

The receipt of medications for opioid use disorder among pregnant individuals in the USA: a multilevel analysis

Laura Curran and Jennifer Manuel

Abstract

Purpose – This study aims to examine the relationship between medication for opioid use disorder (MOUD) among pregnant individuals, referral source, mental health, political affiliation and substance use policies in all 50 states in the USA.

Design/methodology/approach – This study describes MOUD receipt among pregnant people with an opioid use disorder (OUD) in 2018. The authors explored sociodemographic differences in MOUD receipt, referrals and co-occurring mental health disorders. The authors included a comparison of MOUD receipt among states that have varying substance use policies and examined the impact of these policies and the political affiliation on MOUD. The authors used multilevel binary logistic regression to examine effects of individual and state-level characteristics on MOUD.

Findings – Among 8,790 pregnant admissions with OUD, the majority who received MOUD occurred in the Northeast region (71.52%), and 14.99% were referred by the criminal justice system ($n = 1,318$). Of those who were self-referred, 66.39% received MOUD, while only 30.8% of referrals from the criminal justice system received MOUD. Those referred from the criminal justice system or who had a co-occurring mental health disorder were least likely to receive MOUD. The multilevel model showed that while policies were not a significant predictor, a state's political affiliation was a significant predictor of MOUD.

Research limitations/implications – The study has some methodological limitations; a state-level analysis, even when considering the individual factors, may not provide sufficient description of community-level or other social factors that may influence MOUD receipt. This study adds to the growing literature on the ineffectiveness of prenatal substance use policies designed specifically to increase the use of MOUD. If such policies are consistently assessed as not contributing to substantial increase in MOUD among pregnant women over time, it is imperative to investigate potential mechanisms in these policies that may not facilitate MOUD access the way they are intended to.

Practical implications – Findings from this study aid in understanding the impact that a political affiliation may have on treatment access; states that leaned more Democratic were more likely to have higher rates of MOUD, and this finding can lead to research that focuses on how and why this contributes to greater treatment utilization. This study provides estimates of underutilization at a state level and the mechanisms that act as barriers, which is a stronger assessment of how state-specific policies and practices are performing in addressing prenatal substance use and a necessary step in implementing changes that can improve the links between pregnant women and MOUD.

Originality/value – To the best of the authors' knowledge, this is the first study to explore individual-level factors that include mental health and referral sources to treatment that lead to MOUD use in the context of state-level policy and political environments. Most studies estimate national-level rates of treatment use only, which can be useful, but what is necessary is to understand what mechanisms are at work that vary by state. This study also found that while substance use policies were designed to increase MOUD for pregnant women, this was not as prominent a predictor as other factors, like mental health, being referred from the criminal justice system, and living in a state with more Democratic-leaning affiliations.

Keywords Pregnancy, Co-occurring disorders, Opioid use disorder, MOUD, Referral source, Substance use policy

Paper type Research paper

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Received 3 August 2023
Revised 11 December 2023
Accepted 26 December 2023

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NIDA T32 Training Grant. T32 (Predoctoral Fellowship Award).

Conflict of interest statement: The authors declare no relevant financial or nonfinancial competing interests.

Introduction

In the USA, the number of women with an opioid-related diagnosis documented at the time of delivery increased by 131% from 2010 to 2017 (Hirai *et al.*, 2021). In 2019, about 7% of women reported the use of prescription opioid pain relievers during pregnancy; of those, one in five reported misuse of prescription opioids [Center for Disease Control (CDC), 2022]. The misuse of opioids, either illicit or prescribed opioids, during pregnancy increases the risks of adverse fetal and maternal outcomes, including premature births, low infant birth weight (Schmid *et al.*, 2010) and miscarriage (Johnson, 2017). It is also associated with longer hospital stays and higher medical fees (Patrick *et al.*, 2012) and can lead to dangerous withdrawals, endangering both the mother and the fetus (Johnson, 2017). The recommended treatment for OUD during pregnancy is a comprehensive treatment program that includes the initiation of medication for opioid use disorder (MOUD), also called pharmacotherapy, combined with behavioral health therapy (ACOG Committee on Health Care for Underserved Women and American Society of Addiction Medicine, 2012; Jones, Finnegan, & Kaltenbach, 2012; Substance Abuse and Mental Health Services Administration, 2018). The three most common medications used to treat OUD are methadone, buprenorphine and a combination of buprenorphine and naloxone (common brand name, Suboxone). MOUD is effective in reducing maternal substance misuse and improving obstetrical and neonatal outcomes (Kaltenbach, Berghella, & Finnegan, 1998).

Despite a wealth of evidence supporting the efficacy of treatment, only 20% of all individuals with an OUD report accessing any treatment in the previous year (Center for Health Behavior Statistics and Quality, 2015), and pregnant women are less likely to receive treatment than nonpregnant women (Cook *et al.*, 2010; Glasheen *et al.*, 2015; Le Strat *et al.*, 2011; Rosen *et al.*, 2004; Song *et al.*, 2004; Vesga-Lopez *et al.*, 2008). And even with increasing rates of pregnant admissions for OUD since the 1990s, the proportion of pregnant women receiving either methadone or buprenorphine has remained relatively unchanged at around 50% (Short *et al.*, 2018). A study from 2013 estimated that only 46% of admissions included MOUD in pregnant women's treatment plans (Hand *et al.*, 2017).

