater odds of cannabis use, with 15 minutes being a strong defining length); Erik M. Everson, et al., *Post-Legalization Opening of Retail Cannabis Stores and Adult Cannabis Use in Washington State, 2009–2016*, 109 Amer. J. Public Health 1294 (2019) (finding that opening of Washington's adult-use cannabis market increased likelihood of frequent use among those who lives within 0.8 miles of a dispensary and any use for those who lived within 18.4 miles of a dispensary).

8: Pedersen, *supra* note 7.

9: Everson, *supra* note 7 at 1296-1297 (defines frequent use as the use of cannabis on at least 20 days out of the past 30 days)

10: Yen-Han Lee, et al., *Association between medical marijuana legalization and sources of obtaining marijuana among adults in the United States*, 27 J. Substance Use 27 (2022); Weinberger, *supra* note 2 (finding that medical cannabis legalization increased cannabis use among those over 50 years of age but did not affect other age groups); Goodwin, *supra* note 2 (finding that both past-month [3.2%] and daily [0.9%] cannabis use were higher for parents in states with a medical cannabis market); Smart, *supra* note 2 (finding that adoption of medical cannabis laws resulted in increases in use among adults); Yu, *supra* note 2 (finding that legalization of medical cannabis is associated with periods where cannabis use increased); Ryan K. McBain, et al., *State medical marijuana laws, cannabis use and cannabis use disorder among adults with elevated psychological distress*, 215 Drug Alcohol Dependence 1 (2020) (finding that states with medical marijuana laws had a 4.3% increased prevalence of past-month cannabis use and a 1.8% increased prevalence of daily use); Joseph J. Sabia & Thanh Tam Nguyen, *The Effect of Medical Marijuana Laws on Labor Market Outcomes*, 61 J. L. & Econ. 361 (2018); Deborah S. Hasin, et al., *US Adult Illicit Cannabis Use, Cannabis Use Disorder, and Medical Marijuana Laws*, *JAMA Psychiatry* (2017), <https://jamanetwork.com/journals/jamapsychiatry/article-abstract/2619522> (finding that both cannabis use and cannabis use disorders increased a slightly greater rate in states with medical marijuana markets); Silvia S. Martins, et al., *State-Level Medical Marijuana Laws, Marijuana Use and Perceived Availability of Marijuana Among the General U.S. Population*, 169 Drug Alcohol Dependence 26 (2016) (finding that past-month cannabis use increased among those aged 26 or older after adoption of medical marijuana laws); Hollingsworth, *supra* note 2 (finding that legalization of medical cannabis increased past-year marijuana use by 5% among adults in the first 34 states); Hefei Wen, et al., *The effect of medical marijuana laws on adolescent and adult use of marijuana, alcohol, and other substances*, 42 J. Health Econ. 64 (2015) (finding that implementation of a medical marijuana law is associated with increased use by adults aged 21+); See also Taeho Greg Rhee & Robert A. Rosenheck, *Increasing Use of Cannabis for Medical Purposes Among U.S. Residents, 2013–2020*, __ Amer. J. Preventive Medicine __ (2023) (finding that living in a state that has legalized medical cannabis makes it more likely that someone uses it for medical purposes); Bridget Freisthler & Paul I. J. Gruenewald, *Examining the relationship between the physical availability of medical marijuana and marijuana use across fifty California cities*, 143 Drug Alcohol Dependence 244 (2014) (finding that the density of medical marijuana dispensaries in a city is associated with higher frequency of cannabis use but not the likelihood of lifetime use).

11: Lee, *supra* note 10.

12: Lee, *supra* note 10.

13: Sabia, *supra* note 10 (finding that legalization of medical marijuana results in an 11% increase in monthly marijuana use among 20- to 29-year-old males and an approximately 14% increase in use among males 40 and older).

14: Richard A. Miech, et al., *National Survey Results on Drug Use, 1975-2022: Secondary School Students*, The University of Michigan Institute for Social Research (2023), <https://monitoringthefuture.org/wp-content/uploads/2022/12/mtf2022.pdf>.

