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Marijuana legalization and drug abuse as a cause for entry into foster care

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Abstract

In recent years, many states have legalized marijuana for medical use, recreational use, or both. At the same time, parental drug abuse is now the second most frequent reason for a child's placement into the foster care system (34 percent of all entries in 2019). We investigate the causal link between these two facts. Do states that legalize marijuana experience an increase in foster care entries related to drug abuse? We utilize multiple difference-in-difference approaches to exploit the state level variation in recreational and medical marijuana laws. Our findings suggest that when states permitted recreational marijuana use, there was no corresponding change in the number of foster care entries related to drug abuse, relative to control states. For the legalization of medical marijuana, we find an 8-10 percent decrease in the number of cases associated with parental drug abuse in the first two years, followed by an 18 percent decrease in the third year. We calculate that on average, approximately 700 fewer entries to foster care related to parental drug abuse occurred when a state legalized medical marijuana.

Keywords: Marijuana legalization; Foster care; Drug abuse

JEL codes: H75, I18, J13

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I. Introduction

In 2012, Colorado and Washington became the first states to legalize the possession of marijuana for recreational use. Since then, 19 states and D.C. have followed their lead. Furthermore, all but two states have authorized marijuana use for medicinal purposes, starting with California in 1996. While the number of states permitting the use of marijuana has increased recently, so too has the number of children entering foster care for reasons connected to drug abuse. Parental drug abuse is the second most frequent reason (after neglect) for a child’s placement in to the foster care system – 34 percent of all entries in to the U.S. foster care system in 2019 listed parental drug abuse as a contributing factor for the child’s removal from their home, up from 21 percent in 2007. Teenage drug abuse is a less common reason for entering foster care, with about 2 percent of entries citing such behavior as a reason for removal. This fraction has remained constant in recent years. Figure 1 shows the progression of legalization and entries into foster care related to drug abuse from 2007-2019, the years used in this study.

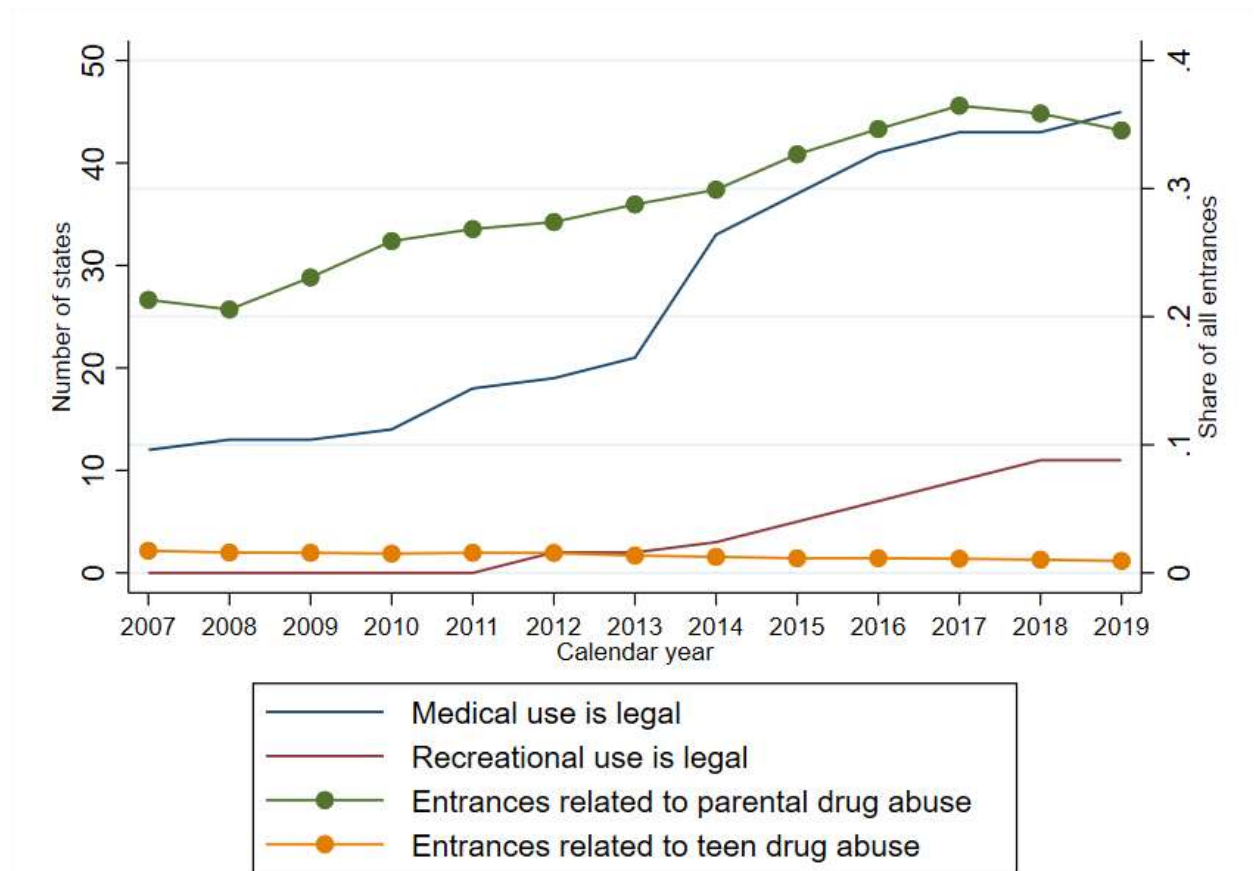


Figure 1 Legalization of marijuana use and entry rates related to drug abuse
 Note: Entry data are from AFCARS. Legalization data are from IIHS. The number of states corresponds to a full calendar year in which medical or recreational use is legal, using effective dates of legislation.

We seek to understand the effect of marijuana legalization on entry rates into foster care. Did states that legalized marijuana use experience an increase in foster care entries

related to parental drug abuse? In other words, does legalization lessen stigma, permit proper use, and reduce the chance that a child will be removed from their home? Or does easy access to legal marijuana increase usage rates by drug abusers, leading to more removals? Are children in states where marijuana use is legal more likely to abuse marijuana and enter foster care?

