

Regulating Medical Marijuana Markets

Insights from Scientific Evaluations of State Experiments

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CT-461

Testimony presented before the Florida House of Representatives Health & Human Services Committee, Subcommittee on Health Quality on January 25, 2017.



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Published by the RAND Corporation, Santa Monica, Calif.

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Testimony of Rosalie Liccardo Pacula¹
The RAND Corporation²

Before the Committee on Health & Human Services
Subcommittee on Health Quality
Florida House of Representatives

January 25, 2017

Chairman Pigman, Vice Chairman Plasencia, and other distinguished members of the Health Quality Subcommittee, thank you very much for the opportunity to testify before you today. I am a senior economist at the RAND Corporation, where I also serve as the co-director of the RAND Drug Policy Research Center.

For the past six years, I have been the principal investigator on a National Institute on Drug Abuse-sponsored grant, conducting research on the public health impacts of medical marijuana laws. During this time, I developed a marijuana policy tracking data system that helped identify various attributes of medical marijuana laws that are important for influencing behavior of both patients and recreational users. In addition, I have evaluated impacts of medical marijuana laws and the implementation of marijuana legalization in the state of Washington and co-authored work with my RAND colleagues on legalization options for the state of Vermont. It is my experience with evaluation of marijuana laws and policies that I draw on in my remarks to you today.

Under Amendment 2, the Florida legislature must develop and pass legislation implementing the changes required by the constitutional amendment. Medical marijuana programs across states vary widely, and the legislature will want to consider how to structure Florida's expanded program so as to meet the intentions of the voters. I will focus my remarks today on three specific issues.

¹ The opinions and conclusions expressed in this testimony are the author's alone and should not be interpreted as representing those of the RAND Corporation or any of the sponsors of its research.

² The RAND Corporation is a research organization that develops solutions to public policy challenges to help make communities throughout the world safer and more secure, healthier and more prosperous. RAND is nonprofit, nonpartisan, and committed to the public interest.

1. The variety of different supply structures that might be used to provide medical marijuana. The structure of medical marijuana supply can greatly influence the size of the market that results and states have experimented with a variety of approaches.
2. The impact of commercialization of medical marijuana. Commercialization occurred in states that had adopted relatively lax regulations (e.g., on the number of outlets and amount that could be sold) prior to the federal government's shift in enforcement in 2009.
3. The impact of medical marijuana laws on youth. While most of the scientific literature finds no impact of simply passing these laws on youth use, recent studies that account for rapid growth in these markets suggest youth use and outcomes may have been impacted.

I will address each of these in order.

Supply Structures for Medical Marijuana

Inquiries about the regulatory structure for supplying medical marijuana usually begin with a discussion of licensing and permissions given to entities that are responsible for cultivating, processing, distributing, and selling marijuana for medicinal purposes. In Florida, these entities will be the Medical Marijuana Treatment Centers (MMTCs). I found nothing in the statutory language that predetermines how this supply structure must be or how licenses and permissions must be set up, which means that the government has the flexibility to consider a variety of options. Let me offer some insights from two alternative approaches.

First, Florida might want to adopt regulations previously implemented in other medical marijuana states. With my colleagues at Beasley School of Law at Temple University, I examined how marijuana was supplied within states that had passed medical marijuana legislation as of July 1, 2016.³ We found substantial variability existed in these 24 states and the District of Columbia in how marijuana was supplied for medicinal purposes. Most states (21 out of 25) legally regulated dispensaries, and all but one of those states (Maryland) regulated the supply sources of marijuana sold through dispensaries.⁴ States differed in who they allowed to supply marijuana to the dispensaries. Some states (13 out of 20) allowed dispensaries to grow and sell their own product (either on site or at another location), housing the entire supply chain within a single business. Eight states allowed dispensaries to sell their excess supply to other dispensaries. In eight states, licensed cultivators/producers were the named source of suppliers to dispensaries. In other states, regulators tried to restrict the size of dispensaries or create a supply structure similar to a communal gardens or co-op. Patients (in four states) or caregivers (in five states) could grow their own marijuana and provide it to the dispensary; those same patients and caregivers were eligible to purchase from the dispensary as well.

³ While the paper summarizing our analyses of these laws is still under review, the data we used to generate the summary is publicly available on the Prescription Drug Abuse Policy System webpage (www.pdaps.org).

