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BRIEF REPORT



Disparities in receipt of medications for opioid use disorder among pregnant women

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ABSTRACT

Background: Medications for opioid use disorder (MOUD) improve outcomes for pregnant women and infants. Our primary aim was to examine disparities in maternal MOUD receipt by family sociodemographic characteristics. **Methods:** This retrospective cohort study included mother-infant dyads with Medicaid-covered deliveries in Tennessee from 2009 to 2016. First, we examined family sociodemographic characteristics – including race/ethnicity, rurality, mother’s primary language and education level, and whether paternity was recorded in birth records – and newborn outcomes by type of maternal opioid use. Second, among pregnant women with OUD, we used logistic regression to measure disparities in receipt of MOUD by family sociodemographic characteristics including interactions between characteristics. **Results:** Our cohort from Medicaid-covered deliveries consisted of 314,965 mother-infant dyads, and 4.2 percent were exposed to opioids through maternal use. Among dyads with maternal OUD, MOUD receipt was associated with lower rates of preterm and very preterm birth. Logistic regression adjusted for family sociodemographic characteristics showed that pregnant women with OUD in rural versus urban areas (aOR: 0.66; 95% CI: 0.60–0.72) and who were aged ≥ 35 years versus ≤ 25 years (aOR: 0.75; 95% CI: 0.64–0.89) were less likely to have received MOUD. Families in which the mother’s primary language was English (aOR: 2.47; 95% CI: 1.24–4.91) and paternity was recorded on the birth certificate (aOR: 1.30; 95% CI: 1.19–1.42) were more likely to have received MOUD. Regardless of high school degree attainment, non-Hispanic Black versus non-Hispanic White race was associated with lower likelihood of MOUD receipt. Hispanic race was associated with lower likelihood of MOUD receipt among women without a high school degree. **Conclusions:** Among a large cohort of pregnant women, we found disparities in receipt of MOUD among non-Hispanic Black, Hispanic, and rural pregnant women. As policymakers consider strategies to improve access to MOUD, they should consider targeted approaches to address these disparities.

KEYWORDS

Opioid-related disorders; social determinants of health; obstetrics; neonatology

Introduction

The opioid crisis has substantially affected pregnant women and infants across the United States. The rate of opioid use disorder (OUD) among pregnant women has increased substantially, as has the incidence of neonatal opioid withdrawal syndrome (NOWS), a postnatal withdrawal syndrome experienced by some infants shortly after birth.^{1–4} Medications for OUD (MOUD), such as buprenorphine, improve outcomes for pregnant women and infants, including reducing risk of overdose death and preventing preterm birth.^{5–8}

Limiting unnecessary opioid use and improving access to MOUD, especially for pregnant women, are national public health priorities.^{9,10} Previous research demonstrates disparities in MOUD access. In rural versus urban counties across the U.S., there were fewer providers of buprenorphine¹¹ and

longer drive times to opioid treatment programs.¹² Recent research focusing on pregnant women with OUD documents racial disparities in MOUD receipt in Massachusetts, where Hispanic and non-Hispanic Black women were less likely than their non-Hispanic White peers to have received MOUD.¹³

Using data from the Tennessee Medicaid program (TennCare), we studied opioid use and MOUD receipt among pregnant women enrolled in Medicaid in Tennessee. Recent research demonstrates that pregnancy and reliance on Medicaid insurance each can be a barrier to accessing MOUD providers.^{14,15} The present study among Medicaid-enrolled pregnant women thus highlights disparities in MOUD receipt. First, we examined family sociodemographic characteristics and newborn birth outcomes by type of

maternal opioid use. Second, among pregnant women with OUD, we measured disparities in receipt of MOUD by family sociodemographic characteristics, including race and ethnicity and the interactions of these characteristics. To understand for whom interventions to improve MOUD treatment rates are most needed, we extend the literature on disparities in MOUD access and receipt^{11–13} by examining how race/ethnicity and rural residence intersect with mother's primary language and mother's education level, considering how health care delivery and health communication might differ by patient levels of literacy, education, and nativity status.¹⁶

Methods

Data and study cohort

This retrospective cohort study included all mother-infant dyads with Medicaid-covered deliveries in Tennessee from 2009 to 2016 in which the mother was continuously enrolled in TennCare for the thirty days before delivery. During this period, pregnant women in Tennessee with household incomes up to 250–255 percent of the federal poverty level were eligible for TennCare.¹⁷ We used inpatient, outpatient, physician, and pharmacy claims data from TennCare linked to hospital discharge and birth records from the Tennessee Department of Health. To assemble this cohort, we followed a mother-child linkage algorithm described in prior research^{18,19} and previously applied to study antenatal opioid use.^{20,21} This study was approved by the institutional review boards at Vanderbilt University Medical Center and the Tennessee Department of Health.