We attempt to answer these questions within a difference-in-differences framework. We employ the DID_M estimator from de Chaisemartin and D’Haultfoeuille (2022) as well as the interaction-weighted (IW) estimator from Sun and Abraham (2021) to estimate the change in entries related to drug abuse for states in which marijuana use is legal relative to states in which use is illegal. Our estimates suggest that when states permitted recreational marijuana use, there was no corresponding change in the number of foster care entries related to parental or teenage drug abuse relative to control states. For the legalization of medical marijuana, we find an 8-10 percent decrease in the number of cases associated with parental drug abuse in the first two years, followed by an 18 percent decrease in the third year. The negative effect then tends toward pre-treatment levels. Based on pre-treatment counts, we calculate that on average, approximately 700 fewer entries to foster care were related to parental drug abuse when a state legalized medical marijuana.

These findings provide insight into the broader effects of marijuana legalization. Nearly a quarter of the 250,000 children entering the foster care system in 2019 came from states in which marijuana may be legally possessed, and over 90 percent came from states in which medical marijuana is legal. With additional states currently considering recreational legalization or less stringent medical legalization, understanding the connection between legal possession of marijuana and foster care entry can contribute to the discussion and crafting of both marijuana and foster care policy.

II. Background

The gradual and sporadic nature of medical marijuana legalization (MML) and recreational marijuana legalization (RML) offers researchers a natural experiment to consider the impacts of marijuana use and policy on a wide variety of topics. While no research, to our knowledge, has specifically addressed the impacts of medical marijuana policy on foster-care rates, researchers have considered the effects of marijuana use and legalization on various related topics.

Not surprisingly, a common research question regarding the legalization of marijuana considers the impacts of marijuana legislation on the frequency of marijuana use. While researchers have found little connection between MML and marijuana use (Choo et al. [2014]; Anderson et al. [2015]), one might anticipate a positive correlation between RML and marijuana use given that RML both eliminates the legal ramifications of marijuana use and reduces barriers to attaining the drug. Indeed, studies generally indicate small but significant increases in marijuana use after RML (e.g. Miller et al. [2017] and Moreno

et al. [2016]). Academic research also shows that marijuana use increases for at-risk groups, such as pregnant women (Gnofam 2020), and leads to increased rates of addiction or “cannabis use disorder” (Cerdeira 2020). While there appears to be a positive association between RML and use for adult subjects, effects of RML on use for adolescents are ambiguous.¹

Such studies are important given that marijuana use is associated with a range of medical and behavioral risks. The potential adverse effects of marijuana are numerous, ranging from an increase in the risk of automobile accidents (Rameaekers et al. [2006]; Asbridge et al. [2012]) to mental illness (Radhakrishnan et al. [2014]; Hall [2014 and 2006]) to accidental poisoning (Ingold 2014).² However, there may also be health benefits from RML; for example, Chan et al. (2019) show that recreational marijuana legalization reduces opioid mortality rates by 20% to 35%, indicating that marijuana legalization may serve as a policy tool to reduce opioid abuse.

While it is difficult to infer the impacts of MML and RML on foster care, previous research point to a few channels through which marijuana laws could be relevant. Firstly, we can consider the effects of marijuana use on birthrates. Given that marijuana use leads to increased sexual activity (Basikin-Sommers et al. 2006) and reduced condom use (Hittner & Kennington, 2008), while also reducing male and female fertility (Bari et al. [2018]; Gundersen et al. [2015]), it is not obvious how RML or MML will affect a state’s birth rates. Prior literature is mixed. While Baggio et al. (2020) shows that MML leads to increased birth rates, Papich (2022) shows that RML reduces state-level birthrates by an average of about 2.8%. If we consider simply the demographic effects, these findings suggest that the need for foster-care homes will increase in states with MML and decrease when RML occurs.

Secondly, we can consider the outcomes of children that are exposed to marijuana prenatally or raised in an environment with frequent marijuana use. In a meta-analysis, Sharapova et al. (2018) report that prenatal exposure is generally associated with a child underperforming on tests of memory, quantitative reasoning, and impulse control, among others. Such effects vary by race and gender (Schepesis 2012). Prenatal exposure to marijuana is also associated with increased adolescent use of marijuana (Day et al. 2006), which is particularly worrisome since prior research indicates a correlation between adolescent use and brain development (Battistella et al. [2014]; Hill et al. [2007]). Prior research (see Wilson and Rhee 2022) suggests that RML increases maternal marijuana use; thus, it’s feasible that marijuana legalization indirectly affects embryotic health. Collectively, these studies indicate that children reared by marijuana users are more likely

¹ For example, Anderson et al. (2021) show no association between RML and adolescent use while Coley et al. (2021) find that RML reduces adolescent use. Conversely, Rusby et al. (2018) report that RML has no effect on the number of adolescent users but increases use among those that already used marijuana prior to legalization.

² For a thorough meta-analysis on the effects of marijuana use and the difficulty in conducting research, see Caulkins et al. (2015).

to experience behavioral or learning problems and use marijuana themselves. These negative effects of marijuana exposure and use could alert educators and law enforcement to poor conditions at home, increasing the likelihood that a child ultimately lands in foster care.

In addition to the, primarily, health-based research above, researchers have also considered the effects of marijuana legalization on a variety of markets. For example, Ellis et al. (2022) report that MML leads to reduced auto accidents and lower auto insurance premiums. Evans et al. (working paper) show that a state's decision to legalize recreational marijuana affects in-state universities' ability to recruit college athletes. Hodge and Hazel (2022) show that RML leads to increased restaurant sales and, consequently, sales tax revenue. While these studies are not directly related to the current research, these articles provide evidence of the growing literature on the importance of marijuana legislation—the effects of MML and, in particular, RML are wide-reaching and robust. It stands to reason that marijuana legislation, which has been shown to affect health outcomes and various markets, could be a factor in determining foster care rates.

Perhaps the research most similar to ours is Gardner and Osei (2022). They estimate the effect of RML on foster care entry and estimate that legalization decreases foster care placements by 10 percent. Our research complements their work, as we include results concerning the effect of medical marijuana legalization on foster care entry in addition to those related to recreational legalization.