A state can determine its response to prenatal substance use through several policy approaches, and this could either facilitate or deter timely admission into treatment for opioid use disorder (OUD), indicating MOUD initiation. Currently, 24 states consider substance use during pregnancy to be child abuse under civil child welfare statutes, and 25 states require health-care professionals to report suspected prenatal drug use (Guttmacher Institute, 2022). Further, only 19 states have treatment programs specifically targeted at pregnant women, generally referred to as targeted program policies. Even fewer states provide pregnant women with priority access to state-funded substance use treatment programs (Guttmacher Institute, 2022). While the intention of these policies is to increase treatment of substance use problems during pregnancy, some states' punitive or criminal approach may actually have the opposite effect, deterring women from seeking treatment for fear of punishment or involvement with the child welfare or legal system. Between 2000 and 2015, more states implemented these punitive or criminal policies than supportive ones that offer priority access to treatment (Faherty *et al.*, 2020). This study examines some of the potential reasons why MOUD receipt remains low and includes both individual-level and state-level characteristics that may contribute to low MOUD use.

Individual-level contributors of medication for opioid use disorder use

Disparities exist among those who are accessing MOUD, and research points to variations by sociodemographic characteristics. Young adults of reproductive age who are black, Hispanic or gendered as women are all significantly less likely than their white and male counterparts to access any evidence-based substance use treatment (Hadland *et al.*, 2017). In one study, MOUD receipt was associated with a maternal age of 26–35 (versus younger or older age),

having at least a high school degree and being of a non-Hispanic white racial or ethnic background (versus non-Hispanic Black) (Henkaus *et al.*, 2021). Lacking a high school education was associated with lower likelihood of MOUD receipt for Hispanic mothers (Henkaus *et al.*, 2021). A recent study by Schiff *et al.* (2022) examined racial and ethnic disparities among treatment access for pregnant women experiencing OUD and found that compared to white non-Hispanic pregnant women, black non-Hispanic and Hispanic pregnant women had a lower likelihood of receiving methadone or buprenorphine treatment, as well as a lower likelihood of consistent use of these medications throughout their pregnancies. In addition, race has shown to be a significant factor in undertreatment of MOUD with regard to medication dosing levels; it is necessary to maintain the appropriate dose throughout pregnancy to adequately address symptoms and can be dangerous if underdosed. One recent study found that adjusting for maternal age, body mass index and type of opioid used, women of color received significantly less medication in their dose when compared to white women (Rosenthal *et al.*, 2021).

Further, how a pregnant patient is referred to substance use treatment is associated with MOUD receipt (Curran, 2023 [under review]). In a study examining the treatment admissions of pregnant women with OUD across the USA, admissions who were self-referred comprise the largest percentage of admissions leading to MOUD use, with a mean of 62.1% of these admissions resulting in MOUD (Curran, 2023 [under review]). In all regions of the USA, the referral source leading to the lowest MOUD use rate across years is among those referred by criminal justice or legal referrals, including driving under the influence (DUI's) and court-mandated treatment (Curran, 2023 [under review]). Other work found that from 1992 to 2017, pregnant women who were referred by a criminal justice agency (compared to other referral sources) were half as likely to receive MOUD as part of their treatment plans (Winkelman *et al.*, 2020).

Jail and prison policies and procedures often prohibit access to methadone or buprenorphine, leading to lower rates of MOUD. Pregnant incarcerated women with OUD in the USA are frequently denied essential medications and receive substandard medical care (Sufirin *et al.*, 2020). Receiving adequate treatment for OUD in correctional facilities is "severely limited" and "often impossible" (Csete, 2019). A few studies have found that almost half of incarcerated pregnant women went through detox or withdrawal from opioids without any use of MOUD, and only a third of facilities reported allowing pregnant women to continue their MOUD if it had been prescribed before entering jail (Kelsey *et al.*, 2017).

Other legally involved pregnant women are referred by the child welfare system and run the risk of becoming incarcerated on charges of child abuse if prenatal substance use is suspected or confirmed. Parental drug use has been associated with losing custody of the child (Choi *et al.*, 2021), and it is not surprising that women fear disclosing their substance use in health care settings (Haffajee *et al.*, 2021). Concerns of being reported to the criminal justice system, the risk of criminal prosecution on grounds of child abuse or neglect (Stone, 2015; Falletta *et al.*, 2018; Angelotta *et al.*, 2016), and the fear of losing custody of children (Kuo *et al.*, 2013) have been identified as major barriers to pregnant women seeking substance use treatment. Prior studies have found that the presence of child abuse laws that allow prosecution of pregnant women with OUD is associated with significantly lower rates of MOUD use (Angelotta *et al.*, 2016). Efforts to penalize prenatal substance use "run counter to the dominant definition of substance use as a public health problem" (Carroll, Green, & Noonan, 2018), and in the long run, these efforts do not equate to increases in MOUD receipt (Carroll *et al.*, 2021). Others have noted that punitive policies such as requiring the reporting of prenatal substance use to authorities "may complicate the physician-patient relationship and deter treatment seeking [...] in states with statutes that permit civil child abuse charges" (Rohan, Monk, Marder, & Reame, 2011).

