



HHS Public Access

Author manuscript

Child Youth Serv Rev. Author manuscript; available in PMC 2022 November 01.

Published in final edited form as:

Child Youth Serv Rev. 2021 November ; 130: . doi:10.1016/j.chilyouth.2021.106249.

Impact of Medicaid expansion and methadone coverage as a medication for opioid use disorder on foster care entries during the opioid crisis

Shichao Tang^{a,*}, Jennifer L. Matjasko^a, Christopher R. Harper^a, Whitney L. Rostad^a, Katie A. Ports^a, Andrea E. Strahan^b, Curtis Florence^c

^aDivision of Violence Prevention, National Center for Injury Prevention and Control, Centers for Disease Control and Prevention, United States

^bDivision of Overdose Prevention, National Center for Injury Prevention and Control, Centers for Disease Control and Prevention, United States

^cDivision of Injury Prevention, National Center for Injury Prevention and Control, Centers for Disease Control and Prevention, United States

Abstract

Between 2012 and 2018, incidents of opioid-involved injuries surged and the number of children in foster care due to parental drug use disorder increased. Treatments for opioid use disorder (OUD) might prevent or reduce the amount of time that children spend in the child welfare system. Using administrative data, we examined the impact of Medicaid expansion and state support for methadone as a medication for opioid use disorder (MOUD) on first-time foster care placements. Results show that first-time foster care entries due to parental drug use disorder experienced a reduction of 28 per 100,000 children in Medicaid expansion states with methadone MOUD covered by their state Medicaid programs. The largest reduction was found among non-Hispanic Black children and the youngest children (age 0–1 years). Policies that increase OUD treatment access may reduce foster care placements by reducing parents' drug use, a risk factor for child abuse/neglect and subsequent home removal.

*Corresponding author at: Division of Diabetes Translation, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, Mailstop S107-3, 4770 Buford Highway, NE, Atlanta, GA 30341, United States. stang2@cdc.gov (S. Tang).

CRedit authorship contribution statement

Shichao Tang, Jennifer L. Matjasko: Conceptualization. **Shichao Tang:** Data curation, Formal analysis, Methodology, Writing - original draft. **Jennifer L. Matjasko, Christopher R. Harper, Whitney L. Rostad, Katie A. Ports, Andrea E. Strahan, Curtis Florence:** Writing - review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Publisher's Disclaimer: Disclaimer

Publisher's Disclaimer: The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

Appendix A. Supplementary material

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.chilyouth.2021.106249>.

Keywords

Foster care; Medicaid expansion; Opioid use disorder; Child abuse and neglect; Methadone

1. Introduction

In 2017, 910 per 100,000 children were victims of child abuse and neglect (CAN) in the United States, 2.7 percent higher than the rate in 2013 (Children's Bureau, 2019b). CAN is an adverse childhood experience (ACE). ACEs are preventable, potentially traumatic events that occur in childhood (0–17 years) such as experiencing violence, abuse, or neglect; witnessing violence in the home; and having a family member attempt or die by suicide (Centers for Disease Control and Prevention, 2019). Parental substance use is an ACE and is associated with diminishing parenting, child neglect and unintentional poisoning (Winstanley & Stover, 2019). ACEs are associated with a wide range of adverse behavioral and health outcomes, including engaging in risky health behaviors like smoking and drinking, depression, overweight/obesity, and other chronic diseases (Merrick et al., 2019). ACEs are a public health problem making the primary prevention of CAN and other ACEs a critical vehicle for improving population health.

Parental substance use may result in identified cases of CAN which could result in a child being removed from the home and placed in foster care. As such, foster care placement is a strong proxy for substantiated CAN incidence (Children's Bureau, 2020). Between 2012 and 2018, the number of children in foster care increased by 10 percent nationally, ending more than a decade of sustained decline (Children's Bureau, 2017, 2019a). Over the same period, incidents of opioid-involved inpatient stays, emergency department visits and death increased substantially (Agency for Healthcare Research and Quality; Hedegaard, Warner, & Miniño, 2018), and may be contributing to increases in foster care placements (Ghertner, Baldwin, Crouse, Radel, Waters, 2018). For example, areas with high rates of drug overdose deaths and drug-related hospitalizations are more likely to have high rates of CAN reports and foster care placements (Ghertner, Waters, Radel, & Crouse, 2018). Foster care entries due to parental drug use increased dramatically between 2000 and 2017 (Meinhofer & Angleró-Díaz, 2019). Infants and toddlers account for a large proportion of the foster care entries and are more likely than older children to enter foster care due to neglect and parental drug use disorder (Williams & Sepulveda, 2019). The number of infants with neonatal abstinence syndrome (NAS) reported to child protective services (CPS) increased from 2010 to 2014 (Lynch, Sherman, Snyder, & Mattson, 2018). Research has shown that medically diagnosed neonatal withdrawal was strongly associated with an infant's chance of being sent to foster care (Prindle, Hammond, & Putnam-Hornstein, 2018). The opioid crisis also differentially affected racial/ethnic groups (Hansen & Netherland, 2016) making racial/ethnic differences an important consideration in advancing our understanding about the relationship between opioid use disorder (OUD) and CAN. For example, areas with a larger proportion of the Black population also have lower buprenorphine treatment rates for OUD (Stein et al., 2018). Barriers such as unstable housing or lack of language proficiency may make Blacks and Hispanics less likely to complete OUD treatment (Stahler & Mennis,

2018); among people who use heroin, Whites are less likely to receive OUD treatment than Blacks and Hispanics (Krawczyk, Feder, Fingerhood, & Saloner, 2017).

Families experiencing CAN and involved with the foster care system are more likely to be low-income and living below the federal poverty line than the general population (Barth, Wildfire, & Green, 2006). In addition, populations with less economic resources and opportunities have significant unmet need for behavioral health and substance use disorder (SUD) treatment including OUD (Busch, Meara, Huskamp, & Barry, 2013). According to a recent report (Children's Bureau, 2020), 34% of the children entering foster care during 2019 had parents experiencing drug use disorder and it was the second most common reason for removal following neglect. Parental substance use disorder was linked to a higher risk of exposure to child physical and sexual abuse (Walsh, MacMillan, & Jamieson, 2003) and child neglect (Dunn et al., 2002), which may lead to the removal of children from their homes. An ecological analysis in California showed a positive association between county-level rates of residents who were prescribed a high dose of opioids and rates of child removal (Quast, Bright, & Delcher, 2019). In addition, parents with an OUD may be less likely to be reunified with their children after child removal (Winstanley & Stover, 2019). Providing affordable, evidence-based treatment for SUD, including OUD, to all families may decrease the risk of CAN which may also reduce or prevent foster care entries.

There are evidence-based treatments for SUD that might prevent or reduce the amount of time that children spend in the child welfare system. Previous research found that parents separated from their children due to SUD who completed SUD treatment were more likely to experience family reunification (Choi, Huang, & Ryan, 2012). Medication for Opioid Use Disorder (MOUD) (Substance Abuse and Mental Health Services Administration, 2020) or Medication-Assisted Treatment (MAT) is an effective approach for the treatment of OUD, a type of SUD (Substance Abuse and Mental Health Services Administration). Though buprenorphine and methadone are both FDA approved medications for the treatment of OUD (Substance Abuse and Mental Health Services Administration), they work differently. For instance, methadone is an opioid agonist that eliminates withdrawal symptoms by acting on opioid receptors. Buprenorphine is a partial opioid agonist, meaning that it acts on opioid receptors but activates them less strongly than full agonists (National Institute on Drug Abuse, 2018). Patients taking methadone to treat OUD must receive the medication through a certified opioid treatment program under the supervision of a physician (Substance Abuse and Mental Health Services Administration). Buprenorphine may be prescribed or dispensed in physician offices, if the practitioner has a waiver under the Drug Addiction Treatment Act of 2000 (DATA 2000) (Substance Abuse and Mental Health Services Administration). Buprenorphine and methadone MOUD also differ in access and insurance coverage. For instance, buprenorphine MOUD can be prescribed in an outpatient setting, while methadone MOUD is only dispensed in regulated clinics (Substance Abuse and Mental Health Services Administration). Buprenorphine is now covered in some form by every state Medicaid program (i.e., there is little to no between-state variation in buprenorphine coverage) (The American Society of Addiction Medicine, 2013), while methadone was only covered by 31 states as of 2015 (The Medicaid and CHIP Payment and Access Commission, 2016), which makes it challenging for Medicaid beneficiaries who live in states not covering methadone to receive this treatment. A previous study found that states with methadone MOUD coverage

have higher OUD treatment utilization than states without coverage for methadone MOUD (Meinhofer & Witman, 2018).

Access to health insurance may improve access to MOUD. A prior study found that among adults with depression, Medicaid expansions were associated with an increase in the probability of receiving mental health treatment (Wen, Druss, & Cummings, 2015). The Patient Protection and Affordable Care Act (ACA) originally mandated all states to expand Medicaid to 138% (The Medicaid and CHIP Payment and Access Commission) of the federal poverty level in 2014 which may be particularly salient support for low income populations with disproportionate risk for SUD and CAN. The Supreme Court struck down the mandate and gave states the choice about whether to expand Medicaid (The Medicaid and CHIP Payment and Access Commission). Thirty-two states expanded Medicaid as of December 2016, increasing Medicaid eligibility for some low-income adults and potentially improving access to health care including MOUD. Newly eligible families in Medicaid expansion states experiencing OUD may have gained greater access to OUD treatment through expanded insurance coverage. In addition, Medicaid expansion can improve access to MOUD for eligible families, but not all states cover methadone MOUD, which may be an important driver of treatment success. Policies related to parents' health insurance and access to mental health care, such as Medicaid expansion, may reduce CAN. For instance, such policies improve parents' access to care for conditions that can increase risk for CAN such as anxiety and drug use disorder (Klevens, Barnett, Florence, & Moore, 2015). One study investigated the impact of Medicaid expansion on CAN and found that Medicaid expansion is associated with a reduction in the reported child neglect rate (Brown et al., 2019).

Previous literature suggests that Medicaid expansion and methadone MOUD coverage reduced the OUD treatment gap (Meinhofer & Witman, 2018; Saloner, Levin, Chang, Jones, & Alexander, 2018). However, no previous studies have examined the impact of the reduction of the treatment gap on the child welfare system. To our knowledge, this is the first study to investigate the impact of Medicaid expansion and methadone MOUD coverage and their interplay on foster care placement, a strong indicator of CAN. This study tests the following hypotheses: (1) state Medicaid expansion is associated with declines in first-time foster care placement due to parental drug use disorder; (2) the rate of first-time foster care placement due to parental drug use disorder decreases in Medicaid expansion states with methadone MOUD coverage.

2. Material and methods

2.1. Data

Data from 2007 to 2016 Adoption and Foster Care Analysis and Reporting System (AFCARS), an administrative dataset that collects case-level information on all children in foster care from all 50 states and the District of Columbia, were used (Children's Bureau, Department of Health and Human Services, 2019). The 2017 data are available but many states started covering methadone for MOUD in 2017 (Substance Abuse and Mental Health Services Administration, 2018; The Medicaid and CHIP Payment and Access Commission, 2016) and it takes time for these policy changes to take effect, so we only examined the data

until 2016. This study was deemed exempt by the Institutional Review Board of the author's institution.

2.2. Measures

2.2.1. Dependent variable—Although the AFCARS database is collected by fiscal year, foster care entries in this study were recoded based on calendar year. The primary outcome variable is the annual number of foster care entries per 100,000 children. We focused our analyses on children aged 17 years or younger who entered foster care for the first time ($N = 2,126,408$) because (1) the first-time entry is more relevant to the primary prevention of CAN than re-entries; and (2) foster care re-entries have different characteristics (Frame, Berrick, & Brodowski, 2000) and experiences in foster care (Connell et al., 2006) than first-time entries making them a qualitatively different group. We further focused on children who entered the foster care system with “parental drug abuse” as one of the reasons for removal, referred to in this study as “drug use disorder” ($N = 600,056$) (see Appendix for definition). There are inconsistencies in removal reasons across states, such as under-reporting of parental drug use disorder, so a sensitivity analysis that excludes states which may under-report, as indicated by an unusual low proportion of foster care entries due to parental drug use disorder, was conducted to address this issue. The number of entries per year was aggregated at the state level.

2.2.2. Independent variables—The Medicaid expansion variable was obtained from multiple sources to ensure accuracy (see Table A3). States expanded Medicaid under the ACA starting in January 2014, with a small number expanding earlier through Section 1115 waivers. Medicaid coverage of methadone MOUD data was based on coverage in September 2015 from the Medicaid and CHIP Payment and Access Commission (see Table A4) that reflects the coverage status as of September 2015. This coverage status is consistent with the data collected by The American Society of Addiction Medicine (The American Society of Addiction Medicine, 2013).

2.2.3. Covariates—Variables that might change over time as well as influence the outcomes were controlled including indicators of the capacity/availability of CAN and OUD services, including state-level CPS response time (an indicator of CPS capacity) to control for capacity of the foster care system in each state, availability of buprenorphine/methadone MOUD treatment facilities to control for variations in the availability of MOUD treatment at the state level, buprenorphine license limits (an indicator of potential buprenorphine treatment capacity) to control for capacity of buprenorphine treatment. We controlled for MOUD treatment availability because prior evidence suggested that SUD including OUD treatment increases the chance of family reunification (Green, Rockhill, & Furrer, 2007; Grella, Needell, Shi, & Hser, 2009). We also included drug mortality rate (Ghertner, Waters, et al., 2018) and Medicaid opioid prescription rate to control for changes in the opioid overdose epidemic over time (Quast et al., 2019). Other socio-economic variables were included to control for social-economic changes over time (Ghertner, Waters, et al., 2018; Rostad, Ports, Tang, & Klevens, 2020) such as child poverty rate, percentage of non-Hispanic White population, high school or GED graduation rate (ages 25–65

years), uninsured rate, and annual unemployment rate (see definitions of covariates in the Appendix).