III. Data

The foster care data come from the Adoption and Foster Care Analysis and Reporting System (AFCARS). We have the universe of foster care entrants, from calendar year 2007-2019, which includes 3.4 million observations.³ Each entry is treated as an independent event, so children do appear more than once in the data – but each entry is listed with separate causes. Non-mutually exclusive binary variables capture reasons for entry into foster care. For our analysis, we use entries related to parental drug abuse and teenage drug abuse (estimated separately). We aggregate up to the state-year level of observation – i.e. we have the number of entrants related to parental or teenage drug abuse by state by year from 2007 to 2019.

We are able to control for several time-varying, state-level characteristics using the AFCARS data. In our regressions, we control for the race, sex, and age percentages of a state's foster care entrants; the average number of previous removals for entering children; the prevalence of 13 removal reasons (e.g. neglect or abandonment); and method of removal (court-ordered, voluntary, or unknown).

³ We begin our analysis in 2007 due to missing parental drug abuse data for certain states, notably New York, in years prior. We end our analysis in 2019 due to COVID considerations.

AFCARS indicates parental drug abuse using two separate indicators. One variable is strictly for parental drug abuse and another variable is for child drug abuse – but the child drug abuse variable is used if a mother abused drugs while the child was in the womb. Therefore, to accurately capture true *parental* drug abuse, we incorporate all cases in which either the parental drug abuse variable is equal to one or the child drug abuse variable is equal to one and the age of the child is zero. To construct the teenage drug abuse variable, we use all observations in which the child drug abuse variable is equal to one and the age of the child at the last removal is between 13 and 19 years old. We take the natural log of both the parental and teenage drug abuse counts (plus one) by state and year.⁴

Marijuana timing data come from the Insurance Institute for Highway Safety (IIHS). For treatment definition, we use the calendar year in which legislation became effective in order to appropriately capture access to either medical or recreational marijuana. In addition to looking at the legalization of broadly-defined medical usage, we also separate states based on use restrictions (e.g. limits on THC), using categories defined by IIHS.

We also include economic control variables in our analysis: the unemployment rate by state and year and real per capita income by state and year. These variables come from the Bureau of Economic Analysis. In addition, we incorporate an annual, state-level proxy for drug abuse, using the number of drug-related deaths as compiled by the State Health Access Data Assistance Center (SHADAC).

We present summary statistics in Tables 1 and 2. Table 1 shows the difference in key variables in 2007 – prior to treatment – between states that never allowed recreational marijuana use and those that did.⁵ The share of black and Hispanic children entering care are different for the two groups, as are the economic variables – income and the unemployment rate. Given that the rates of parental and teenage drug abuse are not statistically different, given that the groups of states have similar reasons for entering foster care, and given that our empirical strategies include pre-treatment periods of ever treated states as controls, these differences do not alarm us. We include these variables as controls in our regressions, and pre-treatment trends, conditional on controls, are not statistically different between these two groups.

Table 2 depicts the analog for states that never and ever allowed medical marijuana use. Generally speaking, the two categories of states are statistically similar except in the number of foster care entries and in the rate of drug-related deaths. For reasons stated above, we are not necessarily concerned about these differences. We use the logged

⁴ Of the 663 observations (51 states over 13 years), two values of the parental drug abuse variable and 38 values of the teenage drug abuse are equal to zero.

⁵ For brevity, we only show the statistics for the five most cited reasons for entry into foster care and the three most referenced race categories.

Table 1 Summary statistics - recreational legalization

Variable	Untreated	Ever treated	Difference
Entered	5,153 (4,206)	7,221 (11,208)	2,069 (3,355)
Percent parental drug abuse	0.23 (0.15)	0.16 (0.15)	-0.08 (0.07)
Percent teen drug abuse	0.02 (0.02)	0.01 (0.02)	-0.01 (0.01)
Percent white	0.48 (0.15)	0.36 (0.16)	-0.12 (0.08)
Percent black	0.29 (0.14)	0.18 (0.11)	-0.11*** (0.04)
Percent Hispanic	0.13 (0.12)	0.35 (0.19)	0.22** (0.10)
Percent male	0.51 (0.02)	0.52 (0.02)	0.00 (0.01)
Percent age is 0	0.17 (0.04)	0.17 (0.02)	0.01 (0.01)
Percent age 1-5	0.28 (0.06)	0.27 (0.03)	-0.00 (0.02)
Percent age 6-10	0.19 (0.03)	0.19 (0.02)	0.00 (0.01)
Percent age 11-15	0.25 (0.06)	0.25 (0.05)	-0.00 (0.02)
Percent age 16-20	0.12 (0.06)	0.12 (0.03)	-0.00 (0.02)
Percent neglect	0.47 (0.26)	0.56 (0.10)	0.09 (0.06)
Percent physical abuse	0.15 (0.09)	0.15 (0.13)	0.00 (0.04)
Percent inability to cope	0.16 (0.14)	0.22 (0.09)	0.06 (0.05)
Drug-related deaths per 100,000	11.88 (3.56)	12.11 (2.16)	0.23 (1.13)
Real per capita income (1980)	17,555 (2,580)	19,012 (2,090)	1,458* (834)
Unemployment rate	4.42 (0.77)	5.27 (0.91)	0.85** (0.33)
Observations	40	11	51

Note: Depicted are (weighted) group means in 2007 for states that never permitted the recreational use of marijuana between 2008 and 2019 and those that did. "Percent" implies the percent of all foster care entries by state and year. Drug death data come from SHADAC. Income and unemployment data come from the BEA. All other data are from AFCARS. *p<0.10, **p<0.05, ***p<0.01