Lastly, the presence of a mental health condition complicates treatment access. Pregnant women with co-occurring mental health and substance use disorders remain undertreated,

accessing any treatment at rates as low as 10.3%–39% (Cook *et al.*, 2010; Glasheen *et al.*, 2015; Le Strat *et al.*, 2011). Up to 12% of pregnant women experience depression (Cook *et al.*, 2010; Le Strat *et al.*, 2011; Vesga-Lopez *et al.*, 2008), and about 17% experience an anxiety disorder (Le Strat *et al.*, 2011), which is linked with reduced quality of life (Goodman *et al.*, 2014), preterm delivery (Grigoriadis *et al.*, 2013), a high risk for postpartum depression (Goodman *et al.*, 2014) and poor maternal-child bonding (Grigoriadis *et al.*, 2013; Rossen *et al.*, 2016). These and other adverse health effects may become even more complex for both mother and infant when they are associated with prenatal substance use (Connelly *et al.*, 2013; Homish *et al.*, 2004; Jaaskelainen *et al.*, 2016).

State-level differences in medication for opioid use disorder use

Prior work reveals variations in MOUD receipt between geographic regions and states. Rates of MOUD have been found to be consistently low in the South region of the USA, with an average rate of 34.01% of admissions receiving MOUD from 2010 to 2018 (Curran, 2023 [under review]). States in the Northeastern region have consistently high rates of MOUD, with an average rate of 63.42% during that same time frame. Another study found that fewer than 31% of women in the south had planned MOUD on their treatment plans, while 48% or higher had planned MOUD on their treatment plans in non-south regions (Hand *et al.*, 2017). In 2018, the state with the highest MOUD rate among pregnant women admitting to a treatment program was Maine, and 13 states had a rate of MOUD use among admissions that was lower than 5% (Curran, 2023 [under review]).

Prenatal substance use policies are designed to increase MOUD for pregnant women by either encouraging treatment options or using criminal punishment as coercion in treatment. Guttmacher outlines three prenatal substance use policies recognized as having a more supportive, or treatment-focused, approach: the presence of a targeted program for pregnant women, having a priority access policy specifically for pregnant women and having a law against the discrimination of pregnant women in treatment. Some states have neither of these policies, some have one and some have both. A limited number of studies examine direct associations between these types of policies and maternal outcomes. One recent study aimed to tease apart the effects on MOUD of each of these policies individually (Tabatabaeeepour *et al.*, 2022) and found that states that implemented targeted program for pregnant women saw increases in MOUD rates by 11% and decreases in opioid overdoses by 45% following the implementation of the policy, but that priority access policies were not associated with significant changes in MOUD dispensing.

Given the myriad factors influencing access to treatment and the need for more research on the impact of various state-level prenatal substance use policies on MOUD, this study aims to identify factors on both an individual and state level that determine MOUD receipt among pregnant women using the most recently available admissions and policy data. This study draws from Andersen's health-care utilization model, which addresses the complexities of treatment access as determined by three dynamics: predisposing factors, enabling factors and need factors (Andersen, 1995). Examples of predisposing factors include a person's age, race or ethnicity, employment status, education, referral source and mental health. Enabling factors represent the environmental attributes that could increase (or decrease) the likelihood of treatment utilization, which includes state-level differences like the presence of a punitive or facilitative prenatal substance use policy in the state where the admission occurred or political leaning of a state, which could determine funding priorities or describe conservative or liberal beliefs, attitudes or behaviors that might shift toward or away from punitive or more facilitative approaches to prenatal substance use through MOUD. The theory also addresses need factors, which in this study are conceptualized as the presence of an OUD, indicating the need for evidence-based care (MOUD). The principle behind this theory is that MOUD utilization occurs in the context of both individual and broader environmental and structural factors that potentially facilitate or restrict

treatment access. This theoretical framework provides a lens through which to analyze and understand the mechanisms influencing a pregnant woman's ability to obtain MOUD. Specifically, it will examine the relationship between MOUD receipt and sociodemographic characteristics such as age, race or ethnicity, employment status, education, criminal justice referrals, mental health status, and the presence of state-level policies that support or impede access to treatment. This study draws from the behavioral-ecological framework to identify significant moderating factors that lead to variations in MOUD receipt. Using national, state and individual-level Treatment Episode Data set-Admissions (TEDS-A) data, the study describes multilevel factors that influence MOUD utilization in each state by drawing associations between MOUD utilization and the presence of either punitive or supportive policies:

RQ1. What are the associations between MOUD receipt and the individual predisposing factors encountered by pregnant women entering substance use treatment (age, race, education, employment, referral source and mental health)?

RQ2. What is the extent to which state-level policies on prenatal substance use (criminalizing prenatal substance use under child abuse or neglect statutes, policy to allow priority access for pregnant women) influence MOUD use among pregnant women in treatment for OUD?

Hypothesis. Using previous literature and guided by Andersen's health-care utilization model, this study aims to test several hypotheses with a representative sample of pregnant women in the USA adult population. While we know that access to any substance use treatment is lower among those with co-occurring mental health conditions, it is possible that those entering treatment with a mental health condition may be perceived as having higher risks of negative substance use outcomes and may be more likely to be prescribed MOUD; therefore, it is hypothesized that admissions with a co-occurring mental health condition will have a higher likelihood of MOUD receipt, and those admitting from a criminal justice referral source will have a lower likelihood of MOUD. Studies showing a positive effect of supportive prenatal substance use policies are not in consensus and are limited. This study will test these associations using data from different sources from the limited number of studies that have shown some positive effects of supportive policies and hypothesize that MOUD receipt will be positively associated with states having a priority access policy. Lastly, it is hypothesized that the multilevel model will reveal significant decreases in MOUD in states where there is a punitive criminalizing policy.