2.3. Statistical Analyses.

The difference-in-differences specification in an ordinary least square regression model with state- and year-fixed effects was used to examine the impact of state Medicaid expansion on first-time foster care entries due to parental drug use disorder. The detailed model is provided in Eq. (1). To investigate the impact of the Medicaid coverage of methadone MOUD, we followed a previous study (Meinhofer & Witman, 2018) and utilized a separate model with an additional interaction term of Medicaid expansion and methadone MOUD coverage added to the first model (see Eq. (2)). Stratified analyses by age and racial/ethnic groups were conducted to examine the heterogeneity of the policies' impacts. Prior research suggests that the opioid crisis disproportionately impacted infants and toddlers (Lynch et al., 2018; Prindle et al., 2018), and racial/ethnic groups (Hansen & Netherland, 2016; Stein et al., 2018), so the policies may affect racial and ethnic groups differently and the impact may vary by child age. An event study was conducted to test if Medicaid expansion is endogenous and to measure the lagged effects of Medicaid expansions (see Eq. (3)). At the end of the analyses, falsification test and sensitivity analysis were conducted to test the robustness of our results.

$$Y_{st} = \alpha + \beta_1 \text{Expansion}_{st} + \theta X_{st} + \gamma \text{State}_s + \varphi \text{Year}_t + \varepsilon_{st} \quad (1)$$

where Y_{st} is the number of reported foster care entries per 100,000 child population in state s at time t . X_{st} includes CPS response time, DATA2000 buprenorphine license limit, methadone MOUD facility availability, buprenorphine MOUD facility availability, drug mortality rate, Medicaid opioid prescription rate, child poverty, race/ethnicity, education, uninsured rate, and unemployment controls. State_s and Year_t represent state and year dummy variables that control for state and year fixed effects. The state fixed effect controls for time-invariant state-specific factors that potentially affect foster care entries. The year fixed effect controls for temporal shocks common to all states that may affect foster care entries. Standard errors of the coefficient estimates are clustered at the state level (Bertrand, Duflo, & Mullainathan, 2004).

$$Y_{st} = \alpha + \beta_1 \text{Expansion}_{st} + \beta_2 \text{Expansion}_{st} \times \text{Methadone}_s + \theta X_{st} + \gamma \text{State}_s + \varphi \text{Year}_t + \varepsilon_{st} \quad (2)$$

The only difference between Eq. (1) and Eq. (2) is the interaction term. β_2 represents the differential impact of Medicaid coverage of methadone MOUD in those states expanding Medicaid. $\beta_1 + \beta_2$ represents the impact of Medicaid expansion and methadone coverage.

The underlying assumption of the difference-in-differences model is that the policy examined is not endogenous, meaning that the changes of the foster care entries were not attributed to the decision of adopting Medicaid expansion. To test this assumption, we conducted an event study (see Eq. (3)) to test if β_j is statistically not different from zero. We also used the event study to measure the lagged effects of Medicaid expansions. The

event study is an important analysis framework in policy evaluation research to examine anticipation effects and phase-in effects in response to a policy in a regression model (Wing, Simon, & Bello-Gomez, 2018). We estimated the following model to conduct this event study.

$$Y_{st} = \alpha + \sum_{j=-5+}^{-1} \beta_j E_{st}(j = t - k) + \sum_{m=1}^{5+} \beta_m E_{st}(m = t - k) + \theta X_{st} + \gamma State_s + \varphi Year_t + \varepsilon_{st} \quad (3)$$

This model is the event study extension of Eq. (1). k is the year of expansion in state s . $t - k$ is the number of years before expansion or after expansion. The dummy variable $E_{st}(j = t - k)$ indicating expansion status equals one if the number of years before expansion equals j , otherwise zero. The dummy variable $E_{st}(m = t - k)$ indicating expansion status equals one if the number of years after expansion equals m , otherwise zero. The reference group is the year when a state expanded Medicaid.

3. Results

3.1. Main results

Descriptive statistics are presented in Table 1. Table 2 (Eq. (1)) shows the results of estimated impact of Medicaid expansion on the foster care entries due to parental drug use disorder. The estimated impacts by race/ethnicity and age are also presented in Table 2. This association of Medicaid expansion with foster care entries due to parental drug use disorder was not statistically significant. Effects by race/ethnicity subgroups or age subgroups were also not significant. Fig. 1 shows the results of the event study of the first model. Since Medicaid expansion may not take effect immediately, we examined the lagged effects of the expansion. None of the coefficients for the time before Medicaid expansion were statistically significant and those coefficients were close to zero suggesting that Medicaid expansion is not endogenous. In other words, there was no evidence that prior levels of foster care placements were correlated with a state choosing to expand Medicaid. The post-expansion coefficients presented in Fig. 1 represent a certain number of years lagged impact of Medicaid expansion on first-time foster care entries due to parental drug use disorder. The magnitude of the impact of Medicaid expansion gradually increased after expansion but none of the coefficients for the time after expansion were statistically significant.

Fig. 2 demonstrates first-time foster care entries due to parental drug use disorder over time by two policies that may affect families struggling with OUD: (1) Medicaid expansion and (2) Medicaid coverage of methadone MOUD. Fig. 2A and 2B show how methadone MOUD coverage is associated with the outcome among states that did not and did expand Medicaid respectively. The three solid horizontal lines represent three major times when states expanded Medicaid. Fig. 2A shows that among states that did not expand Medicaid, the states that covered methadone experienced a lower increase in first-time foster care entries due to parental drug use disorder since 2012. Fig. 2B shows a similar trend among states that expanded Medicaid since 2011 but the difference of the increase is much greater

than states that did not expand Medicaid. Both Fig. 2A and B provide descriptive evidence that the changes of first-time foster care entries due to parental drug use disorder were different by methadone MOUD coverage status among both non-expansion states and expansion states.

Table 3 (Eq. (2)) shows that first-time foster care entries due to parental drug use disorder in Medicaid expansion states with coverage of methadone MOUD experienced a significant reduction (-27.5 per 100,000, $p < 0.01$). This represents a 33% decrease relative to the baseline mean of 84.6 per 100,000. The largest effect was found among non-Hispanic Black children (-92.8 per 100,000, $p < 0.05$), followed by non-Hispanic White (-28.7 per 100,000, $p < 0.01$) and Hispanic (-28.3 per 100,000, $p < 0.05$). The effect is largest among children age 0–1 years (-63.4 per 100,000, $p < 0.05$), followed by those age 2–5 years (-36.5 per 100,000, $p < 0.01$) and 6–17 years (-18.5 per 100,000, $p < 0.01$). Given the fact that the methadone MOUD coverage variable is a time-constant, we examined the association of methadone MOUD coverage with the first-time foster care entries due to parental drug use disorder in a one-way fixed effect model. The association was not statistically significant (see Table A5).

3.2. Falsification test and sensitivity analysis

In order to validly infer that the significant effect of combining Medicaid expansion and methadone MOUD coverage is related to foster care entries due to parental drug use disorder, it is important to conduct a series of falsification tests. Falsification tests involve running the same model on outcomes that are not theoretically related to the policy (the combination of Medicaid expansion and Medicaid coverage of methadone MOUD). The outcome in Eq. (2) was replaced with first-time foster care entries due to other removal reasons (all listed in Table 4) listed in AFCARS other than parental drug use disorder. For instance, if a foster care entry case listed both parental drug use disorder and neglect as the removal reasons, this case was excluded in our falsification test. Theoretically, we do not expect methadone MOUD coverage to be significantly related to foster care entries other than parental drug use disorder. Hence, we re-estimated our models using these other removal reasons as outcomes. Table 4 lists the falsification test results. None of the coefficients were significant, meaning that the combination of Medicaid expansion and methadone MOUD coverage was only related to first-time foster care entries due to parental drug use disorder but not related to first-time foster care entries due to other removal reasons.

As AFCARS data are collected by each individual state, reporting of foster care entries due to parental drug abuse may vary by states. It is possible that a child was sent to foster care due to multiple removal reasons including parental drug use disorder but “parental drug abuse” was not recorded as one of the removal reasons (Correia, 2013), which leads to under-reporting. To address the potential under-reporting issue, we excluded data from five states (New Hampshire, Illinois, Louisiana, California, and Delaware), the District of Columbia, and Arizona in 2013 due to an unusual low proportion of foster care entries due to parental drug use disorder in a sensitivity analysis. A state was excluded if it reported 70% lower than the national average after 2010 and had a consistent under-reporting

pattern. The sensitivity results were generally consistent with the results estimated by the main analysis results except that the impact of the Medicaid expansion and methadone MOUD coverage on first-time foster care entries due to parental drug use disorder was not significant among Hispanic children (see Table A6 to Table A8).

4. Discussion

The objective of this study was to understand the role of Medicaid expansion and Medicaid coverage of methadone MOUD in preventing CAN and related child removals during the opioid crisis. Specifically, we investigated the interplay of two health policies (Medicaid expansion and the Medicaid coverage of methadone MOUD) that address low-income adults' access to OUD treatment and how these two policies can work together to potentially prevent CAN and first-time foster care placements. This study tested two hypotheses: (1) that Medicaid expansion, the policy that significantly increased the low-income population's access to health care including OUD treatment would reduce the first-time foster care placement due to parental drug use disorder; and (2) that the interaction of Medicaid coverage with methadone MOUD would reduce foster care placements due to parental drug use disorder.

For the first hypothesis, Medicaid expansion was not significantly associated with declines in first time foster care placements. Two possible reasons for the non-significant findings could be the following: (1) most states expanded their Medicaid in 2014, which leaves only two years for comparison post-expansion and thus we do not have enough statistical power to detect a significant effect; and (2) as discussed earlier, Medicaid expansion may not take effect immediately and it may take even longer for Medicaid expansion to affect the child welfare system. For instance, the lack of timely and appropriate substance use treatment for parents in some communities after foster care placement (Radel, Baldwin, Crouse, Ghertner, & Waters, 2018) may lead to lagged effect. Therefore, we conducted an event study to examine the lagged policy effects over time. Though we did not find a statistically significant lagged effect, the event study demonstrated that the magnitude of the impact of Medicaid expansion gradually increased at least a year post-expansion. Additional years of data may be required to adequately detect a lagged effect between Medicaid expansion and foster care entries due to parental drug use disorder.

A more interesting finding was the combined effect of two policies: Medicaid expansion and methadone MOUD coverage in Medicaid. Related to our second hypothesis, we found that first-time foster care entries due to parental drug use disorder decreased about 33% in Medicaid expansion states with Medicaid coverage of methadone MOUD relative to the mean. Though these two policies are separate, the interaction of them may affect Medicaid beneficiaries' access to OUD treatment which may subsequently protect children from experiencing abuse and neglect that can lead to foster care placements. First, Medicaid expansion increased health insurance coverage of low-income adults (e. g., the uninsured rate among low-income adults reduced by 5.2% (Sommers, Gunja, Finegold, & Musco, 2015)) and thus increased access to MOUD medications (e.g., the aggregate opioid admissions to specialty treatment facilities increased 18% in expansion states (Meinhofer & Witman, 2018)). Second, Medicaid expansion increased access to methadone MOUD

in states that covered methadone (e.g., methadone MOUD dispensing increased 26% and admission for rehabilitation services involving MOUD increased 105% in expansion states with methadone MOUD coverage (Meinhofer & Witman, 2018)). We also found that the impacts are heterogeneous by race/ethnicity and by age. The largest impact was found among the non-Hispanic Black children and the youngest children (age 0–1 years). One possible explanation is that the Medicaid expansion and the Medicaid coverage of MOUD helped to reduce pre-existing racial disparity on health insurance coverage (Cross-Call, 2020) and OUD treatment and thus may have larger impact on non-Hispanic Black children in the child welfare system. Future research is needed to investigate the causes of the racial and ethnic differences that we found in this study. In terms of age differences, parental drug use disorder may play a larger role in the foster care placement among infants and toddlers than children in other age groups. For example, parental drug use disorder can be detected by toxicology screening during pregnancy or at birth (Prindle et al., 2018). Therefore, the Medicaid expansion and the Medicaid coverage of MOUD may have a larger impact on this group of children due to parents' involvement with the healthcare system. Prior evidence suggested that Medicaid expansion and methadone coverage reduced the OUD treatment gap (Meinhofer & Witman, 2018; Saloner et al., 2018). Our study demonstrates that the reduction of the treatment gap may also have contributed to the prevention of foster care placements during the opioid crisis.

We conducted falsification tests to assess the relationship between methadone MOUD coverage and the first-time foster care entries due to factors that would not be expected to be as affected by changes of this MOUD coverage, including sexual and physical abuse without an indication of parental drug use disorder. We did not find a combining effect of the two policies on the first-time foster care entries due to these less relevant removal reasons. This falsification test provides additional support to our findings. To address the potential issue of under-reporting, we conducted sensitivity analysis by excluding those states that had unusually low proportions of foster care entries due to parental drug use disorder. The sensitivity results were generally consistent with the results estimated by the main model except that the impact of the Medicaid expansion and methadone MOUD coverage on first-time foster care entries due to parental drug use disorder was not significant among Hispanic children. The findings of our study suggest that policies that address access to OUD treatment may play an important role in preventing CAN and reduce the caseload of the child welfare system during the opioid crisis.

There are several limitations in this study. First, the methadone MOUD coverage variable was a time-constant variable in our models. We were not able to identify a time-varying variable of methadone MOUD coverage due to data availability. As a result, we were not able to examine the changes of this policy through the period we examined. Despite that, we compared the state Medicaid coverage of methadone MOUD from different data sources (Substance Abuse and Mental Health Services Administration, 2014; The American Society of Addiction Medicine, 2013; The Medicaid and CHIP Payment and Access Commission, 2016), and we found the coverage status remained the same from 2011 to September of 2015. Therefore, our findings regarding the methadone MOUD coverage only reflect the policy status based on the available data. Second, many of the foster care entries due to parental drug use disorder included other removal reasons. For instance, some foster care

entries list both parental drug use disorder and neglect as the reason for removal. This is because a child who has a parent with drug use disorder is at increased risk of experiencing neglect (about 60% of children who first-time entered foster care due to parental drug use disorder also experienced neglect based on the 2016 data). Therefore, it was not reasonable to exclude foster care entries listing other removal reasons, but we want to note that parental drug use disorder may not be the only listed removal reasons in our outcome. Third, there could be inconsistency in removal reasons across states and under-reporting of foster care entries due to parental drug use disorder may occur. It is possible that a child was sent to foster care due to multiple removal reasons including parental drug use disorder but “parental drug abuse” was not recorded as one of the removal reasons (Correia, 2013). We conducted a sensitivity analysis utilizing the same model but excluding those states that potentially under-reported. The sensitivity results were generally consistent with the results estimated by the main model. Fourth, we were not able to identify the specific drug when parental drug use disorder was cited as a reason for foster care placement. As a result, our estimate of the policy impact was for any parental drug use disorder not just opioids and thus was more conservative (lower bound). Fifth, it is possible that our estimates may pick up additional factors other than the Medicaid expansion and coverage of methadone MOUD. To mitigate the potential confounding, we added multiple covariates and conducted a falsification test to assess if the policy impact was significant for theoretically irrelevant outcomes. We did not find a combining effect of the two policies on the first-time foster care entries due to these less relevant removal reasons based on the falsification test results.

5. Conclusion

This study did not find a significant association between state Medicaid expansion and first-time foster care entries due to parental drug use disorder. However, we found that first-time foster care entries due to parental drug use disorder decreased in Medicaid expansion states with Medicaid coverage of methadone MOUD. Policies that combine health care coverage and increased SUD treatment access may reduce CAN by reducing parents’ drug use and use disorder. Exposure to parental drug use disorder is an ACE and ACEs are preventable. Policies that focus on health care access and treatment options are important but may not be enough to comprehensively support children and families to have safe, stable, nurturing relationships and environments. Implementing more comprehensive strategies, such as strengthening economic support to families (e.g., tax credits, childcare subsidies, family-friendly work policies), promoting social norms that protect against violence and adversity (e.g., public education campaigns), and programs that ensure a strong start (e.g., early childhood home visitation) can prevent parental drug use disorder and other ACEs from happening in the first place and mitigate the harms of ACEs (Centers for Disease Control and Prevention, 2019).