1) *Table 2 Summary statistics - medical legalization*

Variable	Untreated	Ever treated	Difference
Entered	2,677 (1,102)	6,045 (4,351)	3,369*** (874)
Percent parental drug abuse	0.19 (0.08)	0.24 (0.15)	0.05 (0.05)
Percent teen drug abuse	0.02 (0.01)	0.02 (0.03)	0.01 (0.01)
Percent white	0.53 (0.12)	0.48 (0.14)	-0.06 (0.05)
Percent black	0.27 (0.17)	0.30 (0.13)	0.03 (0.07)
Percent Hispanic	0.07 (0.04)	0.13 (0.12)	0.06* (0.03)
Percent male	0.51 (0.02)	0.51 (0.02)	0.01 (0.01)
Percent age is 0	0.15 (0.03)	0.17 (0.04)	0.02 (0.01)
Percent age 1-5	0.27 (0.05)	0.28 (0.06)	0.00 (0.02)
Percent age 6-10	0.19 (0.03)	0.18 (0.03)	-0.01 (0.01)
Percent age 11-15	0.26 (0.04)	0.25 (0.06)	-0.00 (0.02)
Percent age 16-20	0.13 (0.06)	0.12 (0.06)	-0.01 (0.03)
Percent neglect	0.48 (0.16)	0.48 (0.26)	-0.00 (0.08)
Percent physical abuse	0.13 (0.02)	0.15 (0.09)	0.01 (0.02)
Percent inability to cope	0.15 (0.13)	0.16 (0.14)	0.00 (0.06)
Drug-related deaths per 100,000	9.14 (2.26)	12.10 (3.32)	2.96*** (1.00)
Real per capita income (1980)	16,879 (2,954)	17,730 (2,690)	851 (1,573)
Unemployment rate	3.86 (1.17)	4.62 (0.87)	0.76 (0.49)
Observations	6	33	39

*Note: Depicted are (weighted) group means in 2007 for states that never permitted the medical use of marijuana between 2008 and 2019 and those that did so during that time frame. "Percent" implies the percent of all foster care entries by state and year. Drug death data come from SHADAC. Income and unemployment data come from the BEA. All other data are from AFCARS. *p<0.10, **p<0.05, ***p<0.01*

number of entries in our regressions and control for drug-related deaths. Pre-treatment trends, conditional on controls, are not statistically different between these two groups.

IV. Methodology

Given the recent, ongoing revolution regarding difference-in-differences methodology, we utilize two recently developed estimators to understand the causal link between marijuana legalization and drug abuse-related entries into foster care. We separately estimate regressions examining the impact on parental and teenage drug abuse, using both medical and recreational legalization. We employ the interaction-weighted (IW) approach developed in Sun and Abraham (2021) along with the estimator (DID_M) developed in de Chaisemartin and D’Haultfoeulle (2020).

For the IW estimator, first regress

$$DrugAbuse_{st} = \eta_s + \tau_t + X_{st}\theta + \sum_{e \notin C} \sum_{l \neq -1} \delta_{e,l} (1\{E_s = e\} \times Legal_{st}^l) + \epsilon_{st}$$

using never-treated units as controls (C), where *DrugAbuse* is the logged number of entries into foster care related to, separately, parental or teenage drug abuse in state *s* at year *t*; η_s are state fixed effects; τ_t are year fixed effects; *X* includes state-level control variables; *Legal* denotes the treatment status of a state; *e* denotes a cohort of first-time treated states; *l* denotes a relative year to treatment; and E_s represents the time when state *s* initially receives treatment. Estimation of this equation yields weighted cohort-specific average treatment effects by relative year to treatment. Next, estimate weights by the share of each cohort in a period: $\Pr\{E_s = e \mid E_s \in [-l, 13-l]\}$. Then take the weighted average over all the cohort-specific estimates associated with each relative period (from step 1) using the weight estimates (from step 2).

The DID_M estimator in this setting compares the change in the mean outcome between one year and the next for two sets of groups, the newly treated states and the untreated states. Given that no states in our sample go from treated to not treated, the DID_M estimator is equal to $\sum_{t=2}^{13} DID_{+,t}$ where $DID_{+,t}$ is

$$\sum_{g:D_{g,t}=1, D_{g,t-1}=0} \frac{N_{g,t}}{N_{1,0,t}} (Y_{g,t} - Y_{g,t-1}) - \sum_{g:D_{g,t}=D_{g,t-1}=0} \frac{N_{g,t}}{N_{0,0,t}} (Y_{g,t} - Y_{g,t-1})$$

where *g* represents a cohort of states grouped by first year of treatment, $D_{g,t}$ represents treatment status for cohort *g* at year *t*; $N_{g,t}$ represents the number of states in cohort *g,t*; $N_{1,0,t}$ represents the total number of treated states at time *t*; $N_{0,0,t}$ represents the total number of untreated states at time *t*; and $Y_{g,t} - Y_{g,t-1}$ represents the change in the average observed outcome for group *g* at time *t*. The DID_M estimator therefore compares the change in entry rates related to drug abuse for treated states compared to untreated states, weighted by the respective share of observations in each category for each time period.

V. Results

Parental drug abuse

We first present results pertaining to parental drug abuse. Results are presented in Figure 2. Estimates from the top two figures indicate that states which legalized the recreational use of marijuana experienced no statistically meaningful change in the number of foster care entries caused by parental drug abuse compared to states in which recreational use of marijuana is illegal. Estimated effects for each year after treatment are negative, implying fewer drug abuse-related cases, but coefficients are not statistically different from zero. Note that coefficients for years prior to treatment are not statistically distinguishable from zero, allaying concerns that treated states differed from control states in drug-abuse related foster care entries prior to treatment.