Methods

Data and sample

This study analyzed the annual rates of pregnant admissions who reported a primary OUD and proportions of those admissions indicating planned MOUD on their treatment plans for the year 2018. Data were obtained from the TEDS-A, which includes nationally representative data for admissions to publicly funded substance use treatment programs in all 50 states. The TEDS-A data serve as a repository of treatment data routinely collected by states for the purpose of monitoring substance use treatment programs; it comprises states' administrative records, which are converted to a standardized format consistent across all states. TEDS-A contains demographic, clinical and substance use characteristics of admissions to alcohol and drug treatment facilities. The unit of analysis is treatment admissions to state-licensed or certified substance use treatment centers that receive federal public funding.

Policy data were obtained from the Guttmacher Institute, a leading research and policy organization that provides a wide range of resources on the topics of sexual and reproductive health. A recent Guttmacher report (2020) outlines which states hold policies

that consider prenatal drug use as a criminal civil offense under child abuse statutes; this policy is punitive in nature, with criminal punishment underlying its approach to substance use vs a more treatment-focused, or public health, approach. Other states have mandated priority access to treatment for pregnant women, a more facilitative or supportive approach to prenatal substance use; such policies exist in 17 states. Policy data was supplemented using a recent published study (Tabatabaepour *et al.*, 2022), which examined the impact of supportive and punitive policies on substance use treatment seeking among pregnant women. Sufficient policy data were not available on the presence of targeted programs in each state in 2018; data were available on the presence of priority access policies in 2018. Policy data were coded in Excel and merged with TEDS-A data for the year 2018. Data were imported and analyzed in Stata-17; data were publicly available from the Substance Abuse and Mental Health Services Administration. Institutional Review Board approval was obtained for the mixed methods dissertation under which this study was conducted; this portion of the dissertation was exempt from IRB approval given its use of public data files.

The sample included females of reproductive age (18–44 years old) who reported being pregnant at the time of admission to treatment with a primary opioid use problem. Not included in the sample were pregnant admissions who listed problematic opioid use as a secondary or tertiary substance use problem. Treatment episodes were excluded if data on the use of MOUD were missing or treatment occurred in Puerto Rico or Washington, DC. Two states, Montana and Oregon, did not appear in the TEDS-A data in 2018 and were omitted from the analysis.

Measures

OUD was defined as problematic use of heroin, nonprescription methadone or other synthetic opiates, including buprenorphine, codeine, hydrocodone, morphine, oxycodone, tramadol and other narcotic analgesics or opiates, which is self-reported at the time of admission and indicates the primary substance use problem for which they are seeking treatment. Pregnancy is self-reported at admission and coded as a binary variable. The receipt of MOUD is coded as a binary outcome if the admission received (or did not receive) methadone, buprenorphine or naltrexone as part of their treatment plan. Demographic variables such as age, race/ethnicity, education and employment status were categorical and are contained in the TEDS-A data at an individual level. Mental health refers to whether a pregnant admission also had a co-occurring mental health disorder (yes/no). Since the study focuses on low rates of MOUD among criminal justice referrals, the referral source variable was recoded to indicate a binary outcome of criminal justice referrals (yes) or any other referral source (no). Criminal justice referrals include court-mandated treatment, DUI/DWI, judges, prosecutors, probation officers, clients referred through civil commitment or anyone affiliated with the judicial system. Also available in TEDS-A data are state and region identifiers (STFIPS, REGION). Policy data were coded as dummy variables by state; two variables were created (punitive policy and priority access policy) and indicated by a 1 if the state had the policy in 2018 and 0 if it did not. Political affiliation was added as an additional state-level predictor to identify whether the political leanings of states were associated with its MOUD use by way of shaping the state-level policy decisions that encourage (or discourage) treatment of substance use problems as opposed to punishment of it. Data were used from Gallup Daily tracking, which measured affiliation based on annual state averages of political party affiliation and contained five categories: solid Democrat, Democrat leaning, competitive (has approximately equal representation between both political parties), Republican leaning and solid Republican.

Analysis

Estimates of state-level rates of MOUD use among pregnant admissions were identified using a proportion of total pregnant women admitting to treatment with OUD (denominator)

who received MOUD on their treatment plans (numerator). Rates of MOUD receipt were estimated by USA region and for each state.

MOUD use was explored by age, race/ethnicity, education, employment and the presence of a co-occurring mental health disorder. Two-sample tests of proportions (*ptest*) were performed to test the equality of proportions of MOUD receipt by groups: those with a co-occurring mental health disorder (1) and those without one (0), and admissions through the criminal justice system (1) and all other referrals (0). A two-sample *t* test was conducted to test differences in state-level MOUD rates, comparing states that consider prenatal substance use to be child abuse and states that do not consider it child abuse, and states with and without a priority access policy. Here, the state-level rate estimate of MOUD use was used.

