

The Mitigating Effect of Marijuana Legalization on Child Victimization

Amani Rashid and Glen R. Waddell *

December 2018

Preliminary. Please do not post or quote.

Abstract

As legal and societal factors around marijuana consumption change, we wish to understand how relaxing constraints on marijuana's availability influences child welfare. We consider the effects of marijuana availability on child-maltreatment, exploiting temporal variation in state-level legalizations of marijuana. Coincident with the legality of medical marijuana, we find little change in rates of child neglect, but large reductions in rates of substantiated physical abuse. With legalization for recreational use, we find large reductions in both substantiated neglect and physical abuse. Overall, relaxing barriers to marijuana use is associated with significant benefits to child welfare through reductions in maltreatment and victimization.

Keywords: child maltreatment, substance use, marijuana, child abuse

JEL Classification: J13, I12, K4

* Amani Rashid (arashid3@emich.edu) is an Assistant Professor at the University of Eastern Michigan. Waddell (waddell@uoregon.edu) is a Professor of Economics at the University of Oregon and a Research Fellow at IZA.

1 Introduction

It is not surprising that substance abuse is a leading risk factor in the perpetuation of child abuse and neglect. As rates of child victimization steadily increase—annually, there are now almost two-million maltreatment reports assessed by Child Protective Services—it is especially important that we understand the role of substance availability in these outcomes as the landscape of drug availability continues to change. Using state-level variation in beer taxes, Markowitz and Grossman (2000) finds higher levels of abuse where taxes are lower. Exploiting shocks to methamphetamine prices, Cunningham and Finlay (2013) also shows that child abuse responds positively to substance abuse. These studies also sit within a larger literature that finds higher rates of abuse and neglect among children with substance-abusing parents (Famularo et al., 1992; Kelleher et al., 1994; Chaffin et al., 1996; Markowitz and Grossman, 1998, 2000; Dube et al., 2001; Paxson and Waldfogel, 2002; Walsh et al., 2003; Barnard and McKeganey, 2004; Hohman et al., 2004; Freisthler et al., 2017), and with respect to marijuana in particular, evidence of the perpetration of physical abuse by parents correlating positively with marijuana access and use (Freisthler et al., 2015, 2017). Clearly, there is reason for policy makers to consider these externalities at the margin of lowering the costs to marijuana consumption.

Little is known about the effect of marijuana use on child abuse and neglect, even as public acceptance for the substance continues to grow and public policy moves toward increasing access to marijuana. Moreover, despite the literature on broader aspects of substance use, there is reason to anticipate that the causal pathway running from marijuana to child outcomes might work in the opposite direction. For example, to the extent marijuana availability displaces alcohol consumption (Anderson et al., 2013; Miller and Seo, 2018), legalization may indirectly *reduce* child victimization through mitigating alcohol-induced child abuse. Thus, identifying the effects of increasing marijuana availability on child maltreatment is timely.

In an ideal world, the experiment one runs is to randomly vary marijuana consumption across parents and caregivers while recording child-related outcomes of interest. To approximate this ideal, we exploit variation in the state-level introductions of medical marijuana laws (MMLs) over time to explore the effect of increasing marijuana’s availability on rates of child maltreatment. Specifically, we employ difference-in-differences to identify whether states that enact MMLs experience coincident changes in the rates of child maltreatment, neglect, and physical abuse. We then allow for the separate, additive effects of recreational marijuana laws (RMLs), which begin arriving later in the available time series. In so doing, we consider the reduced-form effects of increases in availability and acceptability—we do so separately for reported and substantiated outcomes, which proves important when considering the potential for treatment heterogeneity, in particular. (With movement in substantiated reports, we are more confident in having picked up more than just coincident changes in the willingness to report, furthermore we will consider reporting sources where changes in maltreatment can not be explained by simple appeals to reporting behavior.)

Unfortunately, the Child Protective Service (CPS) child-maltreatment data do not identify marijuana use at the individual-caretaker level—identifying the role of specific drugs and/or substances in CPS child-welfare outcomes often presents somewhat of a challenge to researchers. That is, we are unable to identify the relevant first-stage effect, which in our case is something akin to the effect of MML on marijuana consumption among parents/abusers. Without that data, we appeal to established measures of the relationship between MML and marijuana use in the general population—15-percent increases are a reasonable expectation.¹ As such, in exploring the reduced-form responsiveness of child maltreatment to the legalization of medical marijuana is likely to identify a lower-bound estimate of the local effect of actual marijuana consumption on child mal-

¹ For example, Wen et al. (2015) finds that MML increases reported adult marijuana use by 14 percent at the extensive margin and, among users, induces a 15-percent increase in frequency. Similarly, Chu (2014) finds that marijuana rehab admissions among males increased by 10-to-20 percent after the passage of MMLs. Pacula et al. (2015) estimates a 16-percent increase in treatment admissions coincident with advent of medical marijuana dispensaries.

treatment, and it might be reasonable to anticipate that policies that increase marijuana access further would have larger effects on child maltreatment than would the measurable effects of MMLs. To the extent one anticipates larger consumption responses to recreational legalization than to medical legalization, or that RMLs induce consumption in people with higher odds of committing neglect and/or abuse, one should also anticipate larger reduced-form estimates associated with recreational legalization. (When allowing for the separate effect of RML on outcomes, this is indeed what we find.)

Using administrative data on U.S. child-maltreatment reports from 2003 to 2016, we find that state-level marijuana legalization coincides with *reductions* in both physical-abuse reporting (by 13.1 percent, or 2.6 per 100,000 adults) and substantiated claims (by 9.6 percent, or 0.360 per 100,000). That substantiated claims fall is important, not only as a direct measure of child welfare, but in supporting the inference that something other than mere changes in reporting likely occurs with the arrival of MML. Furthermore, results indicate that the rate of reported physical abuse decreases with MML among professional reporting sources, such as educators and law enforcement personnel, who are not likely to change their reporting behavior simply as a response to a shift in their perception of marijuana acceptability. We thereby conclude that marijuana liberalization decreases not only reporting behavior, but also actual perpetration of child physical abuse. Allowing for the additive effects of legalization for recreational use, we find evidence of large reductions in both substantiated neglect (30.3 percent) and substantiated physical abuse (27.2 percent), with the largest effects on the perpetration of physical abuse by caretakers who are white, and between the ages 25 to 44, consistent with existing literature exploring the effect of MMLs on general marijuana use and related outcomes (Anderson et al., 2013; Chu, 2014; Wen et al., 2015).

In terms of child welfare, our results are encouraging, suggesting a potential pathway by which extending availability of marijuana indirectly serves to mitigate some of the potential long-term so-

cietal costs associated with the perpetration of child physical abuse (Lansford et al., 2002; Edwards et al., 2003; Currie and Tekin, 2012; Springer et al., 2007; Carrell and Hoekstra, 2010; Norman et al., 2012; Carrell et al., 2016).

In Section 2, we briefly describe MMLs and discuss additional examples from the related literature. In Section 3, we introduce our data and develop our empirical specification. We discuss our findings and heterogeneity in Section 4, where we also offer evidence that recreational marijuana laws seemingly induce similar patterns of reduction in physical abuse, but in larger magnitude. We offer concluding remarks in Section 5.

2 Background

2.1 Medical marijuana laws in the United States

Marijuana is thought to have been introduced in the U.S. in the early 1600s, being outlawed by the federal government in 1970 with the passage of the Controlled Substances Act (CSA). In the late 1980s and early 1990s, smokable marijuana was discovered to have positive effects on patients suffering from nausea related to cancer and AIDS, and with evidence of marijuana’s medicinal effects and the support of advocacy groups, a wave of state-level medical-marijuana legislation began in 1996 (Pacula et al., 2002). Now, 33 states and the District of Columbia have a medical-marijuana law in effect—24 states and the District of Columbia had a medical-marijuana law in effect at the end of our sample period (June 2016), which we presented in Table 1.²

Medical marijuana laws allow patients with designated diseases and syndromes to purchase and use marijuana. Although specific components of MMLs differ across states, most MMLs require eligible patients to first obtain a recommendation for medical marijuana treatment from a qualified doctor. With the doctor’s recommendation for medicinal-marijuana treatment—typical conditions

² See <https://medicalmarijuana.procon.org/view.resource.php?resourceID=000881> for additional detail regarding laws and legal documents.

include AIDS, anorexia, arthritis, cancer, chronic pain, glaucoma, migraines, severe nausea and seizures—a patient can then be issued a medical-marijuana patient-identification card by the state. A patient with a valid patient-identification card, and the patient’s caregiver, are legally permitted to purchase from a retail dispensary licensed by the state and/or cultivation at home, and to thereafter possess a specific amount of marijuana for the purpose of treatment.

Given the constraints on marijuana procurement for medical treatment, MMLs should in principle only increase marijuana use among legally qualified patients. However, the passage of MMLs likely increases marijuana use among non-patients (Hathaway et al., 2011; Cerdá et al., 2012; Anderson et al., 2013; Chu, 2014; Pacula et al., 2015; Wen et al., 2015). There are several channels through which MMLs may increase marijuana use among non-patients. The passage of an MML represents a pro-marijuana political sentiment, for example, which may relax the perceived risk of marijuana use among the general population (Khatapoush and Hallfors, 2004; Hathaway et al., 2011; Cerdá et al., 2012). Loose legislative language has also put retail dispensaries and home cultivation operating in a gray area that may ultimately breed a source of supply for non-patients. For example, Pacula et al. (2015) and Chu (2014) find that MMLs with legal protections for dispensaries lead to higher recreational marijuana use relative to MMLs without this supply channel. In Anderson et al. (2013), the supply of high-grade marijuana is said to increase over time after medical marijuana legalization is enacted, leading to downward pressure on prices for high-grade marijuana and increased use. Given these findings, we will explore the potential effect of retail dispensary provisions above and beyond the effects of MML alone. In particular, we construct our dispensary policy measure to identify the state-month in which dispensaries are both legally protected and operational—Table 1 summarizes our operational dispensary dates.

2.2 Recreational marijuana laws in the United States

The liberalization of marijuana policy further expanded in 2012, when voters in both Colorado and Washington approved ballot initiatives that explicitly legalized the production, distribution, and consumption of marijuana for recreational use by adults over 21. In January 2014, recreational marijuana retail operations began in Colorado, followed by Washington in July of the same year. In 2014, Oregon also enacted a recreational marijuana law with retail sales commencing the following year (RML summarized in Table 1).³

As these laws legalize the consumption of marijuana in the adult population without need for medical necessity, we anticipate that RML will further increase the availability and acceptability of marijuana, therefore increasing use on both the intensive and extensive margins (Anderson and Rees, 2014; Hall and Lynskey, 2016).

2.3 Child Protective Services

The Federal Child Abuse Prevention and Treatment Act (CAPTA) describes child maltreatment as any recent acts or failures to act on the part of a parent or caregiver that “result in death, serious physical or emotional harm, sexual abuse or exploitation, ... or presents an imminent risk of serious harm.”⁴ Neglect is typically defined as the failure of caregiver to provide needed food, clothing, shelter, medical care, or supervision, to the degree that the child’s health, safety, and well-being are threatened (Children’s Bureau, 2016). Most states recognize four types of maltreatment: neglect, physical abuse, emotional abuse, and sexual abuse. Note that most states define “child exposure to drugs” or “drugs in the presence of a child” as a form of child neglect.

Every state has a reporting system. In most states, the agency that receives an allegation (called

³ Although a RML went into effect in Alaska during our sample period (ending in June 2016), retail dispensaries were not operational until October 2016. As such we do not include Alaska in our treatment group. Seven additional states have enacted a recreational marijuana law—California, DC, Maine, Massachusetts, Michigan, Nevada, and Vermont—outside of our evaluation window.