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

The authors would like to thank Gery Guy for his assistance in obtaining DATA 2000 buprenorphine prescription waivers data, Robin Ghertner for his assistance in providing Medicaid opioid prescription data and comments, and Laura Radel, Emily Madden for their input on the manuscript. The authors would also like to thank the discussant and participants of 41st Association for Public Policy Analysis and Management (APPAM) Fall Research Conference for providing comments.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

References

- Agency for Healthcare Research and Quality. HCUP Fast Stats. Healthcare Cost and Utilization Project (HCUP). AHRQ. www.hcup-us.ahrq.gov/faststats/opioid/opioiduse.jsp?radio3=on&location1=US&characteristic1=01&setting1=ED&location2=US&characteristic2=01&setting2=IP&expansionInfoState=hide&dataTablesState=hide&definitionsState=hide&exportState=hide.
- Barth RP, Wildfire J, & Green RL (2006). Placement into foster care and the interplay of urbanicity, child behavior problems, and poverty. *American Journal of Orthopsychiatry*, 76(3), 358–366. 10.1037/0002-9432.76.3.358 [PubMed: 16981814]
- Bertrand M, Duflo E, & Mullainathan S (2004). How much should we trust differences-in-differences estimates? *The Quarterly Journal of Economics*, 119(1), 249–275. 10.1162/003355304772839588
- Brown ECB, Garrison MM, Bao H, Qu P, Jenny C, & Rowhani-Rahbar A (2019). Assessment of rates of child maltreatment in states with medicaid expansion vs states without medicaid expansion. *JAMA Network Open*, 2(6), e195529. 10.1001/jamanetworkopen.2019.5529 [PubMed: 31199444]
- Busch SH, Meara E, Huskamp HA, & Barry CL (2013). Characteristics of adults with substance use disorders expected to be eligible for Medicaid under the ACA. *Psychiatric Services (Washington, D. C.)*, 64(6), 520–526.
- Centers for Disease Control and Prevention, 2019. Preventing adverse childhood experiences: leveraging the best available evidence. <https://www.cdc.gov/violenceprevention/pdf/preventingACES.pdf>.
- Children’s Bureau, 2017. The AFCARS report. U.S. Department of Health and Human Services, Administration for Children and Families, Administration on Children Youth and Families <https://www.acf.hhs.gov/sites/default/files/documents/cb/afcarsreport24.pdf>.
- Children’s Bureau (2019a). The AFCARS report. U.S. Department of Health and Human Services, Administration for Children and Families, Administration on Children Youth and Families <https://www.acf.hhs.gov/cb/resource/afcars-report-26>.
- Children’s Bureau (2019b). Child maltreatment 2017. U.S. Department of Health and Human Services, Administration for Children and Families, Administration on Children Youth and Families. <https://www.acf.hhs.gov/cb/research-data-technology/statistics-research/child-maltreatment>.
- Children’s Bureau (2020). The AFCARS report. U.S. Department of Health and Human Services, Administration for Children and Families, Administration on Children Youth and Families <https://www.acf.hhs.gov/sites/default/files/documents/cb/afcarsreport27.pdf>.
- Children’s Bureau, Department of Health and Human Services (2019). Adoption and Foster Care Analysis and Reporting System (AFCARS), Foster Care File 2007. <https://www.ndacan.acf.hhs.gov/datasets/dataset-details.cfm?ID=225>.
- Choi S, Huang H, & Ryan JP (2012). Substance abuse treatment completion in child welfare: Does substance abuse treatment completion matter in the decision to reunify families? *Children and Youth Services Review*, 34(9), 1639–1645.
- Connell CM, Vanderploeg JJ, Flaspohler P, Katz KH, Saunders L, & Tebes JK (2006). Changes in placement among children in foster care: A longitudinal study of child and case influences. *Social Service Review*, 80(3), 398–418. 10.1086/505554 [PubMed: 25342863]

- Correia M (2013). Substance abuse data in child welfare. Casey practice digest: Substance use disorders in families with young children. Casey family programs. https://www.in.gov/children/files/Practice_Digest_Substance_Use_11_13.pdf.
- Cross-Call J (2020). Medicaid expansion has helped narrow racial disparities in health coverage and access to care. Center on Budget and Policy Priorities. <https://www.cbpp.org/research/health/medicaid-expansion-has-helped-narrow-racial-disparities-in-health-coverage-and>.
- Dunn MG, Tarter RE, Mezzich AC, Vanyukov M, Kirisci L, & Kirillova G (2002). Origins and consequences of child neglect in substance abuse families. *Clinical Psychology Review*, 22(7), 1063–1090. 10.1016/s0272-7358(02)00132-0 [PubMed: 12238246]
- Frame L, Berrick JD, & Brodowski ML (2000). Understanding reentry to out-of-home care for reunified infants. *Child Welfare*, 79(4), 339–369. [PubMed: 10925764]
- Ghertner R, Baldwin M, Crouse G, Radel L, & Waters A (2018). The relationship between substance use indicators and child welfare caseloads [research brief]. US Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation. <https://aspe.hhs.gov/system/files/pdf/258831/SubstanceUseCWCaseloads.pdf>.
- Ghertner R, Waters A, Radel L, & Crouse G (2018). The role of substance use in child welfare caseloads. *Children and Youth Services Review*, 90, 83–93. 10.1016/j.childyouth.2018.05.015
- Green BL, Rockhill A, & Furrer C (2007). Does substance abuse treatment make a difference for child welfare case outcomes? A statewide longitudinal analysis. *Children and Youth Services Review*, 29(4), 460–473.
- Grella CE, Needell B, Shi Y, & Hser Y-I (2009). Do drug treatment services predict reunification outcomes of mothers and their children in child welfare? *Journal of Substance Abuse Treatment*, 36(3), 278–293. 10.1016/j.jsat.2008.06.010 [PubMed: 18775623]
- Hansen H, & Netherland J (2016). Is the prescription opioid epidemic a white problem? *American Journal of Public Health*, 106(12), 2127–2129. 10.2105/ajph.2016.303483 [PubMed: 27831792]
- Hedegaard H, Warner M, & Miniño AM (2018). Drug overdose deaths in the United States, 1999–2017 (329).
- Klevens J, Barnett SB, Florence C, & Moore D (2015). Exploring policies for the reduction of child physical abuse and neglect. *Child Abuse and Neglect*, 40, 1–11. 10.1016/j.chiabu.2014.07.013 [PubMed: 25124051]
- Krawczyk N, Feder KA, Fingerhood MI, & Saloner B (2017). Racial and ethnic differences in opioid agonist treatment for opioid use disorder in a U.S. national sample. *Drug and Alcohol Dependence*, 178, 512–518. 10.1016/j.drugalcdep.2017.06.009 [PubMed: 28719885]
- Lynch S, Sherman L, Snyder SM, & Mattson M (2018). Trends in infants reported to child welfare with neonatal abstinence syndrome (NAS). *Children and Youth Services Review*, 86, 135–141. 10.1016/j.childyouth.2018.01.035
- Meinhofer A, & Angleró-Díaz Y (2019). Trends in foster care entry among children removed from their homes because of parental drug use. *JAMA Pediatrics*, 173(9), 881. 10.1001/jamapediatrics.2019.1738 [PubMed: 31305925]
- Meinhofer A, & Witman AE (2018). The role of health insurance on treatment for opioid use disorders: Evidence from the Affordable Care Act Medicaid expansion. *Journal of Health Economics*, 60, 177–197. [PubMed: 29990675]
- Merrick MT, Ford DC, Ports KA, Guinn AS, Chen J, Klevens J, ... Mercy JA (2019). Vital signs: Estimated proportion of adult health problems attributable to adverse childhood experiences and implications for prevention – 25 States, 2015–2017. *MMWR. Morbidity and Mortality Weekly Report*, 68(44), 999–1005. [PubMed: 31697656]
- National Institute on Drug Abuse (2018). Medications to treat opioid use disorder. NIDA. <https://www.drugabuse.gov/node/pdf/21349/medications-to-treat-opioid-use-disorder>.
- Prindle JJ, Hammond I, & Putnam-Hornstein E (2018). Prenatal substance exposure diagnosed at birth and infant involvement with child protective services. *Child Abuse and Neglect*, 76, 75–83. 10.1016/j.chiabu.2017.10.002 [PubMed: 29078100]
- Quast T, Bright MA, & Delcher C (2019). The relationship between foster care entries and high-dose opioid prescribing in California. *Addictive Behaviors*, 93, 52–58. 10.1016/j.addbeh.2019.01.015 [PubMed: 30685568]