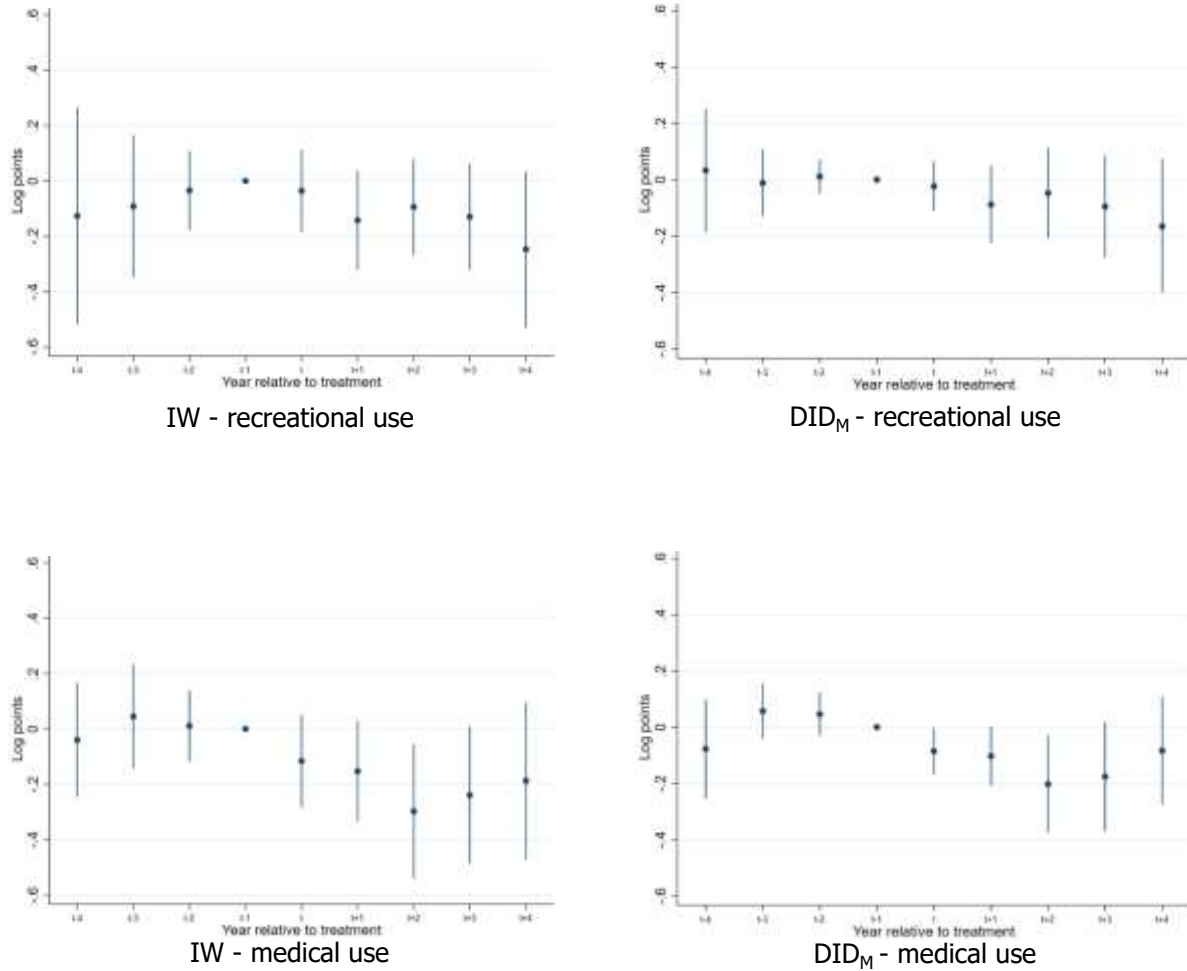


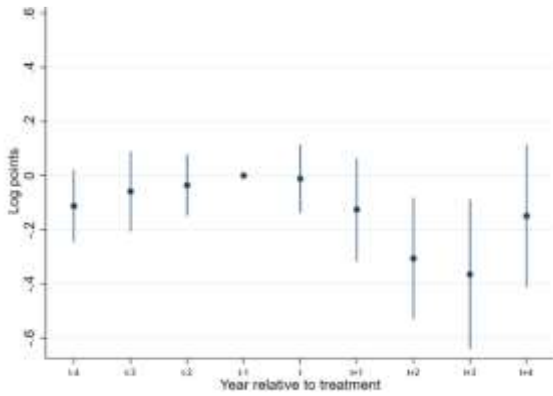
Figure 2 Dynamic treatment effects of marijuana legalization on foster care entries related to parental drug abuse
 Note: Estimates are presented using the Interaction-Weighted estimator and the DID_M estimator. The dependent variable is the logged number of foster care entries related to parental drug abuse in a given state. Data span 2007-2019. Controls include racial, sex, and age percentages of a state's foster care entrants; the average number of previous removals for entering children; the prevalence of 13 removal reasons (e.g. neglect or abandonment); the prevalence of method of removal (court-ordered, voluntary, or unknown); the unemployment rate; real per capita income; the number of drug-related deaths (not available for South Dakota in 2011); and the legalization of medical/recreational marijuana use. Observations vary by legalization: recreational (662) and medical (506). Adjusted standard errors are clustered at the state level. Ninety percent confidence intervals are shown.

States that legalized the medical use of marijuana experienced a decrease in the number of parental drug abuse-related cases following enactment of the law. Using the more precise estimates from the DID_M approach, we estimate an 8 percent decrease (s.e. 0.051) in such cases in the first two years following enactment, followed by an 18 percent decrease (s.e. 0.116) relative to pre-treatment levels in year three.⁶ In the fourth and fifth years, the treatment effect cannot be statistically distinguished from zero. While the IW estimates are not as precise as those of the DID_M estimator, coefficients follow the same trends and support the claim that drug abuse-related entries slowed after legalization, especially in the third year. Given the average number of parental drug abuse-related entries in the year before treatment (2,067) an 8 percent decrease corresponds to 165 entries and an 18 percent decrease implies 372 fewer entries related to parental drug abuse. Over three years, this yields approximately 700 fewer entries into foster care related to parental drug abuse.

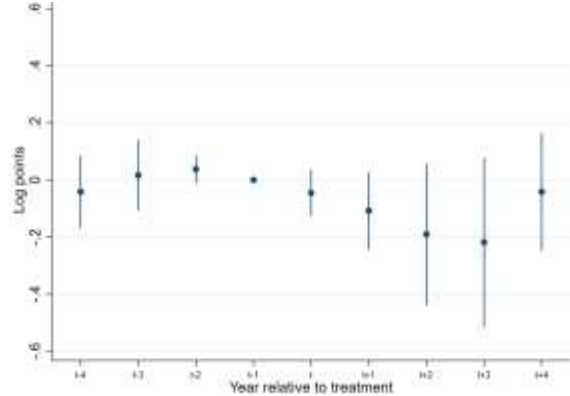
To better explore the connection between medical legalization and foster care entries, we separate states that have legalized the medical use of marijuana into two categories: those with relatively restrictive use laws and those without such restrictions. Typically, limits built into a state's statutes may cap the percent of tetrahydrocannabinol (THC) that may be used in a medicinal product. With separate regressions, we use the same empirical strategies to estimate the change in parental drug abuse-related entries into foster care for unrestrictive and restrictive medical legalization (as categorized by the IIHS), with the control group of states being those that never approved medical use. Results are shown in Figure 3.