15: No Change [11 studies]: Faith English & Jennifer M. Whitehill, *Risk Factors for Adolescent Cannabis Use in a State with Legal Recreational Cannabis: The Role of Parents, Siblings, and Friends*, 45 Clin. Therapeutics 589 (2023); Jennifer A. Bailey, et al., *Effects of Cannabis Legalization on Adolescent Cannabis Use Across 3 Studies*, Amer. J. Prevent. Med. (2022) (finding that youth who spent more years living in a state with adult-use cannabis were neither more nor less likely to have used cannabis by age 15 than those who spent little or no time in such states); D. Mark Anderson, et al., *Association of Marijuana Legalization With Marijuana Use Among US High School Students, 1993-2019*, 4 JAMA Net. Open 1 (2021) (finding that adult-use legalization was not associated with increases in either current or frequent marijuana use among adolescents); Cerda, *supra* note 2 (2020) (finding no change in past-month or past-month frequent use of marijuana among respondents 12 to 17 years old in states that legalized adult-use marijuana); Emily Kan, et al., *Marijuana Use Among Justice-Involved Youths After California Statewide Legalization, 2015–2018*, 110 Amer. J. Public Health 1386 (2020) (finding that neither legalization nor implementation of adult-use cannabis in California resulted in increased use among justice-involved youth); Smart, *supra* note 2 (finding that adoption of adult-use cannabis laws has little impact on adolescent cannabis use); Daniel I. Vigil, et al., *Marijuana Use and Related Health Care Encounters in Colorado Before and After Retail Legalization*, 16 Inter. J. Mental Health Addiction 806 (2018) (finding that the trend of youth cannabis use was unaffected by legalization in Colorado); Claire E Blevins, et al., *The Implications of Cannabis Policy Changes in Washington on Adolescent Perception of Risk, Norms, Attitudes, and Substance Use*, 12 Substance Abuse Res. Treatment 1 (2018) (finding no increase or decrease in cannabis use among sample of adolescents in Washington post adult-use legalization); Scott B. Harpin, et al., *Adolescent Marijuana Use and Perceived Ease of Access Before and After Recreational Marijuana Implementation in Colorado*, 53 Substance Use Misuse 451 (2018) (finding that middle and high school students thought that marijuana was easier to access after legalization in Colorado but that the percentage who ever-used marijuana, used it in the past 30 days, or the first age of use was unaffected); Steven Schinke, et al., *Is the Legalization of Marijuana Associated With Its Use by Adolescents?*, 52 Substance Use Misuse 256 (2017) (finding that the legalization of adult use cannabis had no impact on adolescent use); Ashley C. Estoup, et al., *The Impact of Marijuana Legalization on Adolescent Use, Consequences, and Perceived Risk*, 51 Substance Use Misuse 1881 (2016) (finding that adolescent cannabis use was not impacted by marijuana legalization among a sample of 115 high school students); Montgomery, *supra* note 2 (finding that legalization of adult-use cannabis did not increase the number of 12-20 year olds who start using cannabis).

Increase [13 studies]: Maria M. Orsini, et al., *Adolescent Cannabis Use During a Period of Rapid Policy Change: Evidence From the PATH Study*, 72 J. Adolescent Health 412 (2023) (finding that the likelihood of responding adolescents to use cannabis in the past month was higher in states with adult-use versus states with no form of legalization); Mennis, *supra*, note 2 (finding that cannabis use among adolescents increased following adult-use cannabis legalization); Christopher J. Rogers, et al., *Associations between Local Jurisdiction Ordinances and Current Use of Cannabis Products in California Adolescents*, 57 Substance Use Misuse 373 (2022) (finding that local jurisdictions allowing the sale of adult-use cannabis in California is associated with higher cannabis use by adolescents in the past 30 days); Gunadi, *supra* note 2; Meen Hye Lee, et al., *Adolescents' Marijuana Use Following Recreational Marijuana Legalization in Alaska and Hawaii*, 34 Asia Pacific J. Public Health 65 (2022) (finding that adult-use cannabis legalization in Alaska increased lifetime and current cannabis use among adolescents); Hollingsworth, *supra* note 2 (finding that legalization of adult-use cannabis increased past-year marijuana use by 10% among minors in the first ten states); Mallie J. Paschall, et al., *Recreational Marijuana Legalization and Use Among California Adolescents: Findings From a Statewide Survey*, 82 J. Studies on Alcohol Drugs 103 (2021) (finding that legalization of adult use cannabis in California was associated with an increase in both lifetime and past-30-day use of cannabis among 7th, 9th, and 11th graders in the state); Mallie J. Paschall & Joel W. Grube, *Recreational Marijuana Availability in Oregon and Use Among Adolescents*, 58 Amer. J. Preventive Medicine 63 (2020) (prevalence of past 30-day marijuana use increased in Oregon counties that did and did not allow sales after adult-use legalization); Jennifer A. Bailey, et al., *Marijuana Legalization and Youth Marijuana, Alcohol, and Cigarette Use and Norms*, 59 Amer. J. Prev. Med. 309 (2020) (finding that recreational marijuana legalization predicted higher use of marijuana over the past year among youth when controlling for various factors); Julie C. Rusby, et al., *Legalization of Recreational Marijuana and Community Sales Policy in Oregon: Impact on Adolescent Willingness and Intent to Use, Parent Use, and Adolescent Use*, 32 Psychol. Addictive Behav. 84 (2018) (finding that youth who did not use cannabis before legalization were no more likely to use it but that those who did already use increased frequency of use after legalization); Magdalena Cerdá, et al., *Association of State Recreational Marijuana Laws With Adolescent Marijuana Use*, 171 JAMA Pediatrics 142 (2017) (finding the legalization of adult-use cannabis was associated with a 2.1% increase in marijuana use among 8th and 10th graders in Washington but no change in prevalence among 12th graders in Washington and all grade in Colorado); W. Alex Mason, et al., *Prevalence of marijuana and other substance use before and after Washington State's change from legal medical marijuana to legal medical and nonmedical marijuana: Cohort comparisons in a sample of adolescents*, 37 Substance Abuse 330 (2016) (finding that that transition from medical to adult-use cannabis in Washington was associated with a non-statistically significant increase in reported cannabis use but noting that the increase could be merely in reporting and not actual use); Maria Melchior, et al., *Does liberalisation of cannabis policy influence levels of use in adolescents and young adults? A systematic review and meta-analysis*, BMJ Open (2019), <https://bmjopen.bmj.com/content/9/7/e025880> (finding adoption of adult-use cannabis law is associated with a small increase in cannabis use among minors).

Decrease [7 studies]: 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 cannabis use was lower in California post-legalization than in Pennsylvania which has not legalized cannabis for recreational use); Weinberger, *supra* note 2 (finding that cannabis legalization reduced cannabis use among those aged 12-17 years old); Rebekah Levine Coley, et al., *Recreational Marijuana Legalization and Adolescent Use of Marijuana, Tobacco, and Alcohol*, 69 J. Adolescent Health 41 (2021); Andrea L. Stone, *Adolescent Cannabis Use and Perceived Social Norm Trends Pre and Post-Implementation of Wash-*

ington State’s Liberalized Recreational Cannabis Policy: Healthy Youth Survey, 2008–2018, 21 *Prevent. Sci.* 772 (2020) (finding that cannabis use among 8th, 10th, and 12th graders declined or remained stable post-legalization in Washington); Greg Midgette & Peter Reuter, *Has Cannabis Use Among Youth Increased After Changes in Its Legal Status? A Commentary on Use of Monitoring the Future for Analyses of Changes in State Cannabis Laws*, 21 *Prevention Sci.* 137 (2020) (finding that past 30-day cannabis use declined among 8th graders [22%] and 10th graders [12.7%] after the adoption of adult-use legalization in Washington; no change in prevalence of use among 12th graders); D. Mark Anderson, et al., *Association of Marijuana Laws With Teen Marijuana Use*, 173 *JAMA Pediatrics* 879 (2019) (adult-use legalization was associated with a 8% decline in odds of marijuana use and 9% decline in frequent marijuana use among teens); Julia A. Dilley, et al., *Prevalence of Cannabis Use in Youths After Legalization in Washington State*, 173 *JAMA Pediatrics* 192 (2019) (finding that adult use legalization in Washington was associated with a decline in marijuana use among 8th and 10th graders); Ashley Brooks-Russell, et al., *Adolescent Marijuana Use, Marijuana-Related Perceptions, and Use of Other Substances Before and After Initiation of Retail Marijuana Sales in Colorado (2013–2015)*, 20 *Prevention Sci.* 185 (2019) (finding that neither lifetime or past 30-day use of cannabis increased post-legalization in Colorado but a significant decline in frequent use and use on school property).