- Radel L, Baldwin M, Crouse G, Ghertner R, & Waters A (2018). Substance use, the opioid epidemic, and the child welfare system: Key findings from a mixed methods study. US Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation. <https://aspe.hhs.gov/pdf-report/substance-use-opioid-epidemic-and-child-welfare-system-key-findings-mixed-methods-study>.
- Rostad WL, Ports KA, Tang S, & Klevens J (2020). Reducing the number of children entering foster care: Effects of state earned income tax credits. *Child Maltreat*, 25(4), 393–397. 10.1177/1077559519900922 [PubMed: 31973550]
- Saloner B, Levin J, Chang H-Y, Jones C, & Alexander GC (2018). Changes in buprenorphine-naloxone and opioid pain reliever prescriptions after the affordable care act medicaid expansion. *JAMA Network Open*, 1(4), e181588. 10.1001/jamanetworkopen.2018.1588 [PubMed: 30646116]
- Sommers BD, Gunja MZ, Finegold K, & Musco T (2015). Changes in self-reported insurance coverage, access to care, and health under the affordable care act. *JAMA*, 314(4), 366–374. 10.1001/jama.2015.8421 [PubMed: 26219054]
- Stahler GJ, & Mennis J (2018). Treatment outcome disparities for opioid users: Are there racial and ethnic differences in treatment completion across large US metropolitan areas? *Drug and Alcohol Dependence*, 190, 170–178. 10.1016/j.drugalcdep.2018.06.006 [PubMed: 30041092]
- Stein BD, Dick AW, Sorbero M, Gordon AJ, Burns RM, Leslie DL, & Pacula RL (2018). A population-based examination of trends and disparities in medication treatment for opioid use disorders among Medicaid enrollees. *Substance Abuse*, 39(4), 419–425. 10.1080/08897077.2018.1449166 [PubMed: 29932847]
- Substance Abuse and Mental Health Services Administration. Certification of Opioid Treatment Programs (OTPs) SAMHSA. <https://www.samhsa.gov/medication-assisted-treatment/certification-opioid-treatment-programs>.
- Substance Abuse and Mental Health Services Administration. Medication and counseling treatment. SAMHSA. <https://www.samhsa.gov/medication-assisted-treatment/treatment>.
- Substance Abuse and Mental Health Services Administration. Practitioner and Program Data. SAMHSA. <https://www.samhsa.gov/medication-assisted-treatment/training-materials-resources/practitioner-program-data>.
- Substance Abuse and Mental Health Services Administration (2014). Medicaid coverage and financing of medications to treat alcohol and opioid use disorders. SAMHSA. <https://store.samhsa.gov/sites/default/files/d7/priv/sma14-4854.pdf>.
- Substance Abuse and Mental Health Services Administration (2018). Medicaid coverage of medication-assisted treatment for alcohol and opioid use disorders and of medication for the reversal of opioid overdose. SAMHSA. https://store.samhsa.gov/sites/default/files/d7/priv/medicaidfinancingmatreport_0.pdf.
- Substance Abuse and Mental Health Services Administration (2020). Medications for opioid use disorder.treatment improvement protocol (TIP) series 63 (PEP20-02-01-006).
- The American Society of Addiction Medicine (2013). Advancing access to addiction medications: implications for opioid addiction treatment. ASAM. https://www.asam.org/docs/default-source/advocacy/aaam_implications-for-opioid-addiction-treatment_final.pdf?sfvrsn=cee262c2_25.
- The Medicaid and CHIP Payment and Access Commission. Medicaid and the affordable care act. MCPAC. <https://www.macpac.gov/topics/aca-medicaid/>.
- The Medicaid and CHIP Payment and Access Commission (2016). State policies for behavioral health services covered under the state plan. MCPAC. <https://www.macpac.gov/publication/behavioral-health-state-plan-services/>.
- U.S. Bureau of Labor Statistics. (2016). Local Area Unemployment Statistics and Current Population Survey. U.S. Bureau of Labor Statistics. <https://www.bls.gov/lau/rdsncnp16.htm>.
- U.S. Census Bureau. (2017). Annual Estimates of the Resident Population for Selected Age Groups by Sex for the United States, States, Counties and Puerto Rico Commonwealth and Municipios. U.S. Census Bureau. <https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml>.
- Walsh C, MacMillan HL, & Jamieson E (2003). The relationship between parental substance abuse and child maltreatment: Findings from the Ontario Health Supplement. *Child Abuse and Neglect*, 27(12), 1409–1425. 10.1016/j.chiabu.2003.07.002 [PubMed: 14644058]

- Wen H, Druss BG, & Cummings JR (2015). Effect of medicaid expansions on health insurance coverage and access to care among low-income adults with behavioral health conditions. *Health Services Research*, 50(6), 1787–1809. 10.1111/1475-6773.12411 [PubMed: 26551430]
- Williams SC, & Sepulveda K (2019). Infants and toddlers are more likely than older children to enter foster care because of neglect and parental drug abuse. *Child Trends*. <https://www.childtrends.org/infants-and-toddlers-are-more-likely-than-older-children-to-enter-foster-care-because-of-neglect-and-parental-drug-abuse>.
- Wing C, Simon K, & Bello-Gomez RA (2018). Designing difference in difference studies: Best practices for public health policy research. *Annual Review of Public Health*, 39(1), 453–469. 10.1146/annurev-publhealth-040617-013507
- Winstanley EL, & Stover AN (2019). The impact of the opioid epidemic on children and adolescents. *Clinical Therapeutics*, 41(9), 1655–1662. 10.1016/j.clinthera.2019.06.003 [PubMed: 31303278]