We are hesitant to draw conclusions based on these regression results. For the limited medical legislation, we estimate a sizeable decrease in the number of drug abuse-related foster care entries following enactment in the third and fourth year of treatment when using the IW estimator, but the magnitudes of the coefficients are not as large nor are the coefficients as precisely estimated when using the DID_M estimator. For the less restrictive medical legislation, we observe a statistically and economically significant decrease in the number of entries with the DID_M estimator, but pre-treatment coefficients estimated by the IW estimator suggest that treated and control states may not have had parallel trends prior to legislation enactment.

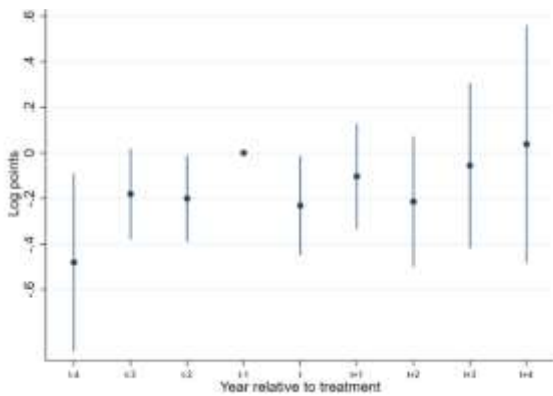
⁶ $e^{-0.085} - 1 = -0.081$; $e^{-0.203} - 1 = -0.184$



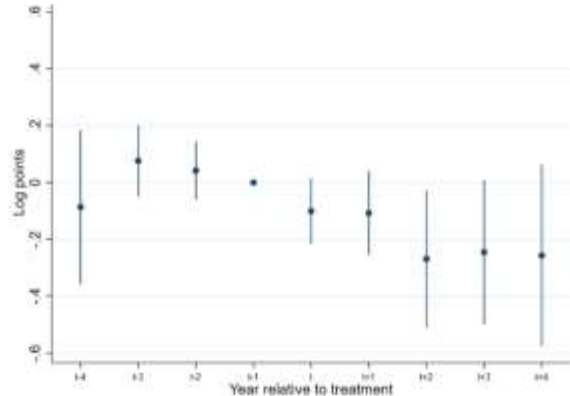
IW - limited medical use



DID_M - limited medical use



IW - unlimited medical use



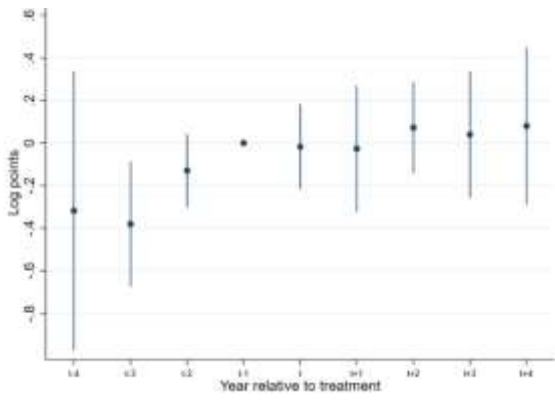
DID_M - unlimited medical use

Figure 3 Dynamic treatment effects by type of medical marijuana legalization

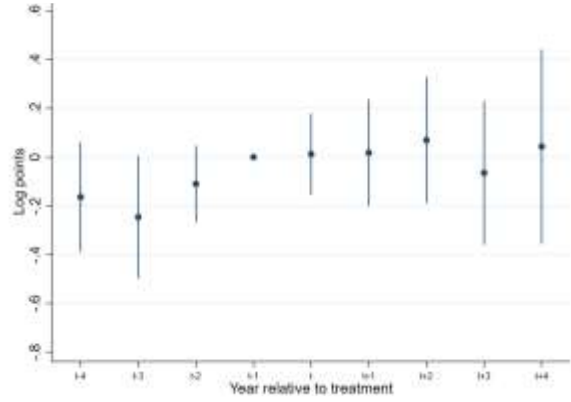
Note: Estimates are presented using the Interaction-Weighted estimator and the DID_M estimator. The dependent variable is the logged number of foster care entries related to parental drug abuse in a given state. Data span 2007-2019. Controls include racial, sex, and age percentages of a state's foster care entrants; the average number of previous removals for entering children; the prevalence of 13 removal reasons (e.g. neglect or abandonment); the prevalence of method of removal (court-ordered, voluntary, or unknown); the unemployment rate; real per capita income; the number of drug-related deaths (not available for South Dakota in 2011); and the legalization of medical/recreational marijuana use. Observations vary by legalization: limited medical (276) and unlimited medical (350). Adjusted standard errors are clustered at the state level. Ninety percent confidence intervals are shown.

Teenage drug abuse

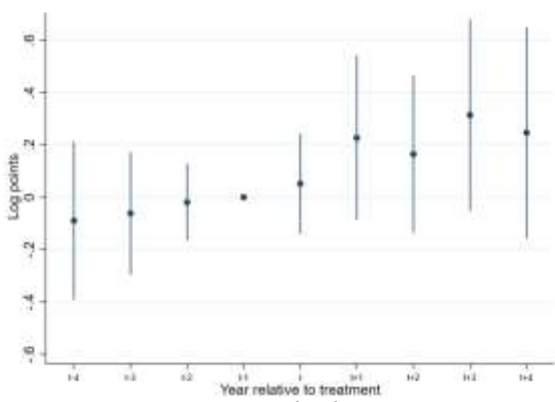
We also examine whether or not marijuana legalization affected entry into foster care based on teenage drug use. In this section, the dependent variable is the logged number of teenage drug abuse-related entries. Results are presented in Figure 4. There is no persuasive evidence that the number of teenage drug abuse-related foster care entries increased in states that legalized recreational use relative to those that did not. When examining the legalization of medical use, coefficients are positive and large but noisy across both estimators. None are statistically significant at traditional levels.