⁴ Those states that did not regulate or legally permit dispensaries as of July 2016 include Alaska, Michigan, Montana, and Pennsylvania. The first three states all allow patient cultivation, while Pennsylvania's law was only passed in April 2016, so the specific provisions regarding access had not been developed yet. Legally allowing dispensaries and tolerating them are two different things, of course.

Other elements of dispensary regulation that have been adopted include limits on store density (14 states); a cap on the total number of dispensaries allowed throughout the state (14 states); restrictions on dispensary locations (18 states); allowances for local zoning rules to apply (16 states); and limits on the stock amount of marijuana that can be maintained at the site (11 states). States with stock limits use a variety of approaches, including usable marijuana (seven states), number of mature plants (five states), number of immature plants (four states), and/or number of plants regardless of maturity (two states). Ten states do not set limits on dispensary stock amounts (which would influence the amount of marijuana available in the market at one point in time).

Much attention has been given to structural requirements for dispensaries, such as security systems (20 states) and secure spaces accessible only to cardholders and/or authorized dispensary employees (19 states) to ensure children or unauthorized persons do not access marijuana. Similarly, many states have adopted product safety regulations (20 states), such as testing requirements, labeling requirements (21 states), and packaging requirements and/or restrictions (18 states). Regulations in this last area continue to evolve and remain fairly naive, as new problems arising from testing of edibles, testing in general, and the use of pesticides continue to emerge in both medical and recreational markets.⁵

A second approach that this committee might take in considering supply structures for medical marijuana in the state of Florida is to “think outside of the box” and consider market structures that have not yet been tried in existing medical or recreational markets. In a recent RAND report to the secretary of administration for Vermont, we identified ten alternative models of supply for marijuana in lieu of prohibition.⁶ While the for-profit commercial system of Colorado, California, and Washington is one of those options, several “middle-ground” options also exist that could feasibly meet voters’ intentions of increasing access for patients while also precluding the development of a for-profit commercial market. Some of these options include the creation of a public authority or the granting of licenses to businesses that serve other objectives rather than profit maximization, such as “for-benefit corporations.”

Today, all medical marijuana states have chosen the licensing of either for-profit or nonprofit entities to supply and sell marijuana, although many add additional controls on the size of the market, such as limiting the number of entities allowed to receive licenses or the number of total outlets. These additional controls reflect the experience in California, where simply restricting the market to nonprofits has not prevented the market from becoming competitive or commercialized. Several states, such as Connecticut, New Jersey, and New York, seriously

⁵ Jonathan P. Caulkins, Beau Kilmer, Mark Kleiman, Robert J. MacCoun, Gregory Midgette, Pat Oglesby, Rosalie Liccardo Pacula, and Peter H. Reuter, *Considering Marijuana Legalization Insights for Vermont and Other Jurisdictions*, Santa Monica, Calif.: RAND Corporation, RR-864, 2015; T.S. Ghosh, M. Van Dyke, A. Maffey, E. Whitley, D. Erpelding, and L. Wolk, “Medical Marijuana’s Public Health Lessons—Implications for Retail Marijuana in Colorado,” *New England Journal of Medicine*, Vol. 372, No. 11, 2015, pp. 991–993; and D. Stone, “Cannabis, Pesticides and Conflicting Laws: The Dilemma for Legalized States and Implications for Public Health,” *Regulatory Toxicology and Pharmacology*, Vol. 69, No. 3, 2014, pp. 284–288.

⁶ Caulkins et al., 2015.

restrict the number of licenses given out and number of outlets allowed. Other states, like Colorado, California, and Washington, have let the market decide for itself.

It is worth noting that the state of Washington has taken a different approach in its development of a legal recreational market than its medicinal market, requiring separate licenses for cultivators, manufacturers or processors, and retailers, as well as licensing or certification for testing facilities (which also is true of Colorado, Oregon, and Alaska). Washington is the only nonmedical legalizing state to date that restricts the number of licenses a single firm can own and prohibits license holders from being involved in both production and retail. Washington has further limited the number of retail store licenses available in an attempt to avoid issues related to overproduction, although the number of licenses has expanded over time. Other recreational marijuana states have not created such restrictions on the number of retail outlets. All legalizing states, except Alaska, restrict the size of cultivation facilities, and Washington has an additional cap on total statewide production. These differences in the structure of the market should theoretically influence the availability and cost of marijuana in each state, and Washington is now forcing some of these same restrictions on its medical market.

The Impact of Commercialization

Two primary concerns exist regarding commercialization of the medical marijuana industry. First, commercialization is expected to substantially reduce production costs, and hence the price of medical marijuana, as competition causes firms to innovate and find ways to reduce their costs and extract higher profits.⁷ Second, commercialization generates financial incentives for legal suppliers to promote their product to heavy consumers who, just like in any other market, represent the vast majority of the total amount sold and/or consumed.⁸ While lower costs for medical products are certainly not a bad thing, recent evidence suggests that the vast majority of medical users also use marijuana recreationally.⁹ This reinforces concerns that not all medical marijuana is being purchased for medicinal purposes.

Scientific evidence of the commercialization of medical markets comes largely from evidence in states that were early adopters of medical marijuana laws (e.g., California, Colorado, and Washington). In the 1990s, when these states initially passed ballot initiatives to allow for medical marijuana, they purposefully set up weak state regulations of their supply chains because

⁷ J.P. Caulkins, A. Hawken, B. Kilmer, and M. Kleiman, *Marijuana Legalization: What Everyone Needs to Know*. New York: Oxford University Press, 2012; and J.P. Caulkins and B. Kilmer, “Considering Marijuana Legalization Carefully: Insights for Other Jurisdictions from Analysis for Vermont,” *Addiction*, Vol. 111, 2016, pp. 2082–2089.

⁸ Caulkins and Kilmer, 2016; and T. Subritzky, S. Pettigrew, and S. Lenton, “Issues in the Implementation and Evolution of the Commercial Recreational Cannabis Market in Colorado,” *International Journal of Drug Policy*, Vol. 27, 2016, pp. 1–12.

⁹ R.L. Pacula, M. Jacobson, and E.J. Maksabedian, “In the Weeds: A Baseline View of Cannabis Use Among Legalizing States and Their Neighbors,” *Addiction*, Vol. 111, 2016, pp. 973–980; G.L. Schauer, B.A. King, R.E. Bunnell, G. Promoff, and T.A. McAfee, “Toking, Vaping, and Eating for Health or Fun: Marijuana Use Patterns in Adults, U.S., 2014,” *American Journal of Preventive Medicine*, Vol. 50, No. 1, 2016, pp. 1–8.

of the considerable uncertainty regarding a federal response to any formal state regulation.¹⁰ Initially, the federal government enforced the national prohibition in markets in some of these states. However, in 2009, two federal actions led to a perceived change in the federal position regarding enforcement of the federal prohibition of marijuana. First, in March 2009, Attorney General Eric H. Holder, Jr. announced an end to raids on distributors of medical marijuana in states where medical marijuana was legal.¹¹ Then, in October of the same year, the Justice Department issued a memo to all federal prosecutors that deprioritized the federal prosecution of medical marijuana users and suppliers who were in “clear and unambiguous compliance with existing state law.”¹² This “pass” from the federal government allowed medical markets in weakly regulated states to proliferate.¹³

Evidence of rapid commercialization in response to federal leniency is most evident in Colorado, which experienced two other important state policy revisions in 2009 that further enabled the development of dispensaries and large medical marijuana centers.¹⁴ The number of individuals who registered to become a patient in Colorado in 2009 skyrocketed. At the beginning of the year (January 2009), the Colorado Department of Public Health and Environment had received only 6,369 total patient applications since medical marijuana was legalized in 2000. By the end of 2009, 41,039 new patients had registered, and this number grew to over 115,000 in 2010.¹⁵ Newspapers and law enforcement reported similar rises in the number of dispensaries during these two years, although official numbers were not yet being collected.

Only a few published studies have closely analyzed the impacts of this rapid growth in the medical marijuana market during the 2009 period.¹⁶ In general, these studies find consistent evidence that perceived harmfulness of marijuana declined with the commercialization of marijuana, and several indicators of problematic use increased, as indicated by fatal crashes

¹⁰ R.L. Pacula and R. Smart, “Effects of Changes in Marijuana Laws on Marijuana Use and Disorders: Medical Marijuana and Marijuana Legalization,” *Annual Review of Clinical Psychology*, Vol. 13, No. 1, 2017.

¹¹ D. Johnston and N.A. Lewis, “Obama Administration to Stop Raids on Medical Marijuana Dispensers,” *New York Times*, March 18, 2009.

¹² D.W. Ogden, *Investigations And Prosecutions in States Authorizing the Medical Use of Marijuana. Memorandum For Selected United States Attorneys*, Washington, D.C.: U.S. Department of Justice, Office of the Deputy Attorney, 2009.

¹³ C. Cambron, K. Guttmanova, and C.B. Fleming, “State and National Contexts in Evaluating Cannabis Laws: A Case Study of Washington State,” *Journal of Drug Issues*, Vol. 47, No. 1, 2017, pp. 74–90; and R. Smart, *Essays on the Effects of Medical Marijuana Laws*, Los Angeles, University of California, 2016.

¹⁴ J.M. Davis, B. Mendelson, J.J. Berkes, K. Suleta, K.F. Corsi, and R.E. Booth, “Public Health Effects of Medical Marijuana Legalization in Colorado,” *American Journal of Preventive Medicine*, Vol. 50, No. 3, 2016, pp. 373–379; and S. Salomonsen-Sautel, S.J. Min, J.T. Sakai, C. Thurstone, and C. Hopfer, “Trends in Fatal Motor Vehicle Crashes Before and After Marijuana Commercialization in Colorado,” *Drug and Alcohol Dependence*, Vol. 140, 2014, pp. 137–144.

¹⁵ Smart, 2016; Ghosh et al., 2016.

¹⁶ Cambron, Guttmanova, and Fleming, 2017; Davis et al., 2016; Salomonsen-Sautel, et al., 2014; J. Schuermeyer, S. Salomonsen-Sautel, R.K. Price, S. Balan, C. Thurstone, S. Min, and J. Sakai, “Temporal Trends in Marijuana Attitudes, Availability and Use in Colorado Compared to Non-Medical Marijuana States: 2003–2011,” *Drug and Alcohol Dependence*, Vol. 140, 2014, pp. 145–155; and Smart, 2016.

involving marijuana, poison calls involving marijuana, and dependent use among youth.¹⁷ Some of these findings stand in stark contrast to evidence that evaluates the impact of passing a medical marijuana law, which shows a reduction in fatal crashes with the passage of these laws.¹⁸ The difference in findings stems from the difference in evaluating the medical marijuana market from legalization on versus evaluating the effects of the medical marijuana market when it grows substantially in size.

Additional insights on the effects of commercialization come from analyses of the density of marijuana outlets on marijuana use and health harms (and I emphasize health harms because virtually no work has been done evaluating the effects of commercialization on health benefits, with the exception of opioid mortality). In a series of papers examining outlet density across 50 cities in the state of California, Dr. Bridget Freisthler and colleagues examined the relationship between greater marijuana outlet density and a variety of measures, including frequency of marijuana use in the past year and hospitalizations for marijuana dependence.¹⁹ In both of these instances, she found a positive association between outlet density and the outcome of interest—as density increased, so did frequency of use and hospitalizations. She did not, however, find any relationship between outlet density and crime.²⁰

One final consideration related to the effects of commercialized markets pertains to the role of advertising in these markets. My colleagues at the RAND Corporation conducted a study of more than 8,200 students from 16 middle schools in southern California in 2010 and 2011, when the promotion of medical marijuana was accelerated in California.²¹ They found that over time, a growing number of middle school students reported seeing at least one medical marijuana advertisement on a billboard, in a magazine, or in other locations in the past three months (rising from 22 percent in 2010 to 30 percent in 2011). Similar to alcohol, they found that greater exposure to medical marijuana advertisements at an early age (age 13) was associated with greater intentions to use marijuana and higher actual marijuana use one year later.²² Given the very strong association between early initiation of marijuana and later dependence, they

¹⁷ Davis et al., 2016; Salomonsen-Sautel et al., 2014; Schuermeyer et al., 2014; and Smart, 2016.

¹⁸ D.M. Anderson, B. Hansen, and D.I. Rees, “Medical Marijuana Laws, Traffic Fatalities, and Alcohol Consumption,” *Journal of Law & Economics*, Vol. 56, 2013, pp. 333–369; and J.Santaella-Tenorio, C.M. Mauro, M.M. Wall, J.H. Kim, M. Cerdá, K.M. Keyes, D.S. Hasin, S. Galea, and S.S. Martins, “US Traffic Fatalities, 1985–2014, and Their Relationship to Medical Marijuana Laws,” *American Journal of Public Health*, Vol. 107, No. 2, 2017, pp. 336–342.