⁴ 42 U.S.C.A. §5106g

a referral) of abuse and/or neglect will first screen the referral to determine if it concerns actions that meet the statutory definition of child abuse or neglect in that state. Referrals that do not meet the statutory criteria are screened-out. Referrals that meet the criteria are screened-in and referred to the local CPS agency ⁵. The majority of state laws explicitly define any exposure to (federally classified) illicit drugs as a form of child maltreatment, and thus referrals pertaining to parental substance use or child exposure to said substance are likely to be screened-in. If a referral is screened-in it is called a report. Roughly two thirds of reports are filed by a professional source (such as an educator, law enforcement official, social service personnel, or medical professional), about one fifth of reports are filed by a non-professional source (parents, relatives, and friends), and the remaining 13 percent of reports are filed by “other” or anonymous sources.

CPS agencies must respond to all reports, and the majority of reports do receive an investigation.⁶ If a report is followed by an investigation, the CPS agency will conduct interviews with family members, the alleged victim, and others, to first determine if a child was maltreated or is at-risk of maltreatment, and then establish whether an intervention is needed. This determination is often called a disposition. The agency will determine a case is “substantiated/indicated” if the allegation of maltreatment or risk of maltreatment is supported or founded by state law or policy (Children’s Bureau, 2016). Although it is commonly assumed that substantiated cases alone represent “true” instances of child maltreatment, many child welfare experts caution against this interpretation as unsubstantiated cases may include high levels of risk/harm but insufficient evidence (Leiter et al., 1994; Drake, 1996; Hussey et al., 2005; Kohl et al., 2009). Nonetheless, in the context of this study it is important to examine the effects of MML on substantiated child maltreatment, as the decision to substantiate a report is made by a CPS agent, and throughout the period of analysis CPS prac-

⁵ For more information on child maltreatment screening procedure refer to <https://www.childwelfare.gov/pubPDFs/repproc.pdf>

⁶ Some reports receive alternative responses, which focus primarily upon the needs of the family and do not make a determination of whether the child is a victim of maltreatment or is at risk of maltreatment.

tice does not change systematically with legalization—local CPS agencies continue to define illicit drug possession/use using federal scheduling guidelines, so there are no mere reporting responses as there may be arising from personal relationships.⁷

3 Empirical analysis

3.1 Data

To examine the effect of increasing marijuana availability on maladaptive parenting we acquire data from the “Child Files” of the National Child Abuse and Neglect Data System (NCANDS), for federal fiscal years 2003 through 2016.⁸ The NCANDS Child Files consist of all maltreatment reports that receive an investigation/alternative response (i.e., all screened-in referrals) in a given reporting year. Our data are such that each observation corresponds to a unique report. As such, a given report can correspond to multiple children (up to ten), multiple perpetrators (up to three), and multiple maltreatment types (up to four) for each child. NCANDS Child Files include the report date, types of maltreatment and maltreatment dispositions, child demographics, and services provided as a result of an investigation (e.g., family counseling or court services). For substantiated reports, we also have information on the number of perpetrators, their race, gender, and age.

In Table 2, we present descriptive statistics, where we have aggregated to monthly state-level counts of the number of maltreatment reports per 100,000 adults, from January 2003 through June 2016. Over this time period in the US, each month, a typical state experienced roughly 70.1 investigated maltreatment reports per 100,000. Consistent with previous literature (Freisthler et al., 2015, 2017) we will not only evaluate the effect of MML on any type of maltreatment, but also we

⁷ The federal government classifies marijuana as a schedule one drug. Schedule one drugs are illegal because they have been characterized as possessing high abuse potential, no medical use, and severe safety concerns (e.g., Heroin and LSD). For more on CPS agency practice and procedure see <http://flcalliance.org/resources/state-profiles/>.

⁸ NCANDS collects data from all U.S states and the District of Columbia. The NCANDS Child Files are distributed by the National Data Archive on Child Abuse and Neglect (NDACAN). States contribute administrative records to the Child Files on a voluntary basis every reporting year. (Our primary results are qualitatively invariant to the exclusion of states where there are ever missing months—Table A.1).

will allow for differential effects across neglect and physical abuse. We define our baseline measure of neglect as the sum of all reports that include neglect as a maltreatment type (whether the neglect was substantiated or not). Physical abuse reports are similarly measured.⁹ The average rate of reported neglect is roughly 43 per 100,000, and the average rate of reported physical abuse is roughly 21 per 100,000.

We will consider whether MML changes rates of substantiation. A report is substantiated if at least one maltreatment allegation for any child on the report receives a determination of “substantiated” or “indicated or reason to suspect.” On average, 25.81 percent of reports are substantiated—of neglect and physical abuse cases, 66.50 and 22.76 percent are substantiated, respectively.

Reported perpetrator race is only available when the report has been substantiated. Roughly 51 percent of substantiated reports involve only white perpetrators, 16 percent involve only black perpetrators, and 11 percent, only Hispanic perpetrators.¹⁰ Roughly 9 percent of substantiated reports involve both male and female perpetrators, while 41.66 percent and 29.82 percent are events involving only female and male perpetrators, respectively.¹¹ The average perpetrator age listed on a substantiated report is 33.10 years old.

We obtain state-year population and race data from the National Cancer Institutes’s Surveillance Epidemiology and End Results (SEER) program. We obtain state-year median household income, state-month unemployment rates, and state-year child and family social worker level of employment from the Bureau of Labor Statistics. To control for state-year welfare expenditures, we obtain data for expenditures on Temporary Assistance for Needy Families (TANF) from the Office of Family Assistance, Administration for Children and Families. State-year measures for other drug and alcohol use come from the Treatment Episode Data Set (TEDS). State-month data on MML

⁹ Neglect and physical abuse are listed as a maltreatment type on 63.93 and 30.74 percent of reports in the sample, respectively.

¹⁰ One percent of events have perpetrators of other race or multiple races represented among perpetrators. The remaining represent reports where race was not indicated.

¹¹ The remaining represent reports where perpetrator sex was not included.

legislation effective dates were collected from ProCon.org, and data on dates of dispensary protection and operation were collected from Powell et al. (2018). State-month data on RML effective dates were collected from state legislature websites and local newspapers.

3.2 Methods and identification

To estimate the change in maltreatment report rates due to medical marijuana legalization, we adopt a difference-in-differences design, estimating the relationship

$$Outcome_{sm y} = \beta_0 + \beta_1 \mathbb{1}(\text{MML}_{sm y}) + \delta X_{sm y} + \alpha_s + \lambda_m + \gamma_y + u_{sm y}, \quad (1)$$

where $Outcome_{sm y}$ is the outcome of interest, measured as the number of events per 100,000 adults in state s in month m of year y . As outcomes, we consider the total number of maltreatment reports, and then stratify by whether the report included neglect and/or physical-abuse. We likewise consider the substantiation of these reports. $\mathbb{1}(\text{MML}_{sm y})$ is an indicator variable equal to one if state s has an MML in effect in my , and zero otherwise.¹² State, year, and month fixed effects (α_s , λ_m , and γ_y) are included in order to control for time-invariant heterogeneity across states, and time-varying and seasonal shocks to adoption outcomes that are constant across states. We control for observable time-varying state-level heterogeneity in $X_{sm y}$ (i.e., racial composition, unemployment rate, median household income, level of children and family social worker employment, and TANF expenditure). We also include an indicator for whether there is a marijuana decriminalization law in

¹² See Figure A.1 and Table A.2 for a replication of our main findings exclusively using states that never had an MML in effect as the control group (26 states), and alternatively exclusively using states that always had an MML in effect as the control group (8 states). Treatment effects reported in Table A.2, and coefficients on the leading indicators reported in Figure A.1 are qualitatively similar to our main findings. We therefore assume that using both types as the control group is appropriate for our analysis.

place.¹³ In an alternative specification, we additionally control for measures of drug use, including population rates of substance abuse treatments that include methamphetamine abuse, heroin abuse, alcohol abuse, opioid abuse, and crack/cocaine abuse. (The sample sizes will be smaller when these controls are included, as TEDS data for substance abuse treatment admissions are missing in some state-years, and are altogether unavailable for the year 2016.) In the error term, u_{smy} , we allow for clustering at the state level. The main identifying assumption of our difference-in-differences approach is that maltreatment report rates in treatment states would have changed over time in a way similar to rates in control states in the absence of the legislative change—that maltreatment is trending similarly in treated and untreated states. In subsequent analysis, we estimate our primary specification inclusive of leading indicators, and find no evidence of a violation of our identifying assumption that trends are common across treated and control states.

4 Results

In this section, we detail our baseline results at the report level, then follow with a consideration of substantiated reports. Where MML plays a role in the movement in outcomes, we also consider mechanisms and potential heterogeneity in the evident treatment effects.

4.1 Baseline results

In Table 3, we present the estimates for the effect of medical marijuana legalization on rates of maltreatment—total reports, reports of neglect, and reports of physical abuse. In Panel A, we report the estimated effects of MML on each of the three possible outcomes controlling for

¹³ Common usage in the literature implies that a state has “decriminalized” marijuana when it reduces the penalty for possessing a small amount of marijuana to a fine rather than imprisonment. During the period we study, the decriminalization indicator captures six legislative changes: Connecticut (2011), Massachusetts (2009), Rhode Island (2013), and Vermont (2013), DC (2014), and Delaware (2015). The remaining 12 states passed decriminalization laws prior to 2003, so do not identify the decriminalization parameter, and any level differences in outcomes for these states are absorbed in state fixed effects. Importantly, in our analysis we find the effect of MML regardless of the inclusion of a decriminalization measure, which itself has a small negative coefficient but is never significant.

month-, year-, and state-fixed effects. In all cases, estimates are imprecise. In Panel B, we allow for state-specific linear trends, keeping any differential in states' trends that may correlate with treatment from loading on to the MML indicator. In doing so, the estimated effect of MML is larger and estimated more precisely—reductions in physical-abuse reports are now significant. Adding time-varying controls, in Panel C, attenuates the relationship somewhat, but again tightens up on precision. Ultimately, we find a 13-percent reduction in the rates of physical abuse coincident with medical-marijuana legalization, or 38.3 percent of a standard deviation ($.383\sigma$). While total maltreatment reports and neglect reports both decline (6.0 and 2.5 percent, respectively), precision is sufficiently lacking to distinguish these estimates from zero. Given that other substances have been associated with *increases* in child victimization (Markowitz and Grossman, 1998, 2000; Paxson and Waldfogel, 2002; Walsh et al., 2003; Cunningham and Finlay, 2013; Freisthler et al., 2015, 2017), that these point estimates remain negative, we interpret as encouraging in terms of MMLs implications for child welfare.¹⁴

Among reports of maltreatment in our sample, roughly 25.81 percent are eventually substantiated, implying that the Child Protective Services agency believes there is sufficient evidence indicating that the harm or risk of harm to the child is severe enough to constitute maltreatment as defined by state law or policy. Furthermore, CPS agents are less likely to modify their substantiation standards merely due to coincident changes in the stigma or perceived risk of marijuana use (for more on this argument see Section 2.3). In Panel D of Table 3, we explore the effect of MML on substantiated claims, which we see as an informative distinction, as movement in substantiated reports is suggestive of changes in child welfare among some of those most harmed by maltreatment. Restricting to substantiated claims, we again find significant reductions in the rates

¹⁴ Similar specifications of the number of maltreatment reports, or the inverse hyperbolic sine transformation (IHS) of maltreatment report counts are qualitatively similar to those reported in Table 3—see panels A and B of Table A.3 for these results. For example these alternative models estimate a 9.1-percent to 12.7-percent reduction in substantiated physical abuse reports.

of physical abuse—average reductions are approximately 10 percent, or 370 fewer children in the typical state each year.¹⁵

Many child welfare experts caution that unsubstantiated cases may include high levels of risk/harm but insufficient evidence, so in that sense we do not in any way want to imply that reductions in unsubstantiated reports are inconsequential. That we find reductions in substantiated reports further suggests that variation in maltreatment with MML is not easily explained by coincident changes in the reporting behavior due to the acceptability of marijuana. If MML merely inducing a different selection into the *reporting* of abuse, then we might have seen reductions in reports, yet no coincident change in substantiated reports. Therefore, significant reductions in substantiated physical abuse have us inclined to lean in the direction of MMLs having induced real increases in welfare.