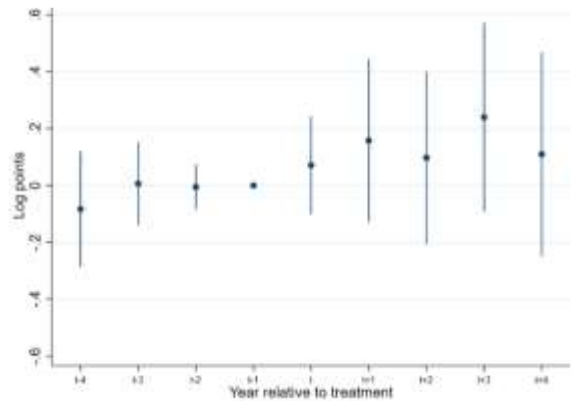
IW - recreational use



DID_M - recreational use



IW - medical use



DID_M - medical use

Figure 4 Dynamic treatment effects of marijuana legalization on foster care entries related to teenage drug abuse
 Note: Estimates are presented using the Interaction-Weighted estimator and the DID_M estimator. The dependent variable is the logged number of foster care entries related to teenage drug abuse in a given state. Data span 2007-2019. Controls include racial, sex, and age percentages of a state's foster care entrants; the average number of previous removals for entering children; the prevalence of 13 removal reasons (e.g. neglect or abandonment); the prevalence of method of removal (court-ordered, voluntary, or unknown); the unemployment rate; real per capita income; the number of drug-related deaths (not available for South Dakota in 2011); and the legalization of medical/recreational marijuana use. Observations vary by legalization: recreational (662) and medical (506). Adjusted standard errors are clustered at the state level. Ninety percent confidence intervals are shown.

VI. Conclusion

Our findings suggest that states which legalized medical marijuana experienced a decrease in parental drug abuse-related entries into foster care in the initial years following the legalization compared to states that did not legalize medical marijuana. Estimates exploiting variation in state-level limitations on medical marijuana are mixed. We find no evidence that the legalization of marijuana for recreational use had a statistically significant impact on foster care entries related to parental drug abuse, and we find no evidence of an impact of marijuana legalization on entry into foster care related to adolescent drug use.

The only states that have legalized the recreational use of marijuana are those that have also legalized its medical use, so it's unclear if this decrease in entries related to medical legalization is a culture effect – marijuana is now somewhat legally accepted and not necessarily an immediate suspicion when investigating claims of child maltreatment – or a medicinal effect – marijuana may now be consumed legally and is perhaps less likely to be abused. We suspect both effects may be at play. Ultimately, further research is necessary in order to fully understand the consequences of marijuana legalization and its impacts on society.

Declarations

The authors have no relevant financial or non-financial interests to disclose.

References

- Anderson DM, Sabia JJ. 2022. Notice of Retraction and Replacement. Anderson et al. Association of Marijuana Legalization With Marijuana Use Among US High School Students, 1993-2019. *JAMA Netw Open*. 2021;4(9):e2124638. *JAMA Netw Open*, 5(3).
- Anderson, D. M., B. Hansen, and D.I. Rees. 2015. Medical marijuana laws and teen marijuana use. *American Law and Economics Review* 17(2): 495-528.
- Asbridge, Mark, Jill A. Hayden, and Jennifer L. Cartwright. 2012. Acute cannabis consumption and motor vehicle collision risk: Systematic review of observational studies and meta-analysis. *British Medical Journal*, Vol. 344.
- Baggio, Michele, Alberto Chong, and David Simon. 2020. Sex, marijuana and baby booms. *Journal of Health Economics*, Volume 70.
- Bari, M., Battista, N., Merlini, G., Fava, M., Ruggiero, C., Piccirillo, S., Maccarrone, M. (2018). The SERiSM project: preliminary data on human stem cell reprogramming in microgravity. *Front. Physiol*.
- Baskin-Sommers and Ira Sommers. 2006. The co-occurrence of substance use and high-risk behaviors. *Journal of Adolescent Health* 38(5): 609-611.
- Battistella, G., Fornari, E., Annoni, JM. *et al.* Long-Term Effects of Cannabis on Brain Structure. *Neuropsychopharmacol* 39, 2041–2048.
- Caulkins, Jonathan P., Beau Kilmer, Mark A. R. Kleiman, Robert J. MacCoun, Gregory Midgette, Pat Oglesby, Rosalie Liccardo Pacula, and Peter H. Reuter. “Consequences of Marijuana Use.” In *Considering Marijuana Legalization: Insights for Vermont and Other Jurisdictions*, 27–48. RAND Corporation, 2015. <http://www.jstor.org/stable/10.7249/j.ctt15zc545.11>.
- Cerdá M, Mauro C, Hamilton A, et al. 2020. Association Between Recreational Marijuana Legalization in the United States and Changes in Marijuana Use and Cannabis Use Disorder From 2008 to 2016. *JAMA Psychiatry*, 77(2):165–171.
- Chan, N.W., Burkhardt, J. and Flyr, M. (2020), THE EFFECTS OF RECREATIONAL MARIJUANA LEGALIZATION AND DISPENSING ON OPIOID MORTALITY. *Econ Inq*, 58: 589-606. <https://doi.org/10.1111/ecin.12819>
- Choo, E. K., 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*, 55 (2) (2014), pp. 160-166.
- Coley, Rebekah Levine, Claudia Kruzik, Marco Ghiani, Naoka Carey, Summer Sherburne Hawkins, Christopher F. Baum. 2021. Recreational Marijuana Legalization and