¹⁹ B. Freisthler and P.J. Gruenewald, “Examining The Relationship Between the Physical Availability of Medical Marijuana and Marijuana Use Across Fifty California Cities,” *Drug and Alcohol Dependence*, Vol. 143, 2014, pp. 244–250; and C. Mair, B. Freisthler, W.R. Ponicki, and A. Gaidus, “The Impacts of Marijuana Dispensary Density and Neighborhood Ecology on Marijuana Abuse and Dependence,” *Drug and Alcohol Dependence*, Vol. 154, 2015, pp. 111–116.

²⁰ N. J. Kepple and B. Freisthler, “Exploring the Ecological Association Between Crime and Medical Marijuana Dispensaries,” *Journal of Studies on Alcohol and Drugs*, Vol. 73, No. 4, 2012, pp. 523–530.

²¹ E.J. D’Amico, J.N. Miles, and J.S. Tucker, “Gateway to Curiosity: Medical Marijuana Ads and Intention and Use During Middle School,” *Psychology of Addictive Behaviors*, Vol. 29, No. 3, 2015, p. 613.

²² D’Amico, Miles, and Tucker, 2015.

recommended that regulators consider advertising restrictions similar to those of alcohol and tobacco products—even for medical marijuana.

The Impact of Medical Marijuana Laws on Youth

While this is a question that has received considerable attention in the academic literature and while I acknowledge that the bulk of the existing research shows no statistical association between medical marijuana laws and youth marijuana prevalence, I believe the question remains far from answered for two reasons.²³ First, the majority of published studies evaluating the impacts of medical marijuana laws on use by youth treat medical marijuana laws as if they can be placed into two simple buckets; for example, states can be meaningfully separated into those that have a medical marijuana law and those that do not or into those that have dispensaries and those that do not. Using such simple characterizations of these laws leads analysts to treat states like New York and Connecticut similarly to states like Colorado and California because they all have medical marijuana laws and they all legally protect dispensaries. Anyone familiar with these specific state markets knows, however, that their policies are in fact quite different.

Recently, researchers have begun developing new ways of measuring the size of these medical markets, rather than their simple existence, to better understand their impacts on youth use and other outcomes.²⁴ Work by Rosanna Smart (2016), for example, shows that a one percentage point increase in the share of adults registered as medical marijuana patients within the state increases the prevalence of past month marijuana use among youth by 5–6 percent, while also increasing traffic fatalities by 7 percent and alcohol poisoning deaths by 4 percent. Her results are consistent with evidence from Colorado evaluating the impact of the commercialization of marijuana on youth use, which I discussed previously.²⁵ The fact that this alternative characterization of markets generates different findings from the previous literature leaves me questioning the robustness of the conclusion that medical marijuana laws do not impact marijuana use among youth.

The second reason why I am not convinced by the current evidence that there is no relationship between medical marijuana laws and youth use is the consistent evidence from studies showing that these laws influence perceptions of harm among most adolescents, with the

²³ D.M. Anderson, B. Hansen, and D.I. Rees, “Medical Marijuana Laws and Teen Marijuana Use,” *American Law and Economics Review*, Vol. 17, No. 2, 2015, pp. 495–528; D.S. Hasin, M. Wall, K.M. Keyes, M. Cerdá, J. Schulenberg, P.M. O’Malley, S. Galea, R. Pacula, and T. Feng, “Medical Marijuana Laws and Adolescent Marijuana Use in the USA from 1991–2014: Results From Annual, Repeated Cross-Sectional Surveys,” *Lancet Psychiatry*, Vol. 2, No. 7, 2015, pp. 601–608; E.K. Choo, M. Benz, N. Zaller, O. Warren, K.L. Rising, K.J. McConnell, “The Impact of State Medical Marijuana Legislation on Adolescent Marijuana Use,” *Journal of Adolescent Health*, Vol. 55, No. 2, 2014, pp.160–166; and S.D. Lynne-Landsman, M.D. Livingston, and A.C. Wagenaar, “Effects of State Medical Marijuana Laws on Adolescent Marijuana Use,” *American Journal of Public Health*, Vol. 103, No. 8, 2013, pp. 1500–1506.