Individual admissions are nested within states, and therefore data are assumed to be clustered or not independent, making any estimates of standard errors artificially low. Given the nested data structure, the analysis included a multilevel binary logistic regression that aimed to identify the effects of a state-level punitive policy on MOUD use (binary outcome). A multilevel logistic regression model was used to identify the probability (or log-odds) of an admission leading to MOUD use (yes or no) within a given state. A multilevel modeling approach seeks to address the violation of the assumption of independence and to disentangle the within-cluster effects of lower-level variables. In this model, Level 1 variables are individual level and include age, race/ethnicity, education, employment, mental health status and whether the admission was referred by the criminal justice system. The Level 2 variable is the presence of the state policy considering substance use to be child abuse (yes/no) and priority access (yes/no), and the binary outcome variable is the probability of MOUD use (yes/no).

Model #1 included the intercept-only model with no predictors, modeling between-state variations in logits. Results from this model can be used to determine whether there is significant nonindependence within states as to MOUD use (aka clustering). Intraclass correlation coefficients (ICC) were estimated to indicate evidence of any substantial clustering of the data. Model #2 added level 1 and level 2 predictors, and model #3 allowed the level 1 slope to randomly vary. Overall, the model is designed to predict the probability of MOUD receipt as a function of both admissions-level and state-level predictors. Missing data was analyzed; for the variables included in the analysis, less than 5% of the observations were missing and were removed from the analysis.

In the multilevel model, MOUD is the binary dependent outcome variable. The level 1 predictors are race (categorical), mental health status (binary) and if the admission is from the criminal justice system (binary). Level 2 predictors at the state level are the presence of punitive criminalizing policy (binary), the presence of a supportive priority access policy (binary) and the political leaning of a state (categorical).

Results

Estimates of medication for opioid use disorder receipt

The sample consisted of pregnant females aged 18–44 who were admitted to a publicly funded substance use treatment program in the USA in 2018 ($N = 8,790$). All states were included except for Montana and Oregon (which were not represented in the TEDS-A data in 2018), Puerto Rico and other USA territories. Regional estimates of MOUD receipt (Table 1) found that the highest proportion of admissions that received MOUD as part of their treatment plan occurred in the Northeast (71.52%). The Midwest had a rate of 34.91% of admissions who received MOUD, the West was slightly lower with a rate of 33.2% receiving MOUD and the lowest regional estimate was the South with 21.15% of admissions receiving MOUD. State-level estimates of MOUD receipt

Table 1 MOUD by region

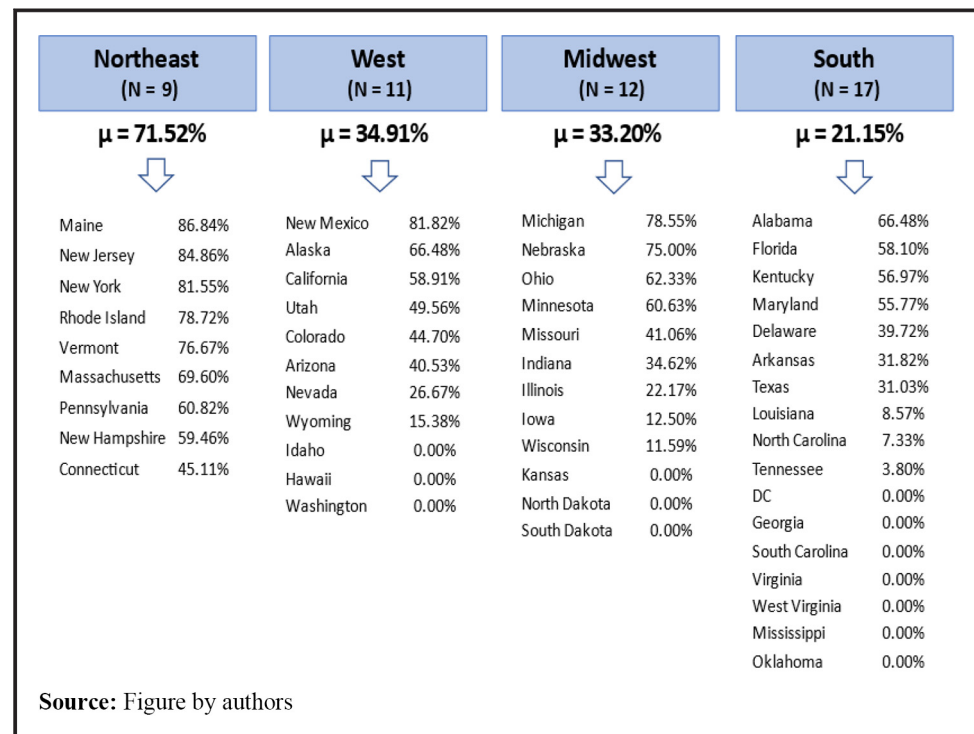
Region	OOD	Received MOUD (%)
Northeast	2,490	71.52
Midwest	2,220	34.91
West	1,602	33.20
South	2,478	21.15
Total	8,790	

Source: Table by authors

(Figure 1) revealed that Maine had the overall highest rate of treatment plans with MOUD (86.84%). The majority of pregnant women who received MOUD were between the ages of 25 and 34, were of white racial identity, had at least a high school education and were unemployed (Table 2). Of those admissions who received MOUD, 47.21% had a co-occurring mental health disorder, and 42.34% did not. The majority of admissions received treatment in a non-intensive outpatient treatment setting and reported daily use of opioids at admission (Table 2).