See also David C. R. Kerr, et al., *Recreational Cannabis Legalization and Proximity to Cannabis Retailers as Risk Factors for Adolescents’ Cannabis Use*, *Prevention Sci.* (2022) (finding that the number of cannabis retail outlets within 2, 10, and 20 miles is not a strong predictor of adolescent cannabis use); Douglas C. Smith, et al., *Adolescent Cannabis Use Among Youth in ZIP Codes with Medical Dispensaries*, 5 *Cannabis* 36 (2022) (finding that teens who lived in a ZIP Code with a cannabis dispensary were less likely to have used cannabis in the past 30 days but there was no impact on cannabis use in the past year).

16: Kristie Ladegard & Devika Bhatia, *Impact of Cannabis Legalization on Adolescent Cannabis Use*, 32 *Child Adolescent Psychiatric Clinics of N. Amer.* 1 (2023) (finding that “numerous national surveys reveal no substantial change in adolescent cannabis usage as a result of medical and recreational cannabis legalization in various states” but long term data will be needed to reach a true conclusion); Megan A. O’Grady, et al., *Is legalization of recreational cannabis associated with levels of use and cannabis use disorder among youth in the United States? A rapid systematic review*, *Euro. Child Adolescent Psychiatry* (2022) (finding that the research on the impact of adult use legalization is mixed with 10 of the 22 studies they reviewed finding no change, 6 reporting a decrease, and 7 reporting an increase); Antoine Lachance, et al., *A Systematic Review and Narrative Synthesis of the Evolution of Adolescent and Young Adult Cannabis Consumption Before and After Legalization*, 70 *J. Adolescent Health* (2022) (literature review of studies finds that 40% found evidence of an increase, 55% found no change, and 5% reported a decrease in adolescent cannabis use); Michael T. French, et al., *Societal Costs and Outcomes of Medical and Recreational Marijuana Policies in the United States: A Systematic Review*, *Med. Care Res.* 1 (2022) (finding that most of the existing research concludes that adoption of medical or adult use legalization either decreases or does not impact adolescent use).

17: English, *supra* note 15.

18: Gunadi, *supra* note 2.

19: Gunadi, *supra* note 2.

20: Coley, *supra* note 15.

21: Coley, *supra* note 15.

22: No Change [9 studies]: Smart, *supra* note 2 (finding that adoption of medical cannabis laws does not impact adolescent cannabis use); Martins, *supra* note 10 (2016) (finding that there was no increase in past-month cannabis use by youth in states that adopted medical cannabis legalization); Melanie M. Wall, et al., *Prevalence of marijuana use does not differentially increase among youth after states pass medical marijuana laws: Commentary on Stolzenberg et al. (2015) and reanalysis of US National Survey on Drug Use in Households data 2002–2011*, 29 *Int. J. Drug Pol’y* 9 (2016) (finding that “there is no evidence of a significant differential increase in youth marijuana use post-MML”); Wen, *supra* note 10 (finding that implementation of medical marijuana legalization is not associated with increased use among those aged 12–20 years of age); Deborah S Hasin, et al., *Medical marijuana laws and adolescent marijuana use in the USA from 1991 to 2014: results from annual, repeated cross-sectional surveys*, 2 *Lancet Psychiatry* 601 (2015) (finding that passage of a law allowing the medical use of cannabis does not increase youth use but that other factors might be causing higher use in states with such laws); Esther K Choo, et al., *The impact of state medical marijuana legislation on adolescent marijuana use*, 55 *J. Adolescent Health* 160 (2014) (finding no increase in adolescent cannabis use related to the legalization of medical cannabis); D. Mark Anderson, et al., *Medical Marijuana Laws and Teen Marijuana Use*, 17 *Amer. L. Econ. Rev.* 496 (2015) (finding that medical marijuana legalization was not associated with increased youth use); Sarah D Lynne-Landsman, et al., *Effects of State Medical Marijuana Laws on Adolescent Marijuana Use*, 103 *Amer. J. Public Health* 1500 (2013) (finding that adoption of medical marijuana laws in Montana, Delaware, and Rhode Island did not impact the prevalence of monthly or lifetime use of marijuana use among youth); Hollingsworth, *supra* note 2 (finding that legalization of medical cannabis had no impact on past-year marijuana use by adolescents in the first 34 states).