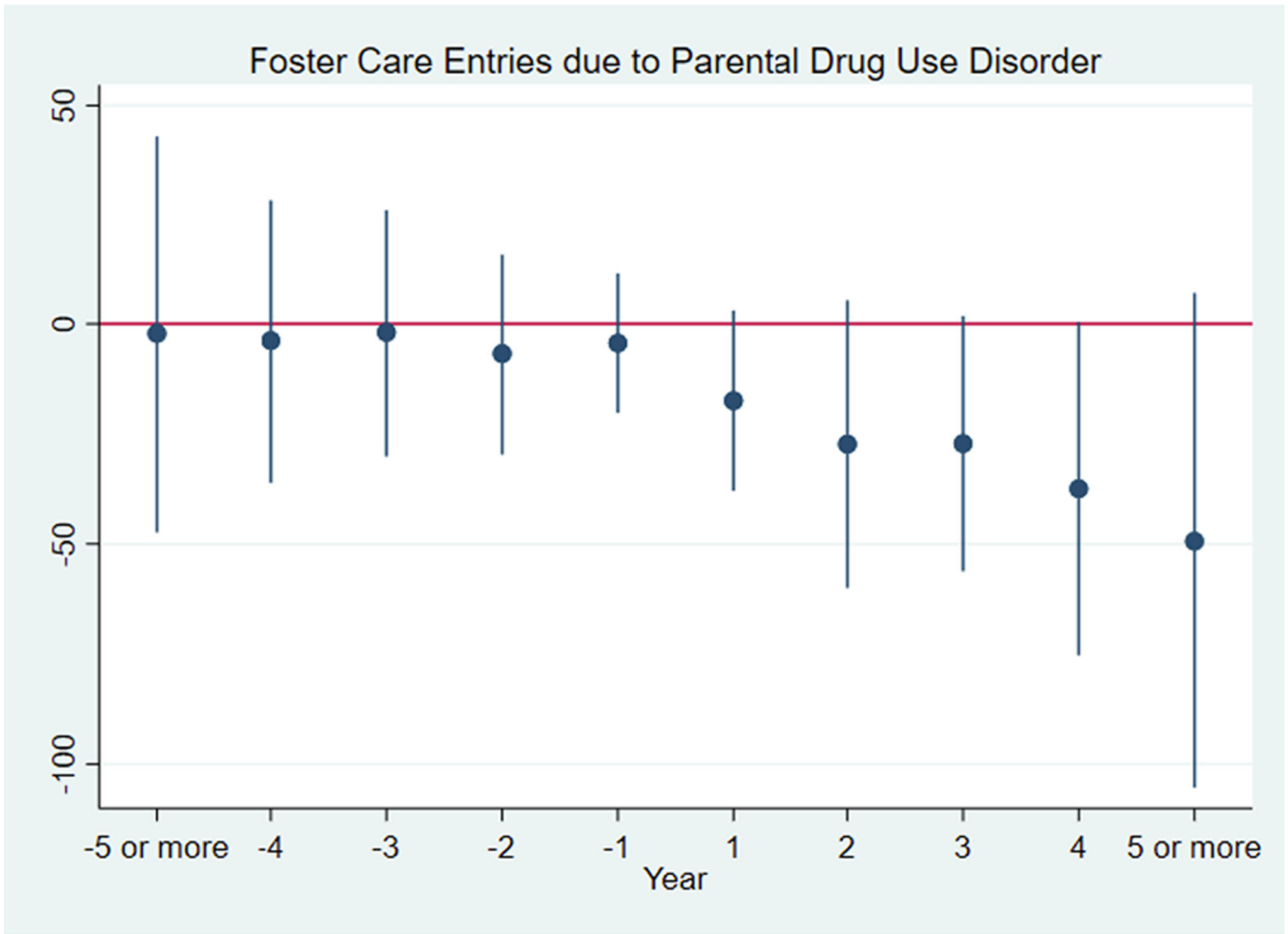


Fig. 1. Estimated Coefficients of Medicaid Expansion Effect over Time, 2007–2016. **Source:** State level data from the Adoption and Foster Care Analysis and Reporting System, 2007–2016 was used. **Notes:** The coefficients displayed are estimated from Eq. (3). Each line is the 95% confidence interval with robust standard error clustered at the state level. The reference group is the year when a state implemented Medicaid expansion. “-1” means 1 year before the expansion, “1” means 1 year after the expansion.

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

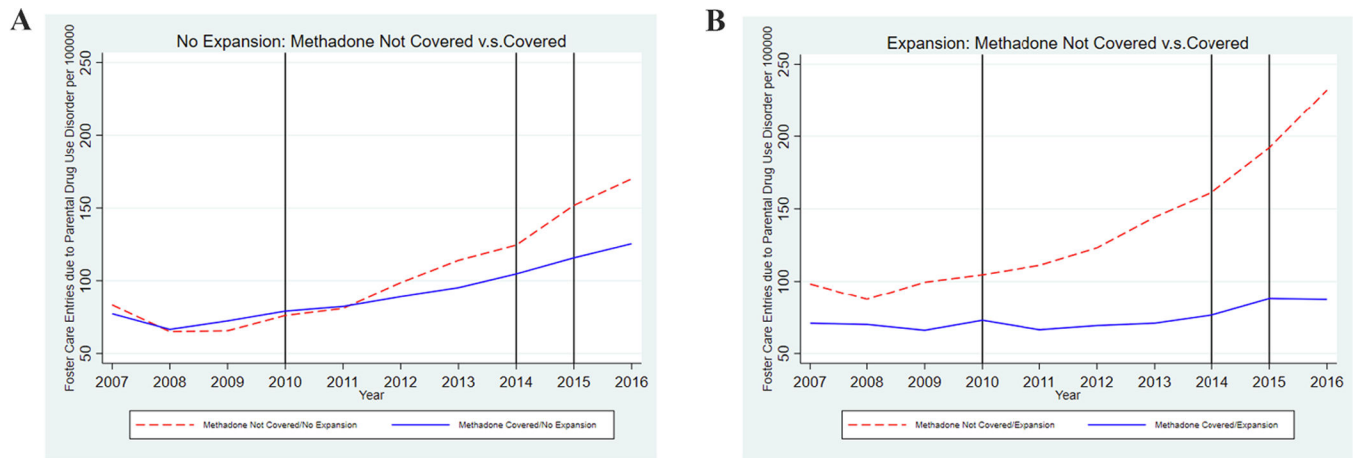


Fig. 2. First-time Foster Care Entries due to Parental Drug Use Disorder by Medicaid Expansion Status and Methadone MOUD Coverage, 2007–2016. **Source:** State level data from the Adoption and Foster Care Analysis and Reporting System, 2007–2016 was used. **Notes:** A state is defined as an expansion state if the expansion year of the state is before 2016. Detailed categories of states were presented in Table A4; The three solid vertical lines represent three major times when states expanded Medicaid.

Table 1

Descriptive Statistics by Medicaid Expansion Status and Medicaid Coverage of Methadone Medication for Opioid Use Disorder (MOUD) Status, 2007–2016

	Expansion		Non-expansion	
	Methadone covered Mean (SD)	Methadone not covered Mean (SD)	Methadone covered Mean (SD)	Methadone not covered Mean (SD)
First-time foster care entries due to parental drug abuse ¹ per 100,000 children ^a	73.8 (49.2)	128.5 (96.0)	90.8 (43.9)	100.8 (52.5)
Drug death rate per 100,000 ^{2b}	15.9 (6.5)	15.7 (7.9)	14.0 (4.3)	12.7 (4.7)
CPS response time (hours) ³	67.3 (48.1)	85.6 (78.3)	64.5 (33.0)	83.1 (54.4)
Methadone MOUD treatment facility rate per 10,000 ⁴	0.08 (0.05)	0.02 (0.02)	0.03 (0.03)	0.01 (0.02)
Buprenorphine MOUD treatment facility rate per 10,000 ⁴	0.2 (0.1)	0.1 (0.1)	0.1 (0.2)	0.1 (0.1)
Buprenorphine license limits per 10,000 ⁵	14.7 (19.0)	11.0 (19.5)	11.3 (14.8)	7.7 (12.1)
Medicaid opioid prescription rate per 1,000 Medicaid enrollees ⁶	2677.7 (1087.2)	3231.1 (1168.6)	3073.0 (754.7)	2712.3 (695.3)
Child poverty ⁷	18.3%	20.2%	20.3%	20.8%
Non-Hispanic White ⁷	67.7%	80.2%	71.8%	78.2%
High school graduation (25 – 65 years) ⁷	89.8%	89.9%	88.7%	89.5%
Uninsured rate ⁷	12.1%	15.0%	16.1%	15.8%
Unemployment ⁸	6.9%	6.2%	6.6%	5.8%
Number of observations	210	110	100	90

Source:

¹ State level data from Adoption and Foster Care Analysis and Reporting System, 2007–2016 was used.