As the specifications of panels C and D of Table 3 will carry forward somewhat—in sections below we will consider potential heterogeneity—we first wish to consider the robustness of these results to additional scrutiny. In Figure 1, we first allow separate indicators for each year—each year prior and subsequent to MML—as might be described as an event study presentation. Doing so reveals no indication of systematic differences in pre-treatment trends across treatment and control states, a requisite assumption in establishing the point estimate on MML as causal. Moreover, in this presentation we find evidence of responsiveness within the first year of treatment, and then of its persistence in the years following the policy change. In Panel A, we report leads and lags for both total claims of physical abuse and for substantiated claims of physical abuse. In light of the Wolfers (2006) critique, and given the role of state-specific trends in this analysis, in Panel B, we restrict pre-treatment years to zero and allow all available post-treatment years to vary. In short, the dynamics apparent in Panel B leave us unconcerned. The Wolfers (2006) critique is relevant to

¹⁵ Treatment reduces the average number of substantiated physical abuse reports by 17.1 per state-month, on average, and given that there are 1.8 children represented in the average physical abuse report, we estimate that there are 30.88 fewer children per state-month.

including trends for each panel variable, as we have done here—that including only a single indicator variable to capture the full adjustment process can be misleading, as any dynamics would not be well captured by a single variable, and state-specific trends can pick up not only different preexisting trends across states, but also differences in the evolution of abuse (in our case) between treatment and control states subsequent to the legalization of marijuana. In particular, the dynamics at play in the Wolfers (2006) case are regarding pent-up demand for divorce, unleashed by the introduction of unilateral divorce laws. While we do not anticipate a similar dynamic, in Panel B of Figure 1 we follow the Wolfers (2006) practice of separately identifying level adjustments in treatment years, in order to “identify the entire response function allowing the estimated state-specific time trends to identify preexisting trends.” We would be concerned that our analysis, which could absorb the immediate and constant response to MML, would be misspecified if actual dynamics were more complex—for example, if it were the case that an immediate decrease in the rates of reporting were reversed in the long run. However, the negative treatment effect persists in the decade following the changes in policy.

4.2 Reporting sources

Here, we consider whether there are differential effects of MML on rates of reported child maltreatment across reporting source. While also directly informative to potential policy prescriptions, note that distinguishing outcomes by reporting sources can inform whether the regularities evident above are merely the result of changes in reporting behavior, or consistent with MML-induced changes in actual maltreatment. For example, the propensity for professional reporting sources to report child maltreatment should not respond to MML, as mandatory reporting laws do not change with legalization—marijuana remains federally classified as a Schedule 1 drug, so mere changes in inclinations to report would not be likely explanations for any evident responsiveness among those

in professional roles.¹⁶See <http://flcalliance.org/resources/state-profiles/> for more on state mandatory child maltreatment reporting laws. On the other hand, reports originating from personal relationships may well be induced by MML’s effect on reporting behavior.

In Panel A of Table 4, we consider the personal reporting sources (e.g., parents, friends, family, and other non-professional reporting sources), and in Panel B we consider “professional” reporting sources (e.g., education, law enforcement, and social services personnel, and other professional reporting sources).¹⁷ “Other personal relationships” include the alleged victim and the alleged perpetrator (1 percent of all reports); “other professional relationships” include medical, day care, and foster care professionals. Education personnel account for the highest percentage of reports at about 19 percent. Roughly 16 percent of reports are filed by an anonymous/unknown/other source.

First, and maybe most notable, is the role of friends and neighbors in maltreatment reports—these reports actually *increase* with marijuana’s legalization. In fact, both overall maltreatment reporting and substantiated reports increase among friends and neighbors, some 22.1 and 27.4 percent, respectively. Our prior is that an MML-induced change to reporting behavior would, if anything, tip toward *fewer* reports among those with personal relationships. Thus, we interpret evident *increases* in maltreatment among this reporting group as consistent with increase in marijuana use. Furthermore, “friend-and-neighbor” reports of substantiated neglect increase somewhat alarmingly—they increase some 38.3 percent relative to pre-treatment means—and may well evidence a possible underreporting of neglect among friends and neighbors prior to MML, and induced increases in marijuana consumption moving friends and neighbors at the margin of reporting into reporting. Few reports originate from friends and neighbors, so large proportional increases are easily hidden in the aggregates of Table 3. We are nonetheless moved away from imagining that reporting behavior is the driving factor in the overall declines in child maltreatment.

¹⁶

¹⁷

Second, in separately considering professional reporting sources, we see significant decreases in maltreatment reports, in both neglect and physical abuse. To the extent that professional reporting praxis is less subjective, and in theory non-responsive to the advent of MML, we interpret these declines as consistent with real changes in maltreatment coincident with MML. Though the 9-way division of the baseline results leave us suffering from imprecision, we see physical abuse reports declining 14 percent (0.190 per 100,000) and 25 percent (0.294 per 100,000) among education and law enforcement personnel respectively.

4.3 Discussion

That increasing access to marijuana would decrease rates of child actual physical abuse is not surprising—some parents report using marijuana in order to prevent themselves from hitting their child (Thurstone et al., 2013), and marijuana use correlates negatively with aggressive behavior and the perpetration of intimate partner violence (Smith et al., 2012; Stuart et al., 2013).

However, to the extent marijuana displaces alcohol, heroin, or opioids (Reiman, 2009; Anderson et al., 2013; Bachhuber et al., 2014; Chu, 2015; Ozluk, 2017; Powell et al., 2018), our estimates may be driven by coincident reductions in the use of substances that themselves induce more child maltreatment. Given that maltreatment reports do not indicate if specific substances were present, we note again that separately identifying this potential coincidence directly is challenging to researchers. In lieu of direct evidence, then, in Table 5 we include state-level rates of treatment-admissions for methamphetamine, heroin, opioids, alcohol, and crack/cocaine (per 100,000)—as with previous literature, these measures serve as proxies for substance use (Anderson, 2010; Cunningham and Finlay, 2013; Chu, 2015; Swensen, 2015; Pacula et al., 2015; Powell et al., 2015; Bondurant et al., 2018).¹⁸ The inclusion of these five control variables, even though they them-

¹⁸ In Table A.4, we re-estimate the analysis conducted in Panel C and D of Table 3 omitting the 575 state-month observations missing from the drug-use treatment admissions data; the results are qualitatively similar to our baseline estimates.

selves can explain variation in outcomes, leaves our baseline results essentially unchanged—point estimates increase slightly in magnitude. To the extent a substitutionary channel is picked up in the variation in treatment admissions, we are inclined to conclude that the direct effects may well be strong, if not the stronger of the two.

It is possible that reductions in the rate of child maltreatment are additionally capturing an income effect (holding constant the level of marijuana use) resulting from decreases in the price of black market marijuana (Anderson et al., 2013). Poverty is among the most-prominent risk factors for the perpetration of child maltreatment, neglect being foremost (Drake and Jonson-Reid, 2014; Raissian and Bullinger, 2017). Given the relatively low impact of MML on average rates of child neglect, it is unlikely, then, that income effects outweigh the direct effects of increased marijuana use. Ultimately, we do not have the means to effectively and separately test both channels.

4.4 Do marijuana dispensaries matter?

Although the fundamental component of any medical marijuana law is common across states, the language describing the legality of dispensaries can differ. This is important, as dispensary allowances are associated with greater access and use of marijuana (Pacula et al., 2010, 2015; Chu, 2014; Powell et al., 2018).

As we consider the role of dispensaries, we also distinguish between policies that were adopted earlier and later, as early adopting states (such as California and Colorado) took relatively lax approaches to regulating dispensaries and thus experienced a larger increase in marijuana use (Powell et al., 2018). In particular, we similarly distinguish periods before 2010 from the entire sample, as dispensary provisions crafted after 2009 are more stringent and in-line with traditional medical care and pharmaceutical regulation (Pacula and Smart, 2017; Powell et al., 2018).¹⁹

¹⁹ The Ogden 2009 memo (Ogden, 2009), sent from the Department of Justice to all U.S. Attorney Generals, stated that the federal prosecution of medical marijuana users and suppliers who were in unambiguous compliance with existing state law were no longer a priority.

We report this analysis in Table 6. In Panel A, we examine reported maltreatment while allowing for differences by the legality of dispensaries, for periods 2003–2010, and the entire sample (2003–2016) separately. In Panel B, we do likewise for substantiated reports. Together, we see several takeaways. Having the explicit allowance for dispensaries is consistent with larger maltreatment reports. However, this is particularly true in earlier years of the sample. In fact, in the 2000–2010 sample, point reductions are also significant in overall reports of maltreatment, neglect, and physical abuse. (Recall that these were insignificant in our baseline estimates that made no distinction for dispensary legality.) Moreover, this significance extends to additional reductions in neglect (8.5 percent) and physical abuse (4.6 percent) when restricting attention to only substantiated claims (Panel B). These regularities revealed in the triple difference further suggest that greater access results in larger effects on child maltreatment.

4.5 Recreational marijuana

Among those states initiating MML, three states have further increased the availability of marijuana, though operational recreational marijuana dispensaries within our time series. As such, in Table 7, Colorado, Washington, and Oregon, identify the change in outcomes associated with this additional increase in availability. We report the results of similar models, estimating parameters on both MML and recreational marijuana legalization (RML), with parameters on RML identifying any *additional* reductions in outcomes. In Column 3, RML appears to have no additional impact on rates of reported physical abuse. However, among substantiated reports (Column 6), there are evidently larger effects on physical abuse associated with RML than with MML alone. These estimates suggest that RML lowered substantiated claims of physical abuse by an additional 27.2 percent. We interpret this as consistent with a larger first-stage consumption responses to recreational legalization than to medical legalization, and strongly corroborating our baseline MML

results.

While movement in neglect is not significant with MML alone (Table 7), we suggest here that the legalization of recreational marijuana is also coincident with reductions in the rate of reported and substantiated child neglect—controlling for a state’s MML status, RML reduces the rate of reported and substantiated child neglect by 27.7 percent (11 per 100,000) and 30.3 percent (2.5 per 100,000), respectively. The estimated effects of RML on neglect are also consistent with a larger first-stage consumption response to recreational legalization than to medical legalization. However, since the additional effect of RML on reported and substantiated neglect is far larger than the added effect of RML on physical abuse, we cannot rule out that these results potentially reflect a change in reporting behavior as RML represents a drastic liberalization of marijuana policy, or an income effect resulting from further reductions in the price of black market marijuana (for more on this argument see Section 4.3).

4.6 Heterogeneity

In following other literature, which has documented differences in the effect of MML on marijuana use and related outcomes by age, race, and gender (Anderson et al., 2013; Chu, 2015; Wen et al., 2015; Ozluk, 2017), we now turn to consider the potential differential responsiveness of maltreatment to MML and RML.

Here we explore the potential differential effects of marijuana liberalization policies on maladaptive parenting across race, gender, and age. In panels A and B (columns 1 through 3) of Table 8, we report the estimated effect of MML allowing for the separate identification of the effect of RML (over and above MML), on the rates of maltreatment reports for white and black children.²⁰ Doing so suggests that MML significantly decreases rates of reporting physical abuse within both white

²⁰ In substantiated reports we also observe the race of perpetrators, in which cases child and perpetrator race matches 94.3 percent of the time.

and black populations—estimates in Column (3) imply reductions of 18.8 percent (1.7 per 100,000) among white children, and 11.4 percent (4.087 per 100,000) among black children. In Column (2), we also find that RML reduces rates of neglect allegation by 21.8 and 14.7 percent for white and black children, respectively. In columns (4) through (6) we report on having applied the same models only to substantiated reports, which reveals largely the same patterns around legalization—substantiated physical abuse is declining proportionately more among white children with MML, and more still with RML. Patterns of impact measures are also similar—substantiated physical abuse decreases in white and black populations 20.1 and 6.3 percent, respectively—however, the decline in substantiated reports among black children is not distinguishable from zero. For both white and black children, the negative effect of RML on rates of substantiated physical abuse is greater than the effect of MML, with impacts of 33.9 and 18.6 percent, respectively. We also find no change in measures of maladaptive parenting for Hispanic, mixed race, and other racial subgroups, with MML or with RML—point estimates are both statistically indistinguishable from zero, and small in magnitude.

In Table 9, we show the differential effects of increasing marijuana availability across the gender of children, for all maltreatment reports (columns 1 through 3), and substantiated reports (columns 4 through 6). MML significantly decreases the rate of physical abuse victimization for both male and female children, with similar impacts of 20.8 and 17.1 percent, or roughly 30 percent of a standard deviation.

While perpetrator race largely follows that of children, separately considering perpetrator gender is informative. In Table 10, we show that reductions in rates of substantiated physical abuse appear to be driven by reductions in both male and female perpetration. In particular, MML reduces rates of physical abuse by male perpetrators by 18.5 percent (0.568 per 100,000), and reduces the rate of physical abuse by female perpetrators by 14.6 percent (0.434). In looking within perpetrator

gender we find that recreational legalization reduces rates of substantiated neglect for both male and female perpetrators, though there is still no evidence that MML reduces rates of substantiated neglect.

Last, we conduct similar analysis across the age of perpetrators.²¹ As the age of perpetrators is only available if a report is substantiated, we consider the potential heterogeneity by age in the effect of MML on the rates of report substantiation, substantiated neglect, and substantiated physical abuse. In Column (3) of Table 11, we see that MML (and RML) has the largest effect on rates of physical abuse perpetration among adults ages 25-44. This is anticipated insofar as previous literature suggests that MMLs induce larger increases in marijuana use in this age group (Chu, 2014). However, our analysis also suggests that RML reduces rates of substantiated physical abuse for both adults aged 18–24 (1.040 per 100,000) and 25–44 (2.566).

5 Conclusion

As the landscape for marijuana policy and regulation rapidly evolves, it is important to understand the potential public health implications and externalities of such changes. For example, policy makers and child welfare experts have become increasingly interested in understanding the effect of caretaker marijuana use and the perpetration of child maltreatment. We contribute to this discussion by, exploiting variation in the location and timing of medical and recreational marijuana legalization between 2003 and 2016, we employ a difference-in-differences approach to estimating the effects of increased marijuana availability on rates of child maltreatment. We find that medical marijuana legalization meaningfully decreases rates of reported and substantiated physical abuse—they both fall by roughly 10-to-12 percent—with the largest effects coming from the perpetration of physical abuse by white adults between the ages of 25 and 44. We do not find evidence that medical

²¹ As multiple perpetrators may appear on a single report, we use the average perpetrator age for our designation. The results of this analysis are not sensitive to the specific age cutoffs.

legalization has significantly changed rates of child neglect, though we do see large increases in neglect reports coming from friends and neighbors. Within states legalizing recreational marijuana, we see coincident reductions in substantiated neglect and physical abuse of roughly 30 percent.

Weighing our reduced-form magnitudes by what we know from the literature about the responsiveness of marijuana use to medical legalization (Wen et al., 2015; Chu, 2014; Pacula et al., 2015), we imagine the physical-abuse elasticity with respect to use to be in the range -0.71—economically meaningful, and encouraging in terms of child maltreatment going forward, as trends are if anything toward increasing access to marijuana. These findings inform marijuana policy directly—with respect to child welfare broadly, one might be encouraged—but suggest followup with respect to the potential for neglect coincident with increasing marijuana availability.

References

- Anderson, D Mark.** 2010. “Does Information Matter? The Effect of the Meth Project on Meth Use Among Youths.” *Journal of Health Economics*, 29(5): 732–742.
- Anderson, D Mark, and Daniel I Rees.** 2014. “The Legalization of Recreational Marijuana: How Likely is the Worst-Case Scenario?” *Journal of Policy Analysis and Management*, 33(1): 221–232.
- Anderson, Mark D, Benjamin Hansen, and Daniel I Rees.** 2013. “Medical Marijuana Laws, Traffic Fatalities, and Alcohol Consumption.” *The Journal of Law and Economics*, 56(2): 333–369.
- Bachhuber, Marcus A, Brendan Saloner, Chinazo O Cunningham, and Colleen L Barry.** 2014. “Medical Cannabis Laws and Opioid Analgesic Overdose Mortality in the United States, 1999-2010.” *JAMA Internal Medicine*, 174(10): 1668–1673.
- Barnard, Marina, and Neil McKeganey.** 2004. “The Impact of Parental Problem Drug Use on Children: What is the Problem and What Can Be Done to Help?” *Addiction*, 99(5): 552–559.
- Bondurant, Samuel R., Jason M. Lindo, and Isaac D. Swensen.** 2018. “Substance Abuse Treatment Centers and Local Crime.” *Journal of Urban Economics*, 104 124–133.
- Carrell, Scott E, Mark Hoekstra, and Elira Kuka.** 2016. “The Long-Run Effects of Disruptive Peers.” Working Paper 22042, National Bureau of Economic Research.
- Carrell, Scott E, and Mark L Hoekstra.** 2010. “Externalities in the Classroom: How Children Exposed to Domestic Violence Affect Everyone’s Kids.” *American Economic Journal: Applied Economics*, 2(1): 211–28.
- Cerdá, Magdalena, Melanie Wall, Katherine M Keyes, Sandro Galea, and Deborah Hasin.** 2012. “Medical Marijuana Laws in 50 States: Investigating the Relationship Between State Legalization of Medical Marijuana and Marijuana Use, Abuse and Dependence.” *Drug & Alcohol Dependence*, 120(1): 22–27.
- Chaffin, Mark, Kelly Kelleher, and Jan Hollenberg.** 1996. “Onset of Physical Abuse and Neglect: Psychiatric, Substance Abuse, and Social Risk Factors from Prospective Community Data.” *Child Abuse & Neglect*, 20(3): 191–203.
- Chu, Yu-Wei Luke.** 2014. “The Effects of Medical Marijuana Laws on Illegal Marijuana Use.” *Journal of Health Economics*, 38 43–61.
- Chu, Yu-Wei Luke.** 2015. “Do Medical Marijuana Laws Increase Hard-Drug Use?” *The Journal of Law and Economics*, 58(2): 481–517.
- Cunningham, Scott, and Keith Finlay.** 2013. “Parental Substance Use and Foster Care: Evidence from Two Methamphetamine Supply Shocks.” *Economic Inquiry*, 51(1): 764–782.
- Currie, Janet, and Erdal Tekin.** 2012. “Understanding the Cycle of Childhood Maltreatment and Future Crime.” *Journal of Human Resources*, 47(2): 509–549.
- Drake, Brett.** 1996. “Unraveling “unsubstantiated”.” *Child Maltreatment*, 1(3): 261–271.

- Drake, Brett, and Melissa Jonson-Reid.** 2014. "Poverty and child maltreatment." In *Handbook of child maltreatment.*: Springer, 131–148.
- Dube, Shanta R, Robert F Anda, Vincent J Felitti, Janet B Croft, Valerie J Edwards, and Wayne H Giles.** 2001. "Growing Up with Parental Alcohol Abuse: Exposure to Childhood Abuse, Neglect, and Household Dysfunction." *Child Abuse & Neglect*, 25(12): 1627–1640.
- Edwards, Valerie J, George W Holden, Vincent J Felitti, and Robert F Anda.** 2003. "Relationship Between Multiple Forms of Childhood Maltreatment and Adult Mental Health in Community Respondents: Results from the Adverse Childhood Experiences Study." *American Journal of Psychiatry*, 160(8): 1453–1460.
- Famularo, Richard, Robert Kinscherff, and Terence Fenton.** 1992. "Parental Substance Abuse and the Nature of Child Maltreatment." *Child Abuse & Neglect*, 16(4): 475–483.
- Freisthler, Bridget, Paul J Gruenewald, and Jennifer Price Wolf.** 2015. "Examining the Relationship Between Marijuana Use, Medical Marijuana Dispensaries, and Abusive and Neglectful Parenting." *Child Abuse & Neglect*, 48 170–178.
- Freisthler, Bridget, Jennifer Price Wolf, Wendy Wiegmann, and Nancy J Kepple.** 2017. "Drug Use, the Drug Environment, and Child Physical Abuse and Neglect." *Child Maltreatment*, 22(3): 245–255.
- Hall, Wayne, and Michael Lynskey.** 2016. "Evaluating the Public Health Impacts of Legalizing Recreational Cannabis Use in the United States." *Addiction*, 111(10): 1764–1773.
- Hathaway, Andrew D, Natalie C Comeau, and Patricia G Erickson.** 2011. "Cannabis Normalization and Stigma: Contemporary Practices of Moral Regulation." *Criminology & Criminal Justice*, 11(5): 451–469.
- Hohman, Melinda, Rhonda Oliver, and Wendy Wright.** 2004. "Methamphetamine Abuse and Manufacture: The Child Welfare Response." *Social Work*, 49(3): 373–381.
- Hussey, Jon M, Jane Marie Marshall, Diana J English, Elizabeth Dawes Knight, Anna S Lau, Howard Dubowitz, and Jonathan B Kotch.** 2005. "Defining maltreatment according to substantiation: Distinction without a difference?" *Child abuse & neglect*, 29(5): 479–492.
- Kelleher, Kelly, Mark Chaffin, Janice Hollenberg, and Ellen Fischer.** 1994. "Alcohol and Drug Disorders Among Physically Abusive and Neglectful Parents in a Community-Based Sample." *American Journal of Public Health*, 84(10): 1586–1590.
- Khatapoush, Shereen, and Denise Hallfors.** 2004. "Sending the Wrong Message: Did Medical Marijuana Legalization in California Change Attitudes About and Use of Marijuana?" *Journal of Drug Issues*, 34(4): 751–770.
- Kohl, Patricia L, Melissa Jonson-Reid, and Brett Drake.** 2009. "Time to leave substantiation behind: Findings from a national probability study." *Child maltreatment*, 14(1): 17–26.
- Lansford, Jennifer E, Kenneth A Dodge, Gregory S Pettit, John E Bates, Joseph Crozier, and Julie Kaplow.** 2002. "A 12-Year Prospective Study of the Long-Term Effects of Early Child Physical Maltreatment on Psychological, Behavioral, and Academic Problems in Adolescence." *Archives of Pediatrics & Adolescent Medicine*, 156(8): 824–830.

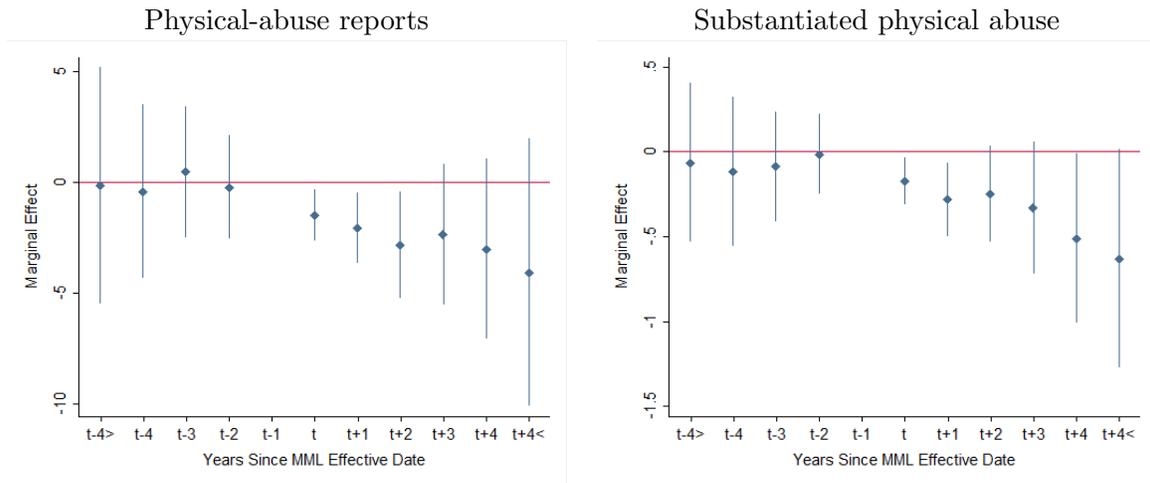
- Leiter, Jeffrey, Kristen A Myers, and Matthew T Zingraff.** 1994. "Substantiated and unsubstantiated cases of child maltreatment: Do their consequences differ?" *Social Work Research*, 18(2): 67–82.
- Markowitz, Sara, and Michael Grossman.** 1998. "Alcohol Regulation and Domestic Violence Towards Children." *Contemporary Economic Policy*, 16(3): 309–320.
- Markowitz, Sara, and Michael Grossman.** 2000. "The Effects of Beer Taxes on Physical Child Abuse." *Journal of Health Economics*, 19(2): 271–282.
- Miller, Keaton, and Boyoung Seo.** 2018. "The Substitutability of Recreational Substances: Marijuana, Alcohol, and Tobacco."
- Norman, Rosana E, Munkhtsetseg Byambaa, Rumna De, Alexander Butchart, James Scott, and Theo Vos.** 2012. "The Long-Term Health Consequences of Child Physical Abuse, Emotional Abuse, and Neglect: A Systematic Review and Meta-Analysis." *PLoS Medicine*, 9(11): .
- Ozluk, Pelin.** 2017. "The Effects of Medical Marijuana Laws on Utilization of Prescribed Opioids and Other Prescription Drugs."
- 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.
- Pacula, Rosalie Liccardo, Jamie F Chriqui, Deborah A Reichmann, and Yvonne M Terry-McElrath.** 2002. "State Medical Marijuana Laws: Understanding the Laws and Their Limitations." *Journal of Public Health Policy*, 23(4): 413–439.
- Pacula, Rosalie Liccardo, Beau Kilmer, Michael Grossman, and Frank J Chaloupka.** 2010. "Risks and prices: The role of user sanctions in marijuana markets." *The BE Journal of Economic Analysis & Policy*, 10(1): .
- Pacula, Rosalie Liccardo, and Rosanna Smart.** 2017. "Medical marijuana and marijuana legalization." *Annual review of clinical psychology*, 13 397–419.
- Paxson, Christina, and Jane Waldfogel.** 2002. "Work, Welfare, and Child Maltreatment." *Journal of Labor Economics*, 20(3): 435–474.
- Powell, David, Rosalie Liccardo Pacula, and Mireille Jacobson.** 2018. "Do Medical Marijuana Laws Reduce Addictions and Deaths Related to Pain Killers?" *Journal of Health Economics*, 58 29–42.
- Powell, David, Rosalie Liccardo Pacula, and Erin Taylor.** 2015. "How Increasing Medical Access to Opioids Contributes to the Opioid Epidemic: Evidence from Medicare Part D." Working Paper 21072, National Bureau of Economic Research.
- Raission, Kerri M, and Lindsey Rose Bullinger.** 2017. "Money matters: Does the minimum wage affect child maltreatment rates?" *Children and youth services review*, 72 60–70.
- Reiman, Amanda.** 2009. "Cannabis as a Substitute for Alcohol and Other Drugs." *Harm Reduction Journal*, 6(1): .

- Smith, Philip H, Gregory G Homish, Kenneth E Leonard, and Jack R Cornelius.** 2012. "Intimate Partner Violence and Specific Substance Use Disorders: Findings from the National Epidemiologic Survey on Alcohol and Related Conditions." *Psychology of Addictive Behaviors*, 26(2): , p. 236.
- Springer, Kristen W, Jennifer Sheridan, Daphne Kuo, and Molly Carnes.** 2007. "Long-Term Physical and Mental Health Consequences of Childhood Physical Abuse: Results From a Large Population-Based Sample of Men and Women." *Child Abuse & Neglect*, 31(5): 517–530.
- Stuart, Gregory L, Todd M Moore, Sara R Elkins, Timothy J O'farrell, Jeff R Temple, Susan E Ramsey, and Ryan C Shorey.** 2013. "The Temporal association Between Substance Use and Intimate Partner Violence Among Women Arrested for Domestic Violence." *Journal of Consulting and Clinical Psychology*, 81(4): .
- Swensen, Isaac D.** 2015. "Substance-Abuse Treatment and Mortality." *Journal of Public Economics*, 122 13–30.
- Thurstone, Christian, Ingrid A Binswanger, Karen F Corsi, Deborah J Rinehart, and Robert E Booth.** 2013. "Medical Marijuana Use and Parenting: A Qualitative Study." *Adolescent Psychiatry*, 3(2): 190–194.
- Walsh, Christine, Harriet L MacMillan, and Ellen Jamieson.** 2003. "The Relationship Between Parental Substance Abuse and Child Maltreatment: Findings from the Ontario Health Supplement." *Child Abuse & Neglect*, 27(12): 1409–1425.
- 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.
- Wolfers, Justin.** 2006. "Did unilateral divorce laws raise divorce rates? A reconciliation and new results." *American Economic Review*, 96(5): 1802–1820.

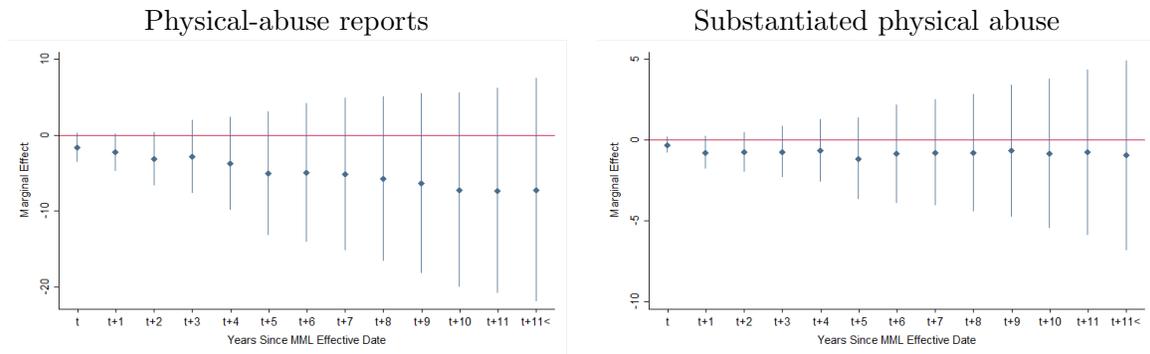
6 Figures and Tables

Figure 1: Rates of physical abuse (per 100,000 adults) around marijuana legalization

Panel A: Local responsiveness



Panel B: Wolfers (2006) dynamics



Notes: We report coefficient estimates, and the 95-percent confidence intervals, for leading and lagged treatment indicators, from an OLS regression that includes state, month, and year fixed effects, state-specific linear time trends, and time-varying state-specific covariates (percent black, percent white, unemployment rate, median household income, TANF expenditures, level of family social worker employment, and an indicator for marijuana decriminalization). Standard errors are estimated allowing for for clustering at the state-level.

Table 1: Marijuana law effective and active dispensary dates as of June 2016

State	MML Effective Date	Medical MJ Dispensaries Legally Protected? (Date Dispensaries Became Protected)	First year MJ Dispensary Legally Protected and Active	Year Medical MJ Dispensary is Known to be Active	RML Effective Date	Date Recreational MJ Dispensary Becomes Active
Alaska	March 3, 1999	No			February 24, 2015	October 2016
Arizona	November 29, 2010	Yes (December 14, 2010)	December 2012	2012		
California	November 6, 1996	Yes (October 8, 2003)	January 2004	1996		
Colorado	June 1, 2001	Yes (June 7, 2010)	June 2010	2005	November 6, 2012	January 1, 2014
Connecticut	October 1, 2012	Yes (October 1, 2012)	August 2014	2014		
Delaware	July 1, 2011	Yes (July 1, 2011)				
DC	July 27, 2010	Yes (July 27, 2010)	April 2013	2013		
Hawaii	December 28, 2000	No				
Illinois	January 1, 2014	Yes (January 1, 2014)				
Maine	December 23, 1999	Yes (December 4, 2009)	March 2011	2011		
Maryland	June 1, 2014	Yes (July 5, 2017)	July 2017	2017		
Massachusetts	January 1, 2013	Yes (May 24, 2013)				
Michigan	December 4, 2008	No		2009		
Minnesota	May 30, 2014	Yes (May 30, 2014)				
Montana	November 2, 2004	No				
Nevada	October 1, 2001	Yes (July 1, 2013)	March 2015	2009		
New Hampshire	July 23, 2013	Yes (July 23, 2013)				
New Jersey	June 1, 2010	Yes (July 1, 2010)	December 2012	2012		
New Mexico	July 1, 2007	Yes (July 1, 2007)	July 2009	2009		
New York	July 5, 2014	Yes (July 5, 2014)				
Oregon	December 3, 1998	Yes (August 14, 2013)	March 2014	2009	July 1, 2015	October 1, 2015
Pennsylvania	May 1, 2016	Yes (May 1, 2016)				
Rhode Island	January 3, 2006	Yes (June 16, 2009)	April 2013	2013		
Vermont	July 1, 2004	Yes (June 2 2011)	June 2013	2013		
Washington	December 3, 1998	No		2009	December 6, 2012	July 8, 2014

Notes: States that adopted a MML after our time period (June 2016) are treated as “control states”: Arkansas, Florida, North Dakota, Ohio, Oklahoma and West Virginia. Information on dispensary legal protection and active dates comes from Powell et al. (2018). If the first year a MJ dispensary is legally protected and active is unknown, we use the date dispensaries became protected to define treatment.

Table 2: National Child Abuse and Neglect Data Systems (NCANDS) Child File, 2003-2016

Variable	Mean (SD)
Maltreatment report rate (monthly) ^a	70.071 (25.791)
Neglect allegation rate	42.566 (23.843)
Physical abuse allegation rate	21.417 (10.732)
Report substantiation rate	16.842 (8.765)
Neglect substantiation rate	11.414 (7.606)
Physical abuse substantiation rate	4.689 (2.830)
Of substantiated reports:	
White perpetrator(s)	0.514 (0.193)
Black perpetrator(s)	0.159 (0.133)
Hispanic perpetrator(s)	0.104 (0.114)
Other-race perpetrator(s)	0.061 (0.119)
Multiple-race perpetrators	0.050 (0.043)
Female perpetrator(s)	0.428 (0.107)
Male perpetrator(s)	0.318 (0.127)
Average perpetrator age <25	0.199 (0.059)
Average perpetrator age 25-44	0.628 (0.095)
Average perpetrator age >44	0.173 (0.100)
Unemployment rate	6.157 (2.069)
Median household income	36,204 (7391.9)
Percent White	81.031 (13.828)
Percent Black	12.013 (11.295)
Decriminalization	0.248 (0.432)
Observations (state-month)	7,705

Notes: NCANDS Child File maltreatment reports, January 2003–June 2016. All perpetrator information is missing in Georgia, and perpetrator race information is missing in Pennsylvania. Race, gender, and age-group fractions do not add to one as some substantiated reports are missing select perpetrator characteristic information. ^a rates per 100,000 adults.

Table 3: Did maltreatment rates change with the legalization of medical marijuana?

	Any Maltreatment (1)	Neglect (2)	Physical Abuse (3)
Panel A: State, month, and year fixed effects			
1(MML)	-2.469 (3.477)	-0.326 (3.575)	-0.094 (2.211)
Observations	7,705	7,705	7,705
Pre-Treatment Mean	64.319	42.965	20.076
Impact (%) at Pre-Treatment Mean	-3.8	-0.8	-0.5
Effect Size	0.128	0.016	0.014
Panel B: Panel A + state-specific linear trends			
1(MML)	-4.504 (2.949)	-1.061 (2.423)	-3.075 ^{***} (0.867)
Observations	7,705	7,705	7,705
Pre-Treatment Mean	64.319	42.965	20.076
Impact (%) at Pre-Treatment Mean	-7.0	-2.5	-15.3
Effect Size	0.234	0.051	0.447
Panel C: Panel B + time-varying controls			
1(MML)	-3.851 (2.509)	-1.094 (2.144)	-2.635 ^{***} (0.818)
Observations	7,705	7,705	7,705
Pre-Treatment Mean	64.319	42.965	20.076
Impact (%) at Pre-Treatment Mean	-6.0	-2.5	-13.1
Effect Size	0.200	0.052	0.383
Panel D: Panel C, for substantiated claims only			
1(MML)	-0.124 (1.207)	1.005 (1.195)	-0.360 ^{**} (0.177)
Observations	7,705	7,705	7,705
Pre-Treatment Mean	17.753	12.728	3.755
Impact (%) at Pre-Treatment Mean	-0.7	7.9	-9.6
Effect Size	0.012	0.107	0.164

Notes: NCANDS Child File, January 2003–June 2016. Time varying state-level controls include population demographics, unemployment rate, median household income, TANF expenditures, level of family social worker employment, and an indicator for marijuana decriminalization. Standard errors are estimated allowing for clustering at the state level. *** significant at 1%; ** significant at 5%; * significant at 10%.

Table 4: Is there heterogeneity across reporting sources?

	All reports			Substantiated reports		
	Any maltreatment	Neglect	Physical abuse	Any maltreatment	Neglect	Physical abuse
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Originating out of personal relationships						
Friends and Neighbors						
‡(MML)	0.472** (0.186)	0.431*** (0.160)	0.060 (0.047)	0.073** (0.034)	0.084*** (0.031)	0.005 (0.008)
Observations	7,705	7,705	7,705	7,705	7,705	7,705
Pre-Treatment Mean	2.140	1.712	0.268	0.218	0.033	7,705
Impact (%) at Pre-Treatment Mean	22.1	25.2	12.0	27.4	38.3	8.0
Effect Size	0.270	0.288	0.117	0.262	0.343	0.041
Other Relatives						
‡(MML)	-0.192 (0.215)	-0.044 (0.188)	-0.148** (0.065)	0.031 (0.093)	0.083 (0.089)	-0.016 (0.011)
Observations	7,705	7,705	7,705	7,705	7,705	7,705
Pre-Treatment Mean	3.420	2.588	0.910	0.882	0.732	0.101
Impact (%) at Pre-Treatment Mean	-5.6	-1.7	-16.3	3.5	11.3	-16.3
Effect Size	0.104	0.029	0.228	0.034	0.109	0.101
Parents						
‡(MML)	-0.306 (0.232)	-0.098 (0.172)	-0.241*** (0.079)	-0.077 (0.068)	0.024 (0.043)	-0.021 (0.019)
Observations	7,705	7,705	7,705	7,705	7,705	7,705
Pre-Treatment Mean	3.906	2.517	1.240	0.600	0.369	0.130
Impact (%) at Pre-Treatment Mean	-7.8	-3.9	-19.4	-12.8	6.5	-16.3
Effect Size	0.171	0.060	0.361	0.184	0.072	0.176
Other personal relationships						
‡(MML)	-0.042 (0.069)	-0.005 (0.046)	-0.008 (0.038)	-0.007 (0.030)	0.018 (0.023)	-0.014 (0.014)
Observations	7,705	7,705	7,705	7,705	7,705	7,705
Pre-Treatment Mean	0.602	0.310	0.293	0.140	0.089	0.048
Impact (%) at Pre-Treatment Mean	-7.0	-1.7	-2.9	-5.0	20.6	-28.3
Effect Size	0.086	0.018	0.031	0.038	0.127	0.162
Panel B: Originating out of professional relationships						
Legal and law enforcement personnel						
‡(MML)	-0.126 (0.365)	-0.101 (0.349)	-0.190* (0.110)	0.267 (0.494)	0.563 (0.446)	-0.065 (0.058)
Observation	7,705	7,705	7,705	7,705	7,705	7,705
Pre-Treatment Mean	6.355	5.133	1.396	4.797	3.605	0.829
Impact (%) at Pre-Treatment Mean	-2.0	-2.0	-13.6	5.6	15.6	-7.9
Effect Size	0.025	0.024	0.161	0.088	0.205	0.112
Education personnel						
‡(MML)	-0.723* (0.367)	-0.485* (0.244)	-0.294** (0.121)	-0.214* (0.125)	-0.129 (0.098)	-0.044 (0.034)
Observations	7,705	7,705	7,705	7,705	7,705	7,705
Pre-Treatment Mean	4.380	3.109	1.178	1.050	0.821	0.168
Impact (%) at Pre-Treatment Mean	-16.5	-15.6	-25.0	-20.4	-15.7	-26.0
Effect Size	0.245	0.195	0.317	0.187	0.137	0.165
Social services personnel						
‡(MML)	0.395 (0.631)	0.545 (0.522)	0.014 (0.195)	0.162 (0.299)	0.308 (0.281)	0.009 (0.045)
Observations	7,705	7,705	7,705	7,705	7,705	7,705
Pre-Treatment Mean	7.460	5.059	2.070	2.465	1.844	0.439
Impact (%) at Pre-Treatment Mean	5.3	10.8	0.7	6.6	16.7	2.0
Effect Size	0.056	0.111	0.006	0.055	0.140	0.013
Other professional relationships						
‡(MML)	-2.651 (2.509)	-1.094 (2.144)	-1.005*** (0.321)	-0.068 (1.200)	0.147 (0.193)	-0.079** (0.043)
Observations	7,705	7,705	7,705	7,705	7,705	7,705
Pre-Treatment Mean	64.319	42.965	20.076	17.753	12.728	3.755
Impact (%) at Pre-Treatment Mean	-4.1	-2.5	-4.8	-0.4	1.2	-2.1
Effect Size	0.200	0.052	0.383	0.007	0.111	0.157
Panel C: Origin of relationship unknown						
Anonymous/Unknown/Other						
‡(MML)	-0.764* (0.437)	-0.582 (0.432)	-0.715** (0.329)	-0.361* (0.203)	-0.266 (0.199)	-0.124 (0.091)
Observations	7,705	7,705	7,705	7,705	7,705	7,705
Pre-Treatment Mean	6.422	5.826	2.527	3.099	2.165	0.673
Impact (%) at Pre-Treatment Mean	-11.9	-10.0	-28.3	-11.6	-12.2	-18.4
Effect Size	0.080	0.113	0.302	0.070	0.101	0.096
State, Month, and Year FEs	Yes	Yes	Yes	Yes	Yes	Yes
State Specific Linear Trends	Yes	Yes	Yes	Yes	Yes	Yes
State-level Controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes: NCANDS Child File, January 2003–June 2016. Time varying state-level controls include population demographics, unemployment rate, median household income, TANF expenditures, level of family social worker employment, and an indicator for marijuana decriminalization. Standard errors are estimated allowing for clustering at the state level. *** significant at 1%; ** significant at 5%; * significant at 10%.

Table 5: Can the response be explained by coincident changes in the use of other substances?

	All reports			Substantiated reports		
	Any maltreatment	Neglect	Physical abuse	Any maltreatment	Neglect	Physical abuse
	(1)	(2)	(3)	(4)	(5)	(6)
l(MML)	-3.104 (2.676)	-0.779 (2.116)	-2.725*** (0.856)	0.089 (1.033)	1.129 (1.033)	-0.373** (0.167)
Treatment admissions (per 100,000)						
Heroin	-0.018* (0.010)	-0.015** (0.007)	-0.003 (0.004)	-0.001 (0.004)	-0.004 (0.003)	0.001 (0.001)
Methamphetamine	-0.031 (0.021)	-0.032* (0.018)	-0.005 (0.008)	-0.009 (0.006)	-0.008 (0.005)	-0.001 (0.002)
Opioids	0.036* (0.018)	0.014 (0.014)	0.004 (0.006)	0.003 (0.008)	-0.001 (0.006)	-0.002* (0.001)
Alcohol	0.009 (0.009)	0.013** (0.007)	0.007 (0.004)	0.002 (0.003)	0.003 (0.003)	0.001 (0.001)
Cocaine	0.000 (0.018)	-0.001 (0.014)	-0.002 (0.006)	-0.001 (0.007)	0.001 (0.005)	-0.000 (0.002)
Observations	7,130	7,130	7,130	7,130	7,130	7,130
Pre-Treatment Mean	64.319	42.965	20.076	17.753	12.728	3.755
Impact (%) (MML)	-4.8	-1.8	-13.6	0.5	8.9	-9.9
Effect Size (MML)	0.161	0.037	0.396	0.009	0.120	0.169
State, Month, and Year FEs	Yes	Yes	Yes	Yes	Yes	Yes
State Specific Linear Trends	Yes	Yes	Yes	Yes	Yes	Yes
State-level Controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes: NCANDS Child File, January 2003–June 2016. Time varying state-level controls include population demographics, unemployment rate, median household income, marijuana decriminalization, and state-level fractions of total treatment admissions for methamphetamine, heroin, and alcohol. Standard errors are estimated allowing for clustering at the state level. *** significant at 1%; ** significant at 5%; * significant at 10%.

Table 6: Did maltreatment decline more with active and legal dispensaries?

	2003-2010			2003-2016		
	Any maltreatment (1)	Neglect (2)	Physical abuse (3)	Any maltreatment (4)	Neglect (5)	Physical abuse (6)
All reports						
Panel A: MML + Active and legal dispensary						
ℙ(MML)	-2.180 (3.630)	-1.179 (4.166)	-2.558*** (0.920)	-3.388 (2.487)	-0.798 (2.112)	-2.393*** (0.822)
ℙ(Active + legal dispensary)	-4.244*** (0.970)	-5.294*** (0.856)	-1.578*** (0.493)	-2.736 (2.583)	-1.746 (2.699)	-1.430 (1.465)
Observations	4,385	4,385	4,385	7,705	7,705	7,705
Pre-Treatment Mean	64.319	42.965	20.076	64.319	42.965	20.076
Substantiated reports						
Panel B: MML + Active and legal dispensary						
ℙ(MML)	-0.799 (1.060)	0.461 (1.046)	-0.243* (0.176)	-0.052 (0.864)	1.539 (0.922)	-0.301* (0.133)
ℙ(Active + legal dispensary)	-0.992 (1.374)	-1.140*** (0.333)	-0.177*** (0.058)	-0.907 (1.104)	-0.881 (0.999)	-0.078 (0.312)
Observations	4,385	4,385	4,385	7,705	7,705	7,705
Pre-Treatment Mean	17.753	13.435	3.830	17.753	12.728	3.755
State, Month, and Year FEs	Yes	Yes	Yes	Yes	Yes	Yes
State Specific Linear Trends	Yes	Yes	Yes	Yes	Yes	Yes
State-level Controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes: NCANDS Child File, January 2003–June 2016. Time varying state-level controls include population demographics, unemployment rate, median household income, TANF expenditures, level of family social worker employment, and an indicator for marijuana decriminalization. Standard errors are estimated allowing for clustering at the state level. *** significant at 1%; ** significant at 5%; * significant at 10%.

Table 7: Did maltreatment change similarly with the legalization of recreational marijuana?

	All reports			Substantiated reports		
	Any maltreatment	Neglect	Physical abuse	Any maltreatment	Neglect	Physical abuse
	(1)	(2)	(3)	(4)	(5)	(6)
ℓ(MML)	-3.874 (2.513)	-1.167 (2.147)	-2.659*** (0.819)	-0.085 (1.196)	1.030 (1.189)	-0.350** (0.168)
ℓ(RML)	-3.485 (4.558)	-10.925*** (3.314)	-3.482 (2.414)	-2.630** (1.065)	-2.459*** (0.688)	-0.712* (0.367)
Observations	7,705	7,705	7,705	7,705	7,705	7,705
Pre-Treatment Mean (MML)	64.319	42.965	20.076	17.753	12.728	3.755
Impact%(MML)	-6.024	-2.716	-13.242	-0.479	8.093	-9.329
Effect Size (MML)	0.201	0.056	0.387	0.008	0.109	0.159
Pre-Treatment Mean (RML)	63.284	39.458	17.660	12.833	8.109	2.620
Impact%(RML)	-5.507	-27.688	-19.716	-20.494	-30.318	-27.161
Effect Size (RML)	0.352	1.631	0.979	0.599	1.072	0.883
State, year, and month FE	Yes	Yes	Yes	Yes	Yes	Yes
State-specific linear trends	Yes	Yes	Yes	Yes	Yes	Yes
Time-varying controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes: NCANDS Child File, January 2003–June 2016. Time varying state-level controls include population demographics, unemployment rate, median household income, TANF expenditures, level of family social worker employment, and an indicator for marijuana decriminalization. Standard errors are estimated allowing for clustering at the state level. *** significant at 1%; ** significant at 5%; * significant at 10%. ^a Pennsylvania and Georgia are omitted from this analysis as race is not reported.

Table 8: Racial heterogeneity in the effect of marijuana legalization on child maltreatment

	All reports			Substantiated reports		
	Any maltreatment	Neglect	Physical abuse	Any maltreatment	Neglect	Physical abuse
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: White children						
1 (MML)	-2.747* (1.401)	-1.006 (1.005)	-1.745** (0.693)	-0.022 (0.477)	0.591 (0.453)	-0.295** (0.145)
1 (RML)	-0.857 (1.868)	-4.298*** (1.506)	-1.813 (1.325)	-1.262** (0.578)	-1.255*** (0.433)	-0.483* (0.242)
Observations	7,408	7,408	7,408	7,408	7,408	7,408
Pre-Treatment Mean (MML)	30.226	19.794	9.299	7.480	5.350	1.467
Impact(%) (MML)	-9.089	-5.084	-18.768	-0.299	11.037	-20.135
Effect Size (MML)	0.217	0.097	0.334	0.005	0.140	0.252
Pre-Treatment Mean (RML)	30.238	19.711	8.739	7.158	4.739	1.426
Impact(%) (RML)	-2.836	-21.803	-20.750	-17.630	-26.486	-33.864
Effect Size (RML)	0.124	0.709	0.660	0.622	1.015	0.943
Panel B: Black children						
1 (MML)	-6.783* (3.614)	-2.819 (2.452)	-4.087** (1.525)	0.405 (1.995)	1.859 (1.964)	-0.478 (0.525)
1 (RML)	0.070 (5.905)	-7.763* (3.981)	-2.294 (2.585)	-1.809 (2.450)	-1.515 (2.074)	-1.261** (0.574)
Observations	7,408	7,408	7,408	7,408	7,408	7,408
Pre-Treatment Mean (MML)	108.607	69.980	35.785	30.970	21.372	7.641
Impact(%) (MML)	-6.245	-4.029	-11.420	1.308	8.696	-6.260
Effect Size (MML)	0.177	0.088	0.250	0.023	0.122	0.090
Pre-Treatment Mean (RML)	90.807	52.672	30.600	22.366	12.595	6.771
Impact(%) (RML)	0.077	-14.738	-7.496	-8.088	-12.025	-18.629
Effect Size (RML)	0.003	0.433	0.185	0.155	0.205	0.250
State, year, and month FE	Yes	Yes	Yes	Yes	Yes	Yes
State-specific linear trends	Yes	Yes	Yes	Yes	Yes	Yes
Time-varying controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes: NCANDS Child File, January 2003–June 2016. Time varying state-level controls include population demographics, unemployment rate, median household income, TANF expenditures, level of family social worker employment, and an indicator for marijuana decriminalization. Standard errors are estimated allowing for clustering at the state level. *** significant at 1%; ** significant at 5%; * significant at 10%. ^a Pennsylvania and Georgia are omitted from this analysis as race is not reported.

Table 9: Gender heterogeneity in the effect of marijuana legalization on child maltreatment

	All reports			Substantiated reports		
	Any maltreatment	Neglect	Physical abuse	Any maltreatment	Neglect	Physical abuse
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Female children						
1(MML)	-4.291** (1.970)	-1.610 (1.552)	-2.299*** (0.647)	-0.495 (0.722)	0.401 (0.727)	-0.403*** (0.145)
1(RML)	0.149 (2.870)	-5.371** (2.484)	-2.413 (1.781)	-0.731 (1.139)	-0.901 (0.611)	-0.529* (0.273)
Observations	7,564	7,564	7,564	7,564	7,564	7,564
Pre-Treatment Mean (MML)	43.529	27.429	13.227	11.679	7.832	2.347
Impact(%) (MML)	-9.858	-5.870	-17.378	-4.236	5.120	-17.163
Effect Size (MML)	0.295	0.105	0.463	0.079	0.068	0.277
Pre-Treatment Mean (RML)	56.276	33.342	15.957	14.137	8.539	2.745
Impact(%) (RML)	0.265	-16.110	-15.124	-5.172	-10.553	-19.256
Effect Size (RML)	0.011	0.482	0.507	0.097	0.172	0.333
Panel B: Male children						
1(MML)	-5.183** (2.142)	-2.057 (1.659)	-2.907*** (0.732)	-0.892 (0.874)	0.243 (0.833)	-0.576*** (0.184)
1(RML)	-0.500 (3.092)	-6.026** (2.990)	-2.863 (2.029)	-1.040 (1.075)	-1.159* (0.617)	-0.545* (0.320)
Observations	7,564	7,564	7,564	7,564	7,564	7,564
Pre-Treatment Mean (MML)	46.924	30.965	15.705	12.139	8.954	2.769
Impact(%) (MML)	-11.045	-6.644	-18.508	-7.350	2.710	-20.817
Effect Size (MML)	0.317	0.120	0.491	0.127	0.037	0.335
Pre-Treatment Mean (RML)	54.668	33.573	17.980	12.659	8.315	3.083
Impact(%) (RML)	-0.914	-17.949	-15.921	-8.215	-13.941	-17.668
Effect Size (RML)	0.048	0.696	0.626	0.174	0.278	0.356
State, year, and month FE	Yes	Yes	Yes	Yes	Yes	Yes
State-specific linear trends	Yes	Yes	Yes	Yes	Yes	Yes
Time-varying controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes: NCANDS Child File, January 2003–June 2016. Time varying state-level controls include population demographics, unemployment rate, median household income, TANF expenditures, level of family social worker employment, and an indicator for marijuana decriminalization. Standard errors are estimated allowing for clustering at the state level. *** significant at 1%; ** significant at 5%; * significant at 10%. ^a Georgia is omitted from this analysis as the child's gender is not reported.

Table 10: Perpetrator gender, and the effect of marijuana legalization on child maltreatment

	Substantiated reports		
	Any maltreatment	Neglect	Physical abuse
	(1)	(2)	(3)
Panel A: Female perpetrators			
1(MML)	-0.910 (1.426)	0.231 (1.323)	-0.434* (0.241)
1(RML)	-1.458 (1.303)	-1.692* (0.899)	-0.551* (0.304)
Observations	7,564	7,564	7,564
Pre-Treatment Mean (MML)	16.464	13.221	2.970
Impact(%) (MML)	-5.530	1.748	-14.611
Effect Size (MML)	0.083	0.024	0.216
Pre-Treatment Mean (RML)	15.815	12.420	2.516
Impact(%) (RML)	-9.217	-13.622	-21.891
Effect Size (RML)	0.157	0.223	0.366
Panel B: Male perpetrators			
1(MML)	-0.916 (0.584)	0.392 (0.504)	-0.568** (0.226)
1(RML)	-1.559 (1.177)	-1.731*** (0.626)	-0.525 (0.422)
Observations	7,564	7,564	7,564
Pre-Treatment Mean (MML)	10.538	5.433	3.056
Impact(%) (MML)	-8.694	7.221	-18.571
Effect Size (MML)	0.164	0.074	0.355
Pre-Treatment Mean (RML)	10.837	4.237	3.082
Impact(%) (RML)	-14.391	-40.856	-17.049
Effect Size (RML)	0.281	0.678	0.305
State, year, and month FE	Yes	Yes	Yes
State-specific linear trends	Yes	Yes	Yes
Time-varying controls	Yes	Yes	Yes

Notes: NCANDS Child File, January 2003–June 2016. Time varying state-level controls include population demographics, unemployment rate, median household income, TANF expenditures, level of family social worker employment, and an indicator for marijuana decriminalization. Standard errors are estimated allowing for clustering at the state level. *** significant at 1%; ** significant at 5%; * significant at 10%. ^a Georgia is omitted from this analysis as perpetrator gender is not reported.

Table 11: Perpetrator age, and the effect of marijuana legalization on child maltreatment

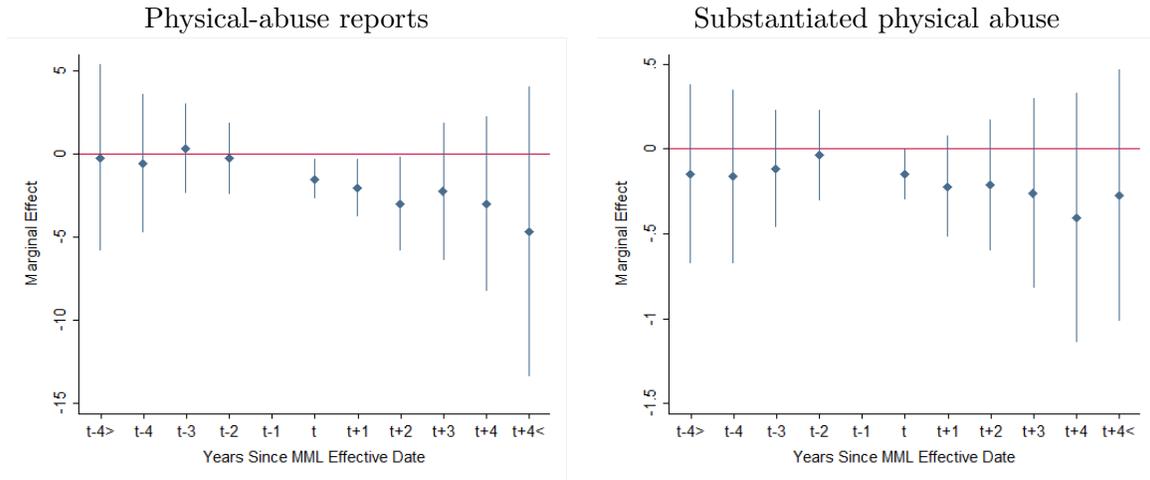
	Substantiated reports		
	Any maltreatment	Neglect	Physical abuse
	(1)	(2)	(3)
Panel A: Ages 18-24			
ℓ(MML)	-0.089 (1.735)	2.316 [*] (1.679)	-0.422 (0.293)
ℓ(RML)	-1.454 (3.339)	-1.767 (1.640)	-1.040 [*] (0.584)
Observations	7,564	7,564	7,564
Pre-Treatment Mean (MML)	20.340	14.614	3.042
Impact(%) (MML)	-0.436	15.851	-13.867
Effect Size (MML)	0.009	0.224	0.209
Pre-Treatment Mean (RML)	21.572	14.661	2.730
Impact(%) (RML)	-6.740	-12.050	-38.081
Effect Size (RML)	0.135	0.228	0.656
Panel B: Ages 25-44			
ℓ(MML)	-0.717 (3.066)	2.595 (2.832)	-1.370 ^{**} (0.651)
ℓ(RML)	-2.554 (7.249)	-3.291 (4.507)	-2.566 [*] (1.280)
Observations	7,564	7,564	7,564
Pre-Treatment Mean (MML)	31.314	23.539	6.725
Impact(%) (MML)	-2.290	11.023	-20.367
Effect Size (MML)	0.038	0.144	0.356
Pre-Treatment Mean (RML)	32.186	22.388	6.212
Impact(%) (RML)	-7.935	-14.701	-41.304
Effect Size (RML)	0.153	0.265	0.888
Panel C: Ages 44+			
ℓ(MML)	0.301 (0.967)	0.346 (0.609)	0.006 (0.218)
ℓ(RML)	-1.057 (1.136)	-1.125 [*] (0.563)	-0.330 (0.312)
Observations	7,564	7,564	7,564
Pre-Treatment Mean (MML)	6.895	4.167	1.742
Impact(%) (MML)	4.362	8.294	0.361
Effect Size (MML)	0.042	0.086	0.003
Pre-Treatment Mean (RML)	6.080	3.174	1.648
Impact(%) (RML)	-17.389	-35.461	-20.013
Effect Size (RML)	0.221	0.380	0.226
State, year, and month FE	Yes	Yes	Yes
State-specific linear trends	Yes	Yes	Yes
Time-varying controls	Yes	Yes	Yes