Increase [4 studies]: Orsini, *supra* note 15 (finding that the likelihood of responding adolescents to use cannabis in the past month was higher in states with medical marijuana legalization versus states with that have only legalized CBD); Su-Wei Wong, et al., *State Medical Marijuana Laws and Associated Marijuana Use, Attitudes, and Perceived Social Norms among Adolescents in the U.S.*, 52 *J. Psychoactive Drugs* 383 (2020) (finding that adolescents residing in states with a medical marijuana law have a higher likelihood of using cannabis in the past year or month and higher frequencies of use in the past month); Xinguang Chen, *Medical Marijuana Laws and Marijuana Use Among U.S. Adolescents: Evidence From Michigan Youth Risk Behavior Surveillance Data*, 48 *J. Drug Ed.* 18 (2018) (finding that adoption of medical marijuana legalization in Michigan resulted in an increased risk of marijuana use among adolescents); Lisa Stolzenberg, et al., *The effect of medical cannabis laws on juvenile cannabis use*, 27 *Int’l J. Drug Pol’y* 82 (2016) (finding that adoption of medical cannabis laws in the first 16 states was associated with increased use of cannabis among 12–17 year olds).

Decrease [7 studies]: Weinberger, *supra* note 2 (finding that medical cannabis legalization significantly reduced cannabis use among those aged 12-17 years old); Anderson, *supra* note 15 (2021) (finding that adoption of medical marijuana law reduced odds of teen marijuana use by 6% and odds of frequent teen marijuana use by 7%); Julie K. Johnson, et al., *Medical marijuana laws (MMLs) and dispensary provisions not associated with higher odds of adolescent marijuana or heavy marijuana use: A 46 State Analysis, 1991–2015*, 42 *Substance Abuse* 471 (2021); Rebekah Levine Coley, et al., *A quasi-experimental evaluation of marijuana policies and youth marijuana use*, 45 *Amer. J. Drug Alcohol Abuse* 292 (2019) (finding that adoption of medical marijuana laws prior to 2015 is associated with a small 1.1% reduction in current cannabis use with reductions being higher for Black, Hispanic, and male adolescents); Julie Johnson, et al., *The Design of Medical Marijuana Laws and Adolescent Use and Heavy Use of Marijuana: Analysis of 45 States from 1991–2011*, 170 *Drug Alcohol Dependence* 1 (2017) (finding that adoption of a medical marijuana law resulted in 7% lowers odds of use among adolescents and “no difference in heavy use”); Katherine M. Keyes, et al., *How does state marijuana policy affect US youth? Medical marijuana laws, marijuana use and perceived harmfulness: 1991–2014*, 111 *Addiction* 2187 (2016) (finding that medical marijuana legalization decreased use of marijuana among 8th graders but had no impact for those in 10th or 12th grade); Sam Harper, et al., *Do Medical Marijuana Laws Increase Marijuana Use? Replication Study and Extension*, 22 *Annals Epidemiology* 207 (2012) (finding that adoption of a medical marijuana law decreased adolescent use by 0.53%).

See also Regina A. Shih, et al., *Associations between young adult marijuana outcomes and availability of medical marijuana dispensaries and storefront signage*, 114 *Addiction* 2162 (2019) (finding that living near a high number of medical marijuana dispensaries is associated with a greater number of days which cannabis was used in the past month).

23: Ladegard, *supra* note 16 (finding that most studies have found no impact on youth cannabis use); French, *supra* note 16 (finding that most of the existing research concludes that adoption of medical or adult use legalization either decreases or does not impact adolescent use); Melchior, *supra* note 15 (finding that adoption of medical marijuana laws do not increase use among minors); Aaron L. Sarvet, et al., *Medical marijuana laws and adolescent marijuana use in the United States: a systematic review and meta-analysis*, 113 *Addiction* 1003 (2018) (combining results of 11 prior studies to find no evidence that adoption of medical marijuana laws increases adolescent marijuana use).

24: Johnson, *supra* note 22.

25: Johnson, *supra* note 22.

26: Substance Abuse and Mental Health Services Administration, National Survey on Drug Use and Health: State Tables, Substance Abuse and Mental Health Services Administration (2023), available at <https://www.samhsa.gov/data/nsduh/state-reports> (see Table 3 for prevalence estimates of monthly marijuana use among 12- to 17-year-olds). A note on the data: The Substance Abuse and Mental Health Services Administration changed its methodology in its most recent publication as part of the State Tables series to include only one year of surveys rather than a two-year average. Therefore, this data should not be used as conclusive proof of a trend in cannabis use within a particular state in isolation. To mitigate any noise in the data from that changed methodology, we have only relied on the data to analyze general trends across a sample of states.

27: Substance Abuse and Mental Health Services Administration, *supra* note 26.