Referral sources to treatment

Overall, over 51% ($n = 4,386$) of pregnant admissions were individual or self-referred to treatment; around 15% were referred by the criminal justice system ($n = 1,318$) and about 13% were from another substance use care provider ($n = 1,064$). Of the pregnant women who received MOUD, 59.05% were self-referred to treatment, while only 8.23% who received MOUD were referred from the criminal justice system. Even fewer received MOUD who were referred from another substance use provider (12.23%) or from another health-

Figure 1 Regional and state-level proportions of MOUD receipt at admission

Source: Figure by authors

Table 2 Sociodemographics and MOUD receipt

<i>Pregnant admissions with OUD (N = 8,790)</i>	<i>Received MOUD (n = 4,931)%</i>	<i>Did not receive MOUD (n = 3,859)%</i>
<i>Age</i>		
18–20	116 (2.35)	127 (3.29)
21–24	769 (15.6)	753 (19.51)
25–29	1,878 (38.09)	1,518 (39.34)
30–34	1,422 (28.84)	981 (25.42)
35–39	625 (12.67)	402 (10.42)
40–44	121 (2.45)	78 (2.02)
<i>Race</i>		
Alaska Native (Eskimo, Indian)	4 (0.08)	9 (0.23)
American Indian (other than Alaskan)	140 (2.84)	128 (3.32)
Black or African American	387 (7.85)	296 (7.67)
White	4,014 (81.4)	3,120 (80.85)
Asian	12 (0.24)	8 (0.21)
Other single race	176 (3.57)	101 (2.62)
Other two or more races	135 (2.74)	107 (2.77)
Native Hawaiian or other PI	21 (0.43)	12 (0.31)
<i>Education</i>		
No school, up to 8 th grade	195 (3.95)	139 (3.6)
Grades 9–11	1,068 (21.66)	826 (21.4)
12 th grade or GED	2,332 (47.29)	1,866 (48.35)
1–3 yrs of college or vocational	1,004 (20.36)	734 (19.02)
4 yrs of college, graduate or more	222 (4.50)	179 (4.64)
<i>Employment</i>		
Full time	352 (7.14)	249 (6.45)
Part time	314 (6.37)	260 (6.74)
Unemployed	1,941 (39.36)	1,734 (44.93)
Not in labor force	2,055 (41.68)	1,505 (39.0)
<i>Referral source</i>		
Individual or self-referral	2,912 (59.05)	1,474 (38.20)
Substance use care provider	603 (12.23)	461 (11.95)
Other health-care provider	555 (11.26)	331 (8.58)
School	1 (0.02)	6 (0.16)
Employer/EAP	5 (0.10)	5 (0.13)
Other community referral	387 (7.85)	574 (14.87)
Criminal justice referral	406 (8.23)	912 (23.63)
<i>Co-occurring disorder</i>		
Yes	2,328 (47.21)	1,552 (40.22)
No	2,088 (42.34)	1,686 (43.69)
Missing	515 (10.44)	621 (16.09)
<i>Service setting</i>		
Detox, 24 HR, hospital	5 (0.10)	22 (0.57)
Detox, 24 HR, residential	155 (3.14)	367 (9.51)
Rehab/residential, hospital (non detox)	4 (0.08)	7 (0.18)
Rehab/residential, 30 days or fewer	272 (5.52)	606 (15.70)
Rehab/residential, more than 30 days	307 (6.23)	521 (13.50)
Intensive outpatient	391 (7.93)	678 (17.57)
non-intensive outpatient	3,768 (76.41)	1,645 (42.63)
Ambulatory, detox	29 (0.59)	13 (0.34)
<i>Frequency of Use</i>		
No use in the past month	1,230 (24.94)	1,393 (36.10)
Some use in the past month	750 (15.21)	757 (19.62)
Daily use	2,902 (58.85)	1,639 (42.47)

Source: Table by authors

care provider (11.26%). More pregnant women who were self-referred to treatment received MOUD than any other referral source; those referred to treatment from the criminal justice system were least likely to receive MOUD once entering substance use treatment.

Two-sample tests

Two-sample tests of proportions were used to identify significant differences in groups who did and did not receive MOUD in treatment. Analysis between those with and without a co-occurring mental health disorder found that admissions with a co-occurring disorder were significantly more likely to receive MOUD than those without a co-occurring disorder ($p < 0.01$). In addition, admissions that are referred from another substance use provider, other health-care providers or were self-referred to treatment are significantly more likely to receive MOUD than those referred from the criminal justice system ($p < 0.1$) (Table 3).

Two-sample t tests of independence used MOUD rates to test for significant differences between the MOUD rates in states with and without the punitive and priority policies. Of the 8,790 admissions total, 4,691 (53.4%) occurred in states with the presence of a punitive policy on prenatal substance use, and 4,099 (46.6%) occurred in states with no punitive policy present. Of the 8,790 admissions, 2,387 (27.2%) occurred in states with the presence of a policy that gives priority access to pregnant women, and 6,403 (72.8%) occurred in states without such a policy. T tests found no significant difference in MOUD rates between states with a punitive policy and those without one, but they did find a significant difference in MOUD rates among states with a priority access policy and those without one. Counter to the hypothesis, states with a priority access policy had a significantly lower MOUD rate than states without such a policy (Table 4), suggesting problems with the way states implement priority access policies.