Measures

We constructed four mutually exclusive groups of dyads based on type of maternal opioid use: (1) maternal use of MOUD (buprenorphine or methadone) for at least 14 days during the last thirty days of gestation, (2) maternal diagnosis of OUD during gestation but no use of MOUD in the last thirty days of gestation, (3) newborn diagnosis of NOWS but none of the above exposures (as a proxy for maternal illicit opioid use), and (4) no maternal opioid use. We defined OUD using *International Classification of Diseases, Ninth and Tenth Revisions, Clinical Modification (ICD-9-CM and ICD-10-CM)* codes from the Agency for Healthcare Research and Quality,²² which are reproduced in [Online Supplement 1](#). We identified NOWS with *ICD-9-CM* code 779.5 and *ICD-10-CM* code P96.1 in any diagnosis field of an inpatient claim on the newborn's or mother's file within fourteen days of birth. *ICD-10-CM* P96.1 is used only for drug withdrawal following antenatal exposure, while *ICD-9-CM* 779.5 does not distinguish withdrawal following antenatal or iatrogenic exposure. We did not exclude presumed iatrogenic withdrawal among dyads identified with *ICD-9-CM* 779.5 given that in a state-wide medical record review of TennCare, only one percent of reviewed cases with *ICD-9-CM* 779.5 had iatrogenic withdrawal.²⁰ We used

a threshold of fourteen days of maternal opioid use as a clinically meaningful level which can be expected to affect newborn risk of withdrawal. We defined group (4) with no maternal opioid use as dyads with no prescription opioid use (MOUD, immediate release, or sustained release prescription opioids) in the last 30 days of gestation, no maternal diagnosis of OUD, and no diagnosis of NOWS.

We examined birth outcomes and family sociodemographic characteristics as recorded in Medicaid enrollment files and birth certificates. Using birth records, we measured rates of preterm birth (<37 weeks of gestation), and very preterm birth (<32 weeks of gestation). Family sociodemographic characteristics included mother's age at childbirth, mother's education level, whether the mother's primary language was English, mother's race and ethnicity, whether paternity was recorded on the birth certificate, and rural versus urban county of residence. We used self-reported race from the Medicaid enrollment file, supplemented with race from hospital discharge records from the Tennessee Department of Health where missing. We studied racial ethnic groups as Hispanic, non-Hispanic White, non-Hispanic Black, and other non-Hispanic race for consistency across reporting in TennCare and hospital discharge records.

Statistical analysis

We calculated descriptive statistics for family sociodemographic characteristics and newborn outcomes for each maternal opioid use group. Among dyads with maternal OUD or likely OUD given MOUD receipt or NOWS diagnosis (groups, 1, 2, or 3; hereafter “presumed maternal OUD”), we used logistic regression to measure associations between family sociodemographic characteristics and MOUD receipt. Self-reported race was included to consider that racism, including experiences of interpersonal racism and residential segregation,^{23,24} might lead to unequal receipt of MOUD. In the first logistic regression, we included all family sociodemographic characteristics described above. Next, we included a series of interactions in separate models to examine the intersection of sociodemographic factors as they relate to likelihood of MOUD receipt. We included an interaction term between rural residence and maternal race/ethnicity, which individually have been correlated with MOUD receipt,^{11–13} as well as interactions between each of these two factors and maternal high school degree completion and an interaction between rural residence and primary language being English. (There was insufficient variation in primary language being English across racial ethnic groups to examine this intersection.) All adjusted regression models included birth year fixed effects. *A priori*, we set a threshold for statistical significance of coefficients at the 5 percent level.

As supplemental analysis, we repeated the full model of MOUD receipt in a subsample restricted to dyads with mothers with near-continuous enrollment throughout the gestational period – allowing at most a 30-day gap in coverage – to ensure results were not biased by mothers who may

Table 1. Family characteristics by type of maternal opioid use, 2009–2016.

	(1) Maternal MOUD receipt N = 3,694	(2) Maternal OUD diagnosis N = 7,505	(3) NOWS diagnosis N = 2,107	(4) No observed opioid use N = 298,571	(5) p-Value
A. Family characteristics					
Mother's age, mean ± SD, years	26.9 ± 4.6	26.8 ± 5.0	26.9 ± 5.3	24.5 ± 5.4	<.001
Mother's education level, N (%)					<.001
<High school	843 (22.8)	2016 (26.9)	577 (27.4)	68,009 (22.8)	
HS graduate or GED	1696 (45.9)	3361 (44.8)	923 (43.8)	121,966 (40.8)	
Some college	1,097 (29.7)	1,971 (26.3)	560 (26.6)	93,668 (31.4)	
Bachelor's or higher degree	45 (1.2)	136 (1.8)	29 (1.4)	14,111 (4.7)	
Mother's primary language English, N (%)	3,678 (99.6)	7,452 (99.3)	2,087 (99.1)	280,979 (94.1)	<.001
Mother's race/ethnicity, N (%)					<.001
Hispanic	35 (0.9)	91 (1.2)	28 (1.3)	18,393 (6.2)	
Non-Hispanic White	3,573 (96.7)	6,886 (91.8)	1,882 (89.3)	178,657 (59.8)	
Non-Hispanic Black	67 (1.8)	476 (6.3)	180 (8.5)	96,569 (32.3)	
Other non-Hispanic race	19 (0.5)	47 (0.6)	11 (0.5)	4,776 (1.6)	
Paternity recorded on birth certificate, N (%)	2,837 (76.8)	5,296 (70.6)	1,477 (70.1)	225,358 (75.5)	<.001
Rural-urban county, N (%)					<.001
Urban	2,838 (76.8)	5,274 (70.3)	1,492 (70.8)	222,911 (74.7)	
Rural adjacent	709 (19.2)	1,792 (23.9)	541 (25.7)	61,465 (20.6)	
Rural remote	142 (3.8)	418 (5.6)	67 (3.2)	13,550 (4.5)	
B. Newborn outcomes					
Preterm (<37 weeks), N (%)	486 (13.2)	1,433 (19.1)	388 (18.4)	34,863 (11.7)	<.001
Very preterm (<32 weeks), N (%)	55 (1.5)	187 (2.5)	32 (1.5)	5,550 (1.9)	<.001