²⁴ Cambron, Guttmanova, and Fleming, 2017; Davis et al., 2016; Smart, 2016.

²⁵ Davis et al., 2016; Schuermeyer et al., 2014; Salomonsen-Sautel et al., 2014.

possible exception of the very young.²⁶ If these laws are effective at reducing perceptions of harm, then evidence by Lloyd Johnston and his “Monitoring the Future” colleagues clearly suggests that we can expect consumption to increase over time.²⁷ Few analyses have considered the lagged effects changes in perceptions might eventually have on youth use.

There is one area where there is clear evidence of a harmful impact of these laws on youth, and that is the problem of toxic ingestions of edibles by children.²⁸ Due to concerns regarding accidental ingestion of edibles by children, even states with recreational laws continue to adopt and evolve their regulations specific to marijuana-infused products. New regulations continue to evolve pertaining to stricter packaging and labeling requirements, potency limits on individual serving sizes, and processing method requirements. The actual effectiveness of these policies is currently unknown, as edibles can be made at home with a number of other marijuana products. Thus, it remains unclear to what extent regulation focused on edibles will reduce the harm that comes from accidental ingestion.

In closing, I’d like to stress that while various medical marijuana experiments have indeed taken place in the United States, each experience has been unique. States have chosen different avenues regarding the degree to which they are willing to regulate these markets, the suppliers, products, and consumers. The changing federal position regarding enforcement of the prohibition has also influenced these markets and complicated evaluations of their effects. While a lot of literature has been emerging on the impacts of medical marijuana, this remains a scientific area where policy is very much in motion and few lessons can be drawn with much certainty.

²⁶ C.B. Fleming, K. Guttmanova, C. Cambron, I.C. Rhew, and S. Oesterle, “Examination of the Divergence in Trends for Adolescent Marijuana Use and Marijuana-Specific Risk Factors in Washington State,” *Journal of Adolescent Health*, Vol. 59, No. 3, 2016, pp. 269–275; S. Khatapoush and D. Hallfors, “‘Sending the Wrong Message’: Did Medical Marijuana Legalization in California Change Attitudes About and Use of Marijuana?” *Journal of Drug Issues*, Vol. 34, No. 4, 2004, pp. 751–770; K.M. Keyes, M. Wall, M. Cerdá, J. Schulenberg, P.M. O’Malley, S. Galea, T. Feng, and D.S. Hasin, “How Does State Marijuana Policy Affect US Youth? Medical Marijuana Laws, Marijuana Use and Perceived Harmfulness: 1991–2014,” *Addiction*, Vol. 111, No. 12, 2016, pp. 2187–2195; and Schuermeyer et al., 2014.

²⁷ J.G. Bachman, L.D. Johnston, and P.M. O’Malley, “Smoking, Drinking, and Drug Use Among American High School Seniors: Correlates and Trends, 1975–1979,” *American Journal of Public Health*, Vol. 71, No. 1, 1981, pp. 59–69; J.G. Bachman, L.D. Johnston, and P.M. O’Malley, “Explaining Recent Increases in Students’ Marijuana Use: Impacts of Perceived Risks and Disapproval, 1976 Through 1996,” *American Journal of Public Health*, Vol. 88, No. 6, 1998, pp. 887–892; and R.L. Pacula, M. Grossman, F.J. Chaloupka, P. O’Malley, L.D. Johnston, and M.C. Farrelly, “Marijuana and Youth,” in Jonathan Gruber, ed. *Risky Behavior Among Youths: An Economic Analysis*. Chicago, Ill.: University of Chicago Press, 2001, pp. 193–191.

²⁸ G.S. Wang, G. Roosevelt, and K. Heard, “Pediatric Marijuana Exposures in a Medical Marijuana State,” *JAMA Pediatrics*, Vol. 167, 2013, pp. 630–633; and G.S. Wang, G. Roosevelt, M.C. Le Lait, E.M. Martinez, B. Bucher-Bartelson, A.C. Bronstein, and K. Heard, “Association of Unintentional Pediatric Exposures with Decriminalization of Marijuana in the United States,” *Annals of Emergency Medicine*, Vol. 63, 2014, pp. 684–689.