Multilevel binary logistic regression models

For the multilevel binary logistic regression, model 1 was run with no predictors to determine if there is any within-group dependence of observations. Results from this model estimated a grand mean of state-level intercepts of -0.831 , which is the expectation for the average state mean. Level 2 variance of state intercepts is estimated at 3.578. The Chi-squared statistic is <0.001 , indicating a significant improvement in fit relative to a standard binary

Table 3 Two-sample test of proportions

<i>Mental health and legal involvement</i>	<i>N</i>	<i>Mean</i>	<i>z</i>	<i>95% CI</i>	<i>p</i>
Co-occurring mental health disorder	3,884	0.599		[0.584, 0.615]	
No co-occurring mental health disorder	3,777	0.553	-4.12	[0.537, 0.569]	0.00
Criminal justice referral	1,318	0.308		[0.283, 0.332]	
No criminal justice referral	7,323	0.610	20.36	[0.598, 0.621]	0.00

Source: Table by authors

Table 4 Two-sample t tests comparing MOUD rates by policy

<i>Prenatal substance use policies</i>	<i>n</i>	<i>Mean</i>	<i>SD</i>	<i>95% CI</i>	<i>t</i>	<i>df</i>	<i>p</i>
Punitive policy	30	0.308	0.276	[0.205, 0.411]			
No punitive policy	19	0.438	0.333	[0.278, 0.599]	1.49	47	0.072
Priority policy	21	0.271	0.271	[0.147, 0.394]			
No priority policy	28	0.425	0.313	[0.303, 0.546]	1.8	47	0.039

Source: Table by authors

logistic regression. The ICC for this model was 0.521, indicating substantial clustering of data (Heck *et al.*, 2014) (Table 5).

The second model added the individual (admissions) level and state-level predictors. Results from this model found a significant Wald Chi-squared test estimate (357.11, $p < 0.001$), leading to the inference that at least one of the predictors slopes is significantly different from zero. The race variable was factored, and all race groups showed nonsignificant differences from the comparison group (white) except for the “other single race” category, which was significantly different than the comparison group ($p = 0.018$, [0.063, 0.665]).

Neither policy was a significant predictor of MOUD receipt; a state having a punitive policy was not significant ($p = 0.679$, [-1.067, 0.695]) and having a priority access policy was also not significant ($p = 0.684$, [-1.093, 0.716]). Of note, both criminal justice referral and co-occurring mental health disorder variables were significant. Admissions with a criminal justice referral were less likely to receive MOUD ($p < 0.001$, [-1.567, -1.248]), and those with a co-occurring mental health disorder were also less likely to receive MOUD ($p < 0.001$, [-0.361, -0.119]) (Table 5).

Political affiliation was also a significant predictor of MOUD in the second model; if a state was Democratic leaning ($p = 0.003$, [0.757, 3.716]) or a solid Democrat state ($p < 0.001$, [1.024, 3.497]), it was significantly more likely to be associated with MOUD receipt. Level 2 variance estimate is 1.39, and the postestimation ICC for this model is 0.296, which is a reduction from the original model with no predictors but still contains evidence of clustering.

The final model allowed the slopes to randomly vary on the race variable and estimated similar coefficients to Model 2 on the criminal justice referral variable ($p < 0.001$, [-1.571, -1.251]) and mental health ($p < 0.001$, [-0.353, -0.110]) variables. Again, there showed no significance on either one of the substance use policies or on race, but

Table 5 Multilevel model results predicting MOUD use from individual and state-level variables

	Model 1 (N = 8,787 from 45 states)			MOUD use Model 2 (N = 7,539 from 39 states)			Model 3 (N = 7,539 from 39 states)		
	Coefficient	SE	p	Coefficient	SE	p	Coefficient	SE	p
	-0.831	0.297	0.005						
<i>Predictors</i>									
State level									
Punitive policy				-0.186	0.450	0.679	-0.397	0.249	0.111
Priority access policy				-0.188	0.461	0.684	-0.240	0.265	0.365
<i>Political affiliation**</i>									
Republican leaning				-0.092	0.805	0.909	0.296	0.475	0.534
Competitive				1.320	0.674	0.050	1.114	0.408	0.006
Democrat leaning				2.237	0.755	0.003	2.170	0.456	0.000
Solid democrat				2.261	0.631	0.000	1.861	0.399	0.000
<i>Individual level</i>									
Criminal justice referral				-1.410	0.081	0.000	-1.411	0.081	0.000
Co-occurring mental health				-0.240	0.062	0.000	-0.231	0.062	0.000
<i>Race</i>									
Black				0.065	0.104	0.528	0.224	0.322	0.487
Asian or Pacific Islander				0.570	0.613	0.352	1.158	0.862	0.179
Other single race				0.364	0.154	0.018	0.627	0.403	0.120
Two or more races				0.322	0.165	0.051	0.559	0.369	0.130
chi squared				357.110			372.010		
ICC	0.521			0.296					

Note: **The “solid republican” category was used as the comparison group

Source: table by authors

there was significance on political affiliation. Being in a competing state (which could be Democratic or Republican) was significantly associated with MOUD receipt ($p = 0.006$, [0.315, 1.913]), as well as being in a Democrat-leaning state ($p < 0.001$, [1.276, 3.063]) and in a solid Democratic state ($p < 0.001$, [1.080, 2.643]) (Table 5). Overall, the multilevel models revealed non-significance in policy variables and found that political affiliation of a state carried significance, suggesting that political leanings may matter more in terms of engagement in MOUD treatment than the policies designed to support or dissuade it across the USA. In conclusion, a referral from the criminal justice system, having a co-occurring mental health disorder, and the political leaning of the state where the admission occurred were the main predictors of MOUD among pregnant women.