Notes. This table displays summary statistics for each group, where groups were defined as: (1) maternal use of MOUD for at least fourteen days during the last thirty days of gestation, (2) maternal diagnosis of OUD (*ICD-9-CM* and *ICD-10-CM* codes for opioid abuse, opioid dependence and unspecified use, and opioid poisoning from the Agency for Healthcare Research and Quality²⁰) at any time during gestation but no use of MOUD in the last thirty days of pregnancy, (3) newborn diagnosis of NOWS (*ICD-9-CM* 779.5 or *ICD-10-CM* P96.1) on inpatient claim but none of the above exposures to opioids, and (4) no opioid use or diagnosis of maternal OUD or NOWS. Rurality was defined using Rural-Urban Continuum Codes (RUCC) from the US Department of Agriculture (version 2013). RUCC 1–3 were classified as “urban;” RUCC 4–9 were classified as “rural.” Preterm status was defined using gestation length from birth certificate data. *p*-Values were calculated for categorical variables from Chi-Square tests, excluding “unknown” group, and for numeric variable from Tukey's Studentized Range (HSD) Test Multiple Comparison. NOWS: neonatal opioid withdrawal syndrome; MOUD: medications for opioid use disorder; OUD: opioid use disorder.

have been diagnosed with OUD prior to the last thirty days of gestation and not enrolled in TennCare.

Results

Our study population consisted of 314,965 mother-infant dyads, including 4.2 percent with filled prescriptions for MOUD for the mother, maternal diagnosis of OUD during the gestational period, or NOWS diagnosis. The prevalence of diagnosed NOWS was 2.0 percent. Among mothers who received MOUD, 85.1 percent had a diagnostic code for OUD.

Table 1 displays family sociodemographic characteristics and newborn outcomes across mutually exclusive groups of dyads defined by type of maternal opioid use. Dyads with maternal MOUD receipt included a larger percentage of urban families and non-Hispanic White mothers compared to other groups with some type of maternal opioid use. The MOUD group had lower rates of preterm birth compared to other opioid-exposed newborns and lower rates of very preterm birth compared to the group with OUD diagnosis but no MOUD receipt.

Among the 13,306 dyads with presumed maternal OUD, 27.8 percent of mothers received MOUD. Table 2 displays results from logistic regressions of MOUD receipt. Adjusted logistic regression showed that, among dyads with presumed maternal OUD, MOUD receipt was associated with urban residence, maternal age 26–34 versus younger or older age, English as the mother's primary language, mother having a high school degree, non-Hispanic White versus non-Hispanic Black race, and paternity recorded on the birth

Table 2. Unadjusted and adjusted odd ratios for MOUD receipt by pregnant women with OUD, 2009–2016.

	Unadjusted OR (95% CI)	Adjusted aOR (95% CI)
Mother's age		
≤25	1.00 (ref.)	1.00 (ref.)
26–34	1.19*** (1.10, 1.28)	1.09* (1.01, 1.19)
≥35	0.83* (0.71, 0.97)	0.75*** (0.64, 0.89)
Mother HS degree	1.25*** (1.14, 1.37)	1.20*** (1.09, 1.31)
Mother's primary language English	2.35* (1.20, 4.60)	2.47** (1.24, 4.91)
Mother's race/ethnicity		
Hispanic	0.72 (0.49, 1.05)	0.69 (0.47, 1.02)
Non-Hispanic White	1.00 (ref.)	1.00 (ref.)
Non-Hispanic Black	0.25*** (0.19, 0.32)	0.24*** (0.18, 0.31)
Other non-Hispanic race	0.80 (0.48, 1.35)	0.74 (0.44, 1.27)
Paternity recorded on birth certificate	1.39*** (1.27, 1.52)	1.30*** (1.19, 1.42)
Rural county	0.72*** (0.66, 0.79)	0.66*** (0.60, 0.72)

Notes. The sample used for all models reported here include groups 1, 2, and 3 defined in Table 1 notes (*N* = 13,306). The first column displays unadjusted results from 6 regressions including family characteristics as regressors one at a time. Adjusted models include characