

Testimony of Dr. D. Mark Anderson

Associate Professor, Montana State University
College of Agriculture and College of Letters and Science
Department of Agricultural Economics and Economics

Research Associate, National Bureau of Economic Research

before the

Pennsylvania Senate Aging and Youth Committee

Marijuana Legalization and Youth Marijuana Use

April 12, 2022

Biography

Dr. D. Mark Anderson is an associate professor of economics at Montana State University, where he holds an appointment in the Department of Agricultural Economics and Economics. He is also a research associate at the National Bureau of Economic Research and a co-editor at *Economic Inquiry*. Dr. Anderson is a health economist whose research focuses on public health interventions, drug markets, and youth outcomes.

Dr. Anderson earned a B.S. in mathematics and a B.S. in economics from Montana State University and an M.A. in economics and a Ph.D. in economics from the University of Washington. He currently sits on the advisory board for the Center for Health Economics and Policy Studies at San Diego State University and is a regional affiliate at the Center for Studies in Demography and Ecology at the University of Washington.

Dr. Anderson has presented his research on marijuana legalization to the Seventh Circuit Bar Association at Northwestern University's Law School, the International Society for the Study of Drug Policy, and at numerous universities across the country. His research on legalization has been published in top economics, medical, public health, and public policy journals such as the *Journal of Law and Economics*, *Journal of Economic Literature*, *JAMA Pediatrics*, *American Journal of Public Health*, *International Journal of Drug Policy*, and the *Journal of Policy Analysis and Management*. His article on the "Association of Marijuana Laws with Teen Marijuana Use" was listed as one of the top ten "Most Talked about Articles of 2019" in *JAMA Pediatrics*, the flagship journal in pediatric medicine.

Committee Chair Ward, Democratic Committee Chair Collett, and Members of the Pennsylvania Senate Aging and Youth Committee, thank you for the opportunity to testify today.

Understanding the effects of legalization on youth marijuana use is important

Evidence from the medical literature indicates that marijuana use during adolescence may lead to long-lasting changes in brain function that adversely affect long-run educational, professional, economic, and social outcomes (Volkow et al. 2014). As support for marijuana legalization grows (Dezenski 2020), it is vital to understand the effects of legalization on teen marijuana consumption.

Research design and available data are crucial to estimating the causal effects of legalization

Given the growing number of scientific studies on the legalization of marijuana, the role of interpreter has taken on added significance. In a recent review of the literature on teen use, I (along with co-author Daniel Rees) identified peer-reviewed studies based on sufficient policy variation, rigorous empirical methods, and large sample sizes (Anderson and Rees 2022). My testimony is largely based on that review.

What do the data say? (Medical Marijuana Laws)

Initial studies focused on estimating the effects of medical marijuana laws, many of which had loose supply-side restrictions and caused large decreases in the price of marijuana in the recreational market (Anderson et al. 2013). These studies are relevant because, in states such as California, Colorado, Oregon and Washington, the legalization of marijuana for medicinal purposes approached de facto legalization of marijuana for recreational purposes. There was substantial diversion to the recreational market in these states.

- 7 of the reviewed studies used nationally representative data from the Youth Risk Behavior Surveys (YRBS), where high school students are asked about their prior marijuana use. None of these studies found that medical marijuana laws have led to increases in teen use. The sample sizes in some of these studies exceed one million observations. See Table 1.
- Researchers have also analyzed data from other large national surveys such as the National Longitudinal Survey of Youth (NLSY) and the National Survey on Drug Use and Health (NSDUH), and have generally come to similar conclusions. See Table 1.
- Finally, two studies analyzed data from the Treatment Episode Data Set (TEDS), which is collected annually by state substance abuse agencies and is based on admissions to publicly funded drug treatment facilities. Neither of the studies reviewed found evidence to suggest that, on average, medical marijuana laws increased admission rates involving marijuana among youths.

In summary, there is little credible evidence that medical marijuana laws have encouraged youth marijuana use.

What do the data say? (Recreational Marijuana Laws)

More recent, yet fewer, studies have explored the effects of recreational marijuana laws on teen marijuana use.

- Using data from the Youth Risk Behavior Surveys for the years 1999-2017, a paper published in the *Journal of Adolescent Health* (Coley et al. 2021) found no evidence that recreational marijuana laws have caused an increase teen marijuana consumption.
- Using data from the National Survey on Drug Use and Health for the period 2001-2017, a paper forthcoming at the *Journal of Law and Economics* (Hollingsworth et a. 2022) found that recreational laws led to a 10% increase in past-year marijuana consumption among adolescents.
- In my own published research in *JAMA Pediatrics* (Anderson et al. 2019), the flagship journal in pediatric medicine, we analyzed Youth Risk Behavior Survey data for the period 1993-2017. Based on a sample size of nearly 1.5 million youths, we found that recreational marijuana laws have not encouraged teen marijuana use, and were even associated with modest decreases in teen use.
 - Why might teen use actually fall? A decrease in use is consistent with the argument that it is more difficult for teenagers to obtain marijuana as drug dealers are replaced by licensed dispensaries that require proof of age. Moreover, the cost of selling to someone underage becomes relatively higher in the wake of legalization.
- In a recent publication in *JAMA Network Open* (Anderson et al. 2022), we updated our data through 2019. Our results again supported the notion that recreational marijuana laws have not caused increases in teen marijuana use.

In sum, the evidence with regard to recreational marijuana legalization and youth use is more equivocal. Three of the 4 studies on recreational laws found no evidence that youth marijuana use increased after legalization, and there is even some evidence of modest decreases in consumption (Coley et al. 2021; Anderson et al. 2019, 2022). On the other hand, one study found evidence of an increase in self-reported pasty-year marijuana use among 12- through 17-year-olds (Hollingsworth et al. 2022).

From a policy evaluation perspective, recreational marijuana laws are a relatively new phenomenon. As more states legalize marijuana use for recreational purposes and more years of post-legalization data become available a clearer picture will presumably emerge.

References

- Anderson, D. Mark, Benjamin Hansen, and Daniel Rees. 2013. "Medical Marijuana Laws, Traffic Fatalities, and Alcohol Consumption." *Journal of Law and Economics*, 56: 333-369.
- 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, Daniel I. Rees, and Joseph J. Sabia. 2019. "Marijuana Laws and Teen Marijuana Use: New Estimates from the Youth Risk Behavior Surveys." *JAMA Pediatrics*, 173(9): 879-881.
- Anderson, D. Mark, Daniel I. Rees, Joseph J. Sabia, and Samuel Safford. 2021. "Association of Marijuana Legalization With Marijuana Use Among US High School Students, 1993-2019." *JAMA Network Open*, 4(9): e2124638.
- Anderson, D. Mark and Daniel Rees. 2022. "The Public Health Effects of Legalizing Marijuana." *Journal of Economic Literature*, In Press.
- Choo, Esther K., Madeline Benz, Nikolas Zaller, Otis Warren, Kristin L. Rising, and K. John McConnell. 2014. "The Impact of State Medical Marijuana Legislation on Adolescent Marijuana Use." *Journal of Adolescent Health*, 55: 160-166.
- Coley, Rebekah Levine, Summer Sherburne Hawkins, Marco Ghiani, Claudi Kruzik, and Christopher Baum. 2019. "A Quasi-Experimental Evaluation of Marijuana Policies and Youth Marijuana Use." *American Journal of Drug and Alcohol Abuse*, 45(3): 292-303.
- Coley, Rebekah Levine, Claudia Kruzik, Marco Ghiani, Naoka Carey, Summer Sherburne Hawkins, and Christopher Baum. 2021. "Recreational Marijuana Legalization and Adolescent Use of Marijuana, Tobacco, and Alcohol." *Journal of Adolescent Health*, 69(1): 41-49.
- Dezenski, Lauren. 2020. "Montana, Arizona, New Jersey, South Dakota and Mississippi Approve Marijuana Ballot Measures, CNN Projects." *CNN*, Dec. 7. Available at: <https://www.cnn.com/2020/11/04/politics/marijuana-legalization-2020-states/index.html>.
- Harper, Sam, Erin Strumpf, and Jay Kaufman. 2012. "Do Medical Marijuana Laws Increase Marijuana Use? Replication Study and Extension." *Annals of Epidemiology*, 22(3): 207-212.
- Hollingsworth, Alex, Coady Wing, and Ashley Bradford. 2022. "Comparative Effects of Recreational and Medical Marijuana Laws on Drug Use Among Adults and Adolescents." *Journal of Law and Economics*, In Press.
- Johnson, Julie, Dominic Hodgkin, and Sion Kim Harris. 2017. "The Design of Medical Marijuana Laws and Adolescent Use and Heavy Use of Marijuana: Analysis of 45 States from 1991 to 2011." *Drug and Alcohol Dependence*, 170: 1-8.

Pacula, Rosalie L., David Powell, Paul Heaton, and Eric L. Sevigny. 2015. "Assessing the Effects of Medical Marijuana Laws on Marijuana Use: The Devil is in the Details." *Journal of Policy Analysis and Management*, 34(1): 7-31.

Volkow, ND, RD Baler, WM Compton, and SR Weiss. 2014. "Adverse Health Effects of Marijuana Use." *New England Journal of Medicine*, 370(23): 2219-2227.

Wen, Hefei, Jason M. Hockenberry, and Janet R. Cummings. 2015. "The Effect of Medical Marijuana Laws on Adolescent and Adult Use of Marijuana, Alcohol, and Other Substances." *Journal of Health Economics*, 42: 64-80.

Table 1. Marijuana Legalization and Youth Marijuana Use: A Review of the Literature

Study	Data Sources	Empirical strategy and identification	Results
<p>Anderson et al. (2015), <i>American Law and Economics Review</i> Examines the effect of legalizing medical marijuana on teenage marijuana use.</p>	<p>Youth Risk Behavior Surveys (YRBS), 1993-2011</p> <p>National Longitudinal Survey of Youth 1997 (NLSY97)</p> <p>Treatment Episode Data Set (TEDS), 1992-2009</p>	<p>YRBS analysis: Difference-in-differences (DD) regression at the individual-year level. Models include individual- and state-level covariates, state and year fixed effects, and state-specific linear time trends.</p> <p>NLSY97 analysis: DD regression at the individual-year level. Models include individual- and state-level covariates, individual and year fixed effects, and state-specific linear time trends.</p> <p>TEDS analysis: DD regression at the state-year level. Models include state-level covariates, state and year fixed effects, and state-specific linear time trends.</p>	<p>YRBS analysis: With or without state-specific time trends, there is no evidence that MMLs increased the likelihood of marijuana use or frequent use among teenagers.</p> <p>NLSY97 analysis: With or without state-specific time trends, there is no evidence that MMLs increased the likelihood of marijuana use or frequent use among teenagers.</p> <p>TEDS analysis: With or without state-specific time trends, there is no evidence that MMLs increased admission rates involving marijuana among teens at publicly funded drug treatment facilities.</p>
<p>Anderson et al. (2019), <i>JAMA Pediatrics</i> Estimates the effects of legalizing medical and recreational marijuana on teenage marijuana use.</p>	<p>YRBS, 1993-2017</p>	<p>DD regression at the individual-year level. Models include individual- and state-level covariates, state and year fixed effects.</p>	<p>There is no evidence that MMLs increased the likelihood of marijuana use or frequent use among teenagers. RMLs are associated with an 8% decrease in the odds of any marijuana use and a 9% decrease in the odds of frequent teen marijuana use.</p>
<p>Anderson et al. (2022), <i>JAMA Network Open</i> Estimates the effects of legalizing medical and recreational marijuana on teenage marijuana use.</p>	<p>YRBS, 1993-2019</p>	<p>DD regression at the individual-year level. Models include individual- and state-level covariates, state and year fixed effects</p>	<p>There is no evidence that MMLs or RMLs are associated with marijuana use among high school students.</p>

<p>Choo et al. (2014), <i>Journal of Adolescent Health</i> Examines the association between legalizing medical marijuana and teenage marijuana use.</p>	<p>YRBS, 1991-2011</p>	<p>DD regression at the individual-year level. Models include individual-level covariates, state and year fixed effects.</p>	<p>There is no evidence that MMLs increased the probability of marijuana use among teens.</p>
<p>Coley et al. (2019), <i>American Journal of Drug and Alcohol Abuse</i> Examines the association between legalizing medical marijuana and the use of marijuana by teenagers. In addition, examines the association between decriminalization and teenage marijuana use.</p>	<p>YRBS, 1999-2015</p>	<p>DD regression at the individual-year level. Models include individual- and state-level covariates, state and year fixed effects.</p>	<p>MMLs are associated with a 9% decrease in the odds of marijuana use among teens. There is no evidence that MMLs affected frequent teen marijuana use. There is no evidence that marijuana decriminalization affects the likelihood of marijuana use or frequent use among teenagers.</p>
<p>Coley et al. (2021), <i>Journal of Adolescent Health</i> Estimates the effects of marijuana decriminalization, medical marijuana legalization, and recreational marijuana legalization on teenage marijuana use.</p>	<p>YRBS, 1999-2017</p>	<p>DD regression at the individual-year level. Models include individual- and state-level covariates, state and year fixed effects.</p>	<p>There is no evidence that marijuana decriminalization, MMLs, or RMLs affected the likelihood of marijuana use among teens. RMLs are associated with a small decrease in the frequency of marijuana use among current marijuana users.</p>
<p>Harper et al. (2012), <i>Annals of Epidemiology</i> Examines the association between legalizing medical marijuana and marijuana use by teenagers.</p>	<p>National Survey on Drug Use and Health (NSDUH), 2002-2009</p>	<p>DD regression at the state-year level. Models include state and year fixed effects.</p>	<p>MMLs are associated with an 8% decrease in any marijuana use among teens. There is no evidence that MMLs affect perceived riskiness of monthly marijuana use.</p>

<p>Hollingsworth et al. (2022), <i>Journal of Law and Economics</i> Estimates the effects of legalizing medical and recreational marijuana on marijuana use among 12- through 17-year-olds.</p>	NSDUH, 2001-2017	DD regression at the state-year level. Models include state-level covariates, state fixed effects, and region-by-year fixed effects.	MML adoption is associated with negligible effects on youth marijuana use, while recreational laws are associated with a 10% increase in past-year use.
<p>Johnson et al. (2017), <i>Drug and Alcohol Dependence</i> Examines the association between legalizing medical marijuana and teenage marijuana use.</p>	YRBS, 1991-2011	DD regression at the individual-year level. Models include individual-level covariates, state and year fixed effects.	MMLs are associated with a 7% reduction in the odds of marijuana use among teens. There is no evidence that MMLs affected frequent teen marijuana use. MMLs with more liberal provisions are associated with lower odds of teen marijuana use, while MMLs with higher possession limits and voluntary registration are associated with higher odds of use.
<p>Pacula et al. (2015), <i>Journal of Policy Analysis and Management</i> Estimates the effect of legalizing medical marijuana on marijuana use among individuals under the age of 21.</p>	NLSY97 TEDS, 1992-2011	NLSY97 analysis: DD regression at the individual-year level. Models include individual- and state-level covariates, state and year fixed effects. TEDS analysis: DD regression at the state-year level. Models include state-level covariates, state and year fixed effects.	NLSY97 analysis: There is no evidence that MMLs affected the likelihood of marijuana use or frequent marijuana use among individuals under the age of 21. MMLs that require a patient registry system are associated with increased use, while MMLs that allow home cultivation are associated with decreased use. TEDS analysis: MMLs are associated with a 12% decrease in the admission rates involving marijuana among individuals under the age of 21 at publicly funded drug treatment facilities. MMLs that legally permit dispensaries are associated with more treatment admissions, while MMLs that allow home cultivation are associated with fewer treatment admissions.

Wen et al. (2015), *Journal of Health Economics*
Examines whether legalizing medical marijuana affects the use of marijuana by 12- through 20-year-olds.

NSDUH, 2004-2012

DD regression at the individual-year level. Models include individual- and state-level covariates, state and year fixed effects, and state-specific linear time trends.

There is no evidence that MMLs affected past-month marijuana use among 12- through 20-year-olds. MMLs are associated with a 5% increase in the probability of past-year marijuana initiation among 12- through 20-year-olds.