Discussion

This study seeks to expand what we know about the myriad factors that contribute to variability in MOUD use for pregnant OUD admissions to treatment. This study is the first to explore individual-level factors that include mental health and referral sources to treatment that lead to MOUD use in the context of state-level policy and political environments. Most notable in these findings is the variation in MOUD use between regions and states. This study found that while substance use policies were designed to increase MOUD for pregnant women, this was not as prominent a predictor as other factors, like mental health, being referred from the criminal justice system and living in a state with more Democratic-leaning affiliations. This study corroborates with prior work that points to major deficits in treatment access when entering treatment from the criminal justice system (Csete, 2019; Matusow *et al.*, 2013). This is especially important in states that criminalize prenatal substance use under their child abuse statutes, and this is precisely how pregnant women become legally involved with a court system that routinely blocks access to the very treatment they need. Those with a co-occurring mental health condition were more likely to receive MOUD, as was hypothesized. It is possible this points to how both types of services are accessed, indicating it might increase likelihood of being referred to treatment for substance use if one is already receiving mental health services, or vice versa. While studies show a decreased likelihood of accessing any type of substance use treatment among those with a mental health condition (Cook *et al.*, 2010; Glasheen *et al.*, 2015; Le Strat *et al.*, 2011), this study found the opposite in regards to MOUD specifically. More research is needed to understand the link between MOUD dispensing and mental health services for those with co-occurring disorders.

And lastly, a Democratic political affiliation showed an association with increased MOUD in a state. This could have occurred in a more direct manner, through explicit funding priorities driven by a political party that shift the state either into more treatment or more channels of punishment (i.e. child welfare involvement, jails, prisons, etc.). Or it could exist through a general set of shared beliefs, attitudes or behaviors that are tied to the political affiliation but may have an indirect impact on the state's overall outlook on approaches to prenatal substance use (treatment focused vs criminalization). This study is in alignment with other literature that continues to point to the dearth of treatment access, and particularly MOUD access, among legally involved individuals, specifically pregnant people with OUD. This represents broader questions pertaining to prenatal substance abuse and highlights the persistence of a system that perceives the problem to be one of a moral nature, endorsing punishment rather than a medical one. And ultimately, these approaches do not lead to an increase in treatment receipt.

The study has some methodological limitations; a state-level analysis, even when considering the individual factors, may not provide sufficient description of community-level or other factors that may influence MOUD receipt. For example, social factors like the availability and quality of social support, experiences of discrimination or stigma (from family, friends or providers) or community-level factors like the availability of buprenorphine

prescribers or access to public transportation. Further, a binary policy indicator makes it difficult to depict the more nuanced characteristics of a state that might contribute to problems of access. Future research can more accurately capture the realities of treatment-seeking under various social and community circumstances by incorporating these concepts.

Use of the TEDS-A data set also has its limitations. While an exceptionally large and powerful data set, limitations exist in two broad categories: those related to the scope of the data collection system and those related to the difficulties of aggregating data from highly diverse state data collection systems. TEDS is an admission-based system, and therefore admissions do not represent individuals. An individual admitting to treatment two separate times in a year would constitute two admissions. For reasons of confidentiality, most states cannot identify clients with a unique ID. Thus, TEDS-A data is unable to follow individual clients through a sequence of treatment episodes. And lastly, the sample does not represent the scope of actual need for opioid use treatment, as it includes only those individuals who have already entered a treatment facility. Future studies should take into account individuals who have not accessed any substance use treatment programs to understand the potential barriers to being linked with treatment.

Implications

The findings from this study have the potential to highlight the need for improvement in existing policies and systems that function either as barriers or facilitators for pregnant women to obtain MOUD. Laws and policies should avoid punitive measures that deter women from seeking help and that perpetuate the cycle of involvement with a legal system that routinely does not link them with MOUD. This study can inform efforts to develop existing policies and practices that promote multidisciplinary, collaborative teams across systems of care, especially with the legal system, that can provide multiple points of access to specialized care designed for their unique needs. This study adds to the growing literature on the ineffectiveness of prenatal substance use policies designed specifically to increase the use of MOUD. If such policies are consistently assessed as not contributing to substantial increase in MOUD among pregnant women over time, it is imperative to investigate potential mechanisms in these policies that may not facilitate MOUD access the way they are intended to. Future research can include explorations of how these policies operate in certain states – for example, researchers can delve into which components of priority access policies can be amended to more effectively link pregnant women with MOUD.

Lastly, we can begin to understand the impact that a political affiliation may have on treatment access; states that leaned more Democratic were more likely to have higher rates of MOUD, and this finding can lead to research that focuses on how and why this contributes to greater treatment utilization. Overall, this study provides estimates of underutilization at a state level and the mechanisms that act as barriers, which is a stronger assessment of how state-specific policies and practices are performing in addressing prenatal substance use and a necessary step in implementing changes that can lead to future improvements in services for pregnant individuals seeking MOUD.

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