Notes: NCANDS Child File, January 2003–June 2016. Time varying state-level controls include population demographics, unemployment rate, median household income, TANF expenditures, level of family social worker employment, and an indicator for marijuana decriminalization. Standard errors are estimated allowing for clustering at the state level. *** significant at 1%; ** significant at 5%; * significant at 10%. ^a Georgia is omitted from this analysis as perpetrator age is not reported.

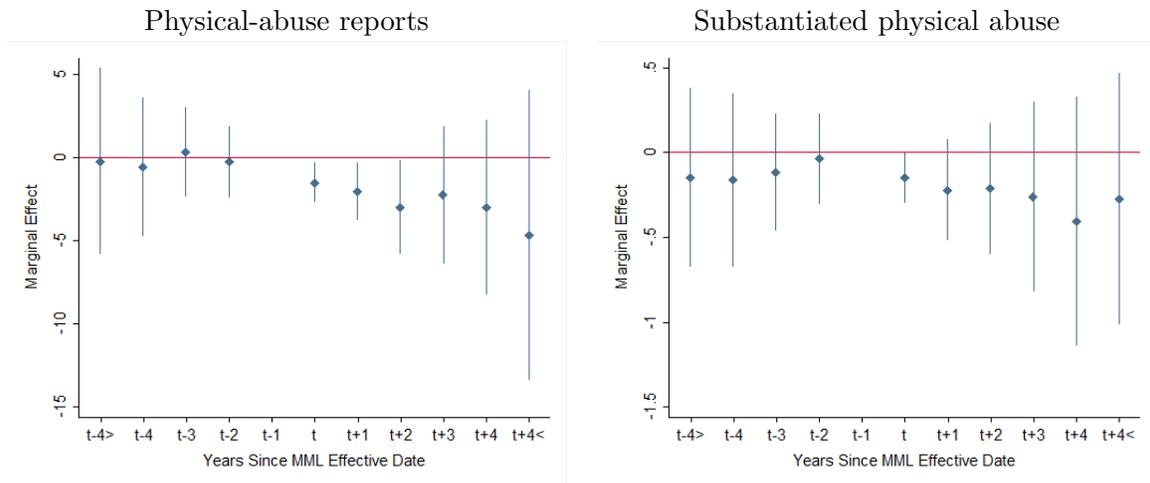
A Appendix

Figure A.1: MML on reported and substantiated physical abuse, by control group

Panel A: Controls restricted to 26 “Never-treated” states



Panel A: Controls restricted to 8 “Always-treated” states



Notes: We report coefficient estimates, and the 95-percent confidence intervals, for leading and lagged treatment indicators, from an OLS regression that includes state, month, and year fixed effects, state-specific linear time trends, and time-varying state-specific covariates (percent black, percent white, unemployment rate, median household income, TANF expenditures, level of family social worker employment, and an indicator for marijuana decriminalization). Standard errors are estimated allowing for clustering at the state-level.

Table A.1: Omitting states with missing state-month observations in NCANDS data

	All reports			Substantiated reports		
	Any maltreatment	Neglect	Physical abuse	Any maltreatment	Neglect	Physical abuse
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Full sample						
ℓ(MML)	-3.851 (2.509)	-1.094 (2.144)	-2.635 ^{***} (0.818)	-0.124 (1.207)	1.094 (1.195)	-0.360 ^{**} (0.177)
Observations	7,705	7,705	7,705	7,705	7,705	7,705
Pre-Treatment Mean	64.319	42.965	20.076	17.753	12.728	3.755
Impact (%) at Pre-Treatment Mean	-6.0	-2.5	-13.1	-0.7	7.9	-9.6
Effect Size	0.200	0.052	0.383	0.012	0.107	0.164
Panel B: Balanced subsample of states						
ℓ(MML)	-3.473 (2.749)	0.178 (2.199)	-3.674 ^{***} (0.995)	0.411 (1.340)	1.716 (1.286)	-0.586 ^{***} (0.202)
Observations	5,646	5,646	5,646	5,646	5,646	5,646
Pre-Treatment Mean	65.652	45.141	20.812	18.638	13.850	3.876
Impact (%) at Pre-Treatment Mean	-5.3	0.4	-17.7	2.2	12.4	-15.1
Effect Size	0.196	0.008	0.528	0.039	0.172	0.257
State, Month, and Year FEs	Yes	Yes	Yes	Yes	Yes	Yes
State Specific Linear Trends	Yes	Yes	Yes	Yes	Yes	Yes
State-level Controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes: NCANDS Child File, January 2003–June 2016. Time varying state-level controls include population demographics, unemployment rate, median household income, marijuana decriminalization, and state-level fractions of total treatment admissions for methamphetamine, heroin, and alcohol. Standard errors are estimated allowing for clustering at the state level. *** significant at 1%; ** significant at 5%; * significant at 10%.

Table A.2: MML on reported and substantiated maltreatment, invariance to control groups

	Total reports		
	Any Maltreatment	Neglect	Physical Abuse
	(1)	(2)	(3)
Panel A: Controls restricted to 26 “Never treated” states			
ℓ(MML)	-3.564 (2.530)	-1.051 (2.172)	-2.368*** (0.821)
Observations	6,406	6,406	6,406
Pre-Treatment Mean	64.319	42.965	20.076
Impact (%) at Pre-Treatment Mean	-5.5	-2.4	-11.8
Effect Size	0.185	0.050	0.344
Panel B: Controls restricted to 8 “Always treated” states			
ℓ(MML)	-3.241 (2.440)	-0.410 (2.139)	-2.140** (0.823)
Observations	3,593	3,593	3,593
Pre-Treatment Mean	64.319	42.965	20.076
Impact (%) at Pre-Treatment Mean	-5.0	-1.0	-10.7
Effect Size	0.168	0.020	0.311
	Substantiated reports		
	Any Maltreatment	Neglect	Physical Abuse
	(1)	(2)	(3)
Panel C: Controls restricted to 26 “Never treated” states			
ℓ(MML)	-0.066 (1.197)	0.954 (1.178)	-0.350* (0.180)
Observations	6,406	6,406	6,406
Pre-Treatment Mean	17.753	12.728	3.755
Impact (%) at Pre-Treatment Mean	-0.4	7.5	-9.3
Effect Size	0.007	0.101	0.159
Panel D: Controls restricted to 8 “Always treated” states			
ℓ(MML)	0.027 (1.215)	1.146 (1.207)	-0.277 (0.178)
Observations	3,593	3,593	3,593
Pre-Treatment Mean	17.753	12.728	3.755
Impact (%) at Pre-Treatment Mean	0.2	9.0	-7.4
Effect Size	0.003	0.122	0.126
State, year, and month FE	Yes	Yes	Yes
State-specific linear trends	Yes	Yes	Yes
Time-varying controls	Yes	Yes	Yes

Notes: NCANDS Child File, January 2003–June 2016. Time varying state-level controls include population demographics, unemployment rate, median household income, TANF expenditure, level of family social worker employment, and marijuana decriminalization. Standard errors are estimated allowing for clustering at the state level. *** significant at 1%; ** significant at 5%; * significant at 10%.

Table A.3: Alternative Models

	All reports			Substantiated reports		
	Any maltreatment	Neglect	Physical abuse	Any maltreatment	Neglect	Physical abuse
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Inverse hyperbolic sine transformation						
ℓ(MML)	-0.061 (0.038)	-0.041 (0.046)	-0.114*** (0.037)	0.014 (0.078)	0.081 (0.121)	-0.091* (0.049)
Observations	7,705	7,705	7,705	7,705	7,705	7,705
Panel B: Negative Binomial						
ℓ(MML)	-183.185 (124.194)	-109.501 (103.857)	-118.118*** (39.119)	56.134 (75.406)	58.883 (68.779)	-24.680** (11.152)
Observations	7,705	7,705	7,705	7,705	7,705	7,705
Pre-Treatment Mean	3343.006	2495.667	980.512	948.709	749.773	194.594
Impact (%) at Pre-Treatment Mean	-5.5	-4.4	-12.0	5.9	7.9	-12.7
Effect Size	0.049	0.031	0.123	0.048	0.054	0.121
State, Month, and Year FEs	Yes	Yes	Yes	Yes	Yes	Yes
State Specific Linear Trends	Yes	Yes	Yes	Yes	Yes	Yes
State-level Controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes: NCANDS Child File, January 2003–June 2016. Time varying state-level controls include population demographics, unemployment rate, median household income, marijuana decriminalization, and state-level fractions of total treatment admissions for methamphetamine, heroin, and alcohol. Standard errors are estimated allowing for clustering at the state level. *** significant at 1%; ** significant at 5%; * significant at 10%.

Table A.4: Omitting state-month observations missing in TEDS data

	All reports			Substantiated reports		
	Any maltreatment	Neglect	Physical abuse	Any maltreatment	Neglect	Physical abuse
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Full Sample						
ℓ(MML)	-3.851 (2.509)	-1.094 (2.144)	-2.635 ^{***} (0.818)	-0.124 (1.207)	1.094 (1.195)	-0.360 ^{**} (0.177)
Observations	7,705	7,705	7,705	7,705	7,705	7,705
Pre-Treatment Mean	64.319	42.965	20.076	17.753	12.728	3.755
Impact (%) at Pre-Treatment Mean	-6.0	-2.5	-13.1	-0.7	7.9	-9.6
Effect Size	0.200	0.052	0.383	0.012	0.107	0.164
Panel B: TEDS subsample						
ℓ(MML)	-3.736 (2.595)	-1.175 (2.192)	-2.776 ^{***} (0.824)	0.046 (1.112)	1.053 (1.118)	-0.317 [*] (0.168)
Observations	7,130	7,130	7,130	7,130	7,130	7,130
Pre-Treatment Mean	64.319	42.965	20.076	17.753	12.728	3.755
Impact (%) at Pre-Treatment Mean	-5.8	-2.7	-13.8	0.3	8.3	-8.4
Effect Size	0.194	0.056	0.404	0.005	0.112	0.144
State, Month, and Year FEs	Yes	Yes	Yes	Yes	Yes	Yes
State Specific Linear Trends	Yes	Yes	Yes	Yes	Yes	Yes
State-level Controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes: NCANDS Child File, January 2003–June 2016. Time varying state-level controls include population demographics, unemployment rate, median household income, marijuana decriminalization, and state-level fractions of total treatment admissions for methamphetamine, heroin, and alcohol. Standard errors are estimated allowing for clustering at the state level. *** significant at 1%; ** significant at 5%; * significant at 10%.