- Adolescent Use of Marijuana, Tobacco, and Alcohol. *Journal of Adolescent Health*, Volume 69, Issue 1: Pages 41-49.
- Day, N.L., Goldschmidt, L. and Thomas, C.A. (2006), Prenatal marijuana exposure contributes to the prediction of marijuana use at age 14. *Addiction*, 101: 1313-1322.
- de Chaisemartin, Clement and D'Haultfoeuille, Xavier. Two-way fixed effects estimators with heterogeneous treatment effects. *American Economic Review*. 110(9): 2964–2996.
- Ellis, Cameron M., Margin F. Grace, Rhet A. Smith, and Juan Zhang. 2022. Medical cannabis and automobile accidents: Evidence from Auto Insurance. *Health Economics*, 31(9).
- Evans, Brent, Christopher Clark, and Josh Pitts. Working Paper. Marijuana legalization and recruiting in college basketball and football. https://www.researchgate.net/publication/357097675_Marijuana_Legislation_and_Recruiting_in_College_Basketball_and_Football_---Working_paper. Accessed 12 Dec 2012.
- Gardner, John and Osei, Bright. “Recreational marijuana legalization and admission to the foster-care system.” *Economic Inquiry*. 60(3): 1311-1334.
- Gnofam, Mayi, Amanda A. Allshouse, Elaine H. Strickrath, and Torri D. Metz. 2020. Impact of marijuana legalization on prevalence of maternal marijuana use and perinatal outcomes. *American Journal of Perinatology* 31(1): 59-65.
- Gundersen, Tina Djernis, Niels Jørgensen, Anna-Maria Andersson, Anne Kirstine Bang, Loa Nordkap, Niels E. Skakkebæk, Lærke Priskorn, Anders Juul, Tina Kold Jensen, Association Between Use of Marijuana and Male Reproductive Hormones and Semen Quality: A Study Among 1,215 Healthy Young Men, *American Journal of Epidemiology*, Volume 182, Issue 6, 15 September 2015, Pages 473–481, <https://doi.org/10.1093/aje/kwv135>
- Hall, Wayne. 2014. What has research over the past two decades revealed about the adverse health effects of recreational cannabis use? *Addiction*.
- Hall, Wayne. 2006. Is cannabis use Psychotogenic? *Lancet*. Vol 367, No. 9506: 193-195.
- Hammond CJ, Mayes LC, Potenza MN. Neurobiology of adolescent substance use and addictive behaviors: treatment implications. *Adolescent Med State Art Rev*. 2014; 25(1):15–32.
- Hill SY, Muddasani S, Prasad K, Nutche J, Steinhauer SR, Scanlon J, McDermott M, Keshavan M. Cerebellar volume in offspring from multiplex alcohol dependence families. *Biol Psychiatry*. 2007;61(1):41–7.

- Hittner, J. B., and Kennington, L. E. (2008). Normative Perceptions, Substance Use, Age of Substance Use Initiation, and Gender as Predictors of HIV-Risky Sexual Behavior in a College Student Sample. *Journal of Applied Biobehavioral Research*, 13(2), 86-101. institutions.” *Journal of population economics*, 17 (1), 17-43.
- Hodge, Timothy and Cooper Hazel. 2022. The munchies: Marijuana legalization and food sales in Washington. *Southern Economic Journal* 89(1): 112-137.
- Ingold, John. 2014. Colorado budget committee okays cautious plan for marijuana tax money. *Denver Post*. 22 April 2014. Accessed 7 Dec 2022. <https://www.denverpost.com/2014/04/22/colorado-budget-committee-oks-cautious-plan-for-marijuana-tax-money/>
- Miller, Austin M. Robert Rosenman, Benjamin W. Cowan. Recreational marijuana legalization and college student use: Early evidence. *SSM - Population Health*, Volume 3, 2017: 649-657.
- Moreno, M.A. J.M. Whitehill, V. Quach, N. Midamba, I. Manskopf. 2016. Marijuana experiences, voting behaviors, and early perspectives regarding marijuana legalization among college students from 2 states. *Journal of American College Health*, 64(1): 9-18.
- Papich, Sarah. Working Paper. Marijuana legalization and fertility. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4133784#:~:text=Sarah%20Papich,-University%20of%20California&text=This%20paper%20is%20the%20first,active%20by%203.6%20percentage%20points. Accessed 12 Dec 2022.
- Radhakrishnan, R., S. T. Wilkinson, and D. C. D’Souza. 2014. Gone to pot: A review of the association between cannabis and psychosis. *Frontiers in Psychiatry*, Vol. 5, May 22, Article 54.
- Raemakers, J.G., G. Berghaus, M. van Laar, and O.H. Drummer. 2004. Dose related risk of motor vehicle crashes after cannabis use. *Crug and Alcohol Dependence*, 73(2): 109-119.
- Rusby, Julie C., Erika Westloing, Ryann Crowley, and John M. Light. 2018. Legalization of recreational marijuana and community sales policy in Oregon: Impact on adolescent willingness and intent to use, parent use, and adolescent use. *Psychology of Addictive Behaviors*, 32(1): 84-92.
- Sarvet A., Wall M., Fink D., Greene E., Le A., Pacula R. *et al*. Medical marijuana laws and adolescent marijuana use in the United States: a systematic review and meta-analysis. *Addiction* 2018; **113**: 1003– 1016.

- Schepis TS, Desai RA, Cavallo DA, Smith AE, McFetridge A, Liss TB, Potenza MN, Krishnan-Sarin S. Gender differences in adolescent marijuana use and associated psychosocial characteristics. *J Addict Med.* 2011 Mar;5(1):65-73.
- Sharapova, SR, Phillips, E, Sirocco, K, Kaminski, JW, Leeb, RT, Rolle, I. 2018, Effects of prenatal marijuana exposure on neuropsychological outcomes in children aged 1-11 years: A systematic review. *Paediatr Perinat Epidemiol*, 32: 512– 532.
- Sun, Liyang and Abraham, Sarah. “Estimating dynamic treatment effects in event studies with heterogeneous treatment effects.” *Journal of Econometrics*. 225(2): 175–199.
- Wilson, Silvia and Soo Hyun Rhee. 2022. Causal effects of cannabis legalization on parents, parenting, and children: A systematic review. *Preventive Medicine* (156).