² CDC WONDER online database.

³ *Child Maltreatment* annual reports, 2007–2016.

⁴ National Survey of Substance Abuse Treatment Services (N-SSATS) 2007–2016.

⁵ Substance Abuse and Mental Health Services Administration. Practitioner and Program Data (SAMHSA) Drug Addiction Treatment Act of 2000 (DATA 2000).

⁶ Centers for Medicare & Medicaid Services (CMS) State Drug Utilization database.

⁷ U.S. Census Bureau (2017).

⁸ U.S. Bureau of Labor Statistics (2016).

Notes: SD = Standard Deviation.

^a The number of foster care entries was divided by the child (17 years old or younger) population (or child population by race/ethnicity if necessary) in that state each year. The child population data by different age groups are from National Center for Health Statistics. Bridged-race population estimates—data files and documentation.

^b North Dakota was missing the data for 2011.

Estimated Impact of State Medicaid Expansion on First-Time Foster Care Entries due to Parental Drug Use Disorder by Race/Ethnicity and by Age Group, 2007–2016

Table 2

		By Race/Ethnicity				By Age		
		All race (0–17)	Non-Hispanic-Black	Non-Hispanic-White	Hispanic	0–1	2–5	6–17
First-time foster care entries due to parental drug use disorder per 100,000^a								
Eq. (1)								
Expansion	-6.2 (-24.9, 12.4)	-36.2 (-105.7, 33.2)	-8.6(-28.9, 11.6)	-13.1(-38.7, 12.6)	-10.9 (-58.9, 37.1)	-7.0 (-34.0, 20.0)	-5.7 (-17.6, 6.3)	
<i>n</i>	509 ^b	509 ^b	509 ^b	509 ^b	509 ^b	509 ^b	509 ^b	509 ^b

Source: State level data from Adoption and Foster Care Analysis and Reporting System, 2007–2016 was used.

Notes: This model (Eq. (1)) controls for drug mortality rate, CPS response time, DATA2000 buprenorphine license limit, MOUD methadone facility availability, MOUD buprenorphine facility availability, Medicaid opioid prescription rate, race, child poverty, education, uninsured rate, unemployment and at the state level.

^aThe number of foster care entries was divided by the child (17 years old or younger) population (or child population by race/ethnicity if necessary) in that state each year. The child population data by different age groups are from National Center for Health Statistics. Bridged-race population estimates—data files and documentation. http://www.cdc.gov/nchs/nvss/bridged_race/data_documentation.htm.

^b50 States and the District of Columbia were examined from 2007 to 2016 except that North Dakota was missing the data for 2011 for drug death rate. The values in parentheses are 95% confidence interval. Boldface indicates statistical significance.

* $p < 0.05$,

** $p < 0.01$.

Table 3

Estimated Impact of Medicaid Expansion and Methadone MOUD Coverage on First-time Foster Care Entries due to Parental Drug Use Disorder by Race/Ethnicity and by Age Group, 2007–2016.

	First-time foster care entries due to parental drug use disorder per 100,000 ^a						
	Overall	By Race/Ethnicity			By Age		
		All race (0–17)	Non-Hispanic-Black	Non-Hispanic-White	Hispanic	0–1	2–5
Eq. (2)							
Expansion and methadone	-27.5 ^{**} (-47.2, -7.9)	-92.8 [*] (-168.2, -17.3)	-28.7 [*] (-50.6, -6.8)	-28.3 [*] (-55.3, -1.3)	-63.4 [*] (-118.3, -8.5)	-36.5 ^{**} (-63.4, -9.6)	-18.5 ^{**} (-31.4, -5.6)
Mean of outcome ^b	84.6	202.1	81.5	70.7	270.8	111.3	44.9
<i>n</i>	509 ^c	509 ^c	509 ^c	509 ^c	509 ^c	509 ^c	509 ^c

Source: State level data from Adoption and Foster Care Analysis and Reporting System, 2007–2016 was used.

Notes: This model (Eq. (2)) controls for drug mortality rate, CPS response time, DATA2000 buprenorphine license limit, MOUD methadone facility availability, MOUD buprenorphine facility availability, Medicaid opioid prescription rate, race, child poverty, education, uninsured rate, unemployment at the state level.

^aThe number of foster care entries was divided by the child (17 years old or younger) population (or child population by race/ethnicity if necessary) in that state each year. The child population data by different age groups are from National Center for Health Statistics. Bridged-race population estimates—data files and documentation. http://www.cdc.gov/nchs/nvss/bridged_race/data_documentation.htm.

^bThe baseline mean is the average of the outcome prior to the expansion for non-expansion states.

^c50 States and the District of Columbia were examined from 2007 to 2016 except that North Dakota was missing the data for 2011 for drug death rate. The values in parentheses are 95% confidence interval. Boldface indicates statistical significance.

* $p < 0.05$,

** $p < 0.01$.

Table 4

Falsification Test Using Other Removal Reasons (Age < 18): Adoption and Foster Care Analysis and Reporting System, United States, 2007–2016

Foster care entries by removal reasons	Expansion and methadone
Sex abuse	0.5 (−1.6, 2.6)
Physical abuse	0.2 (−4.8, 5.1)
Neglect	18.5 (−5.3, 42.3)
Parental alcohol use disorder	1.9 (−2.0, 5.9)
Child alcohol use disorder	−0.1 (−1.2, 1.1)
Child drug use disorder	−1.3 (−3.8, 1.2)
Child disability	0.8 (−1.3, 2.9)
Child behavior problem	1.1 (−9.0, 11.3)
Parent death	0.3 (−0.1, 0.7)
Parent incarceration	0.5 (−3.0, 4.1)
Caretaker inability to cope	−6.2 (−14.1, 1.7)
Abandonment	−0.1 (−1.7, 1.4)
Relinquishment	0.1 (−1.0, 1.1)
Inadequate housing	−1.1 (−5.4, 3.2)
<i>n</i>	509 ^a

Source: State level data from Adoption and Foster Care Analysis and Reporting System, 2007–2016 was used.

Notes: Eq. (2) was used to conduct the falsification test and controls for drug mortality rate, CPS response time, DATA2000 buprenorphine license limit, MOUD methadone facility availability, MOUD buprenorphine facility availability, Medicaid opioid prescription rate, race, child poverty, education, uninsured rate, unemployment at the state level. The estimated coefficients correspond to the estimate of $\beta_1 + \beta_2$ in Eq. (2).

^aNorth Dakota was missing the data for 2011 for drug death rate. The values in parentheses are 95% confidence interval. Boldface indicates statistical significance.

* $p < 0.05$,

** $p < 0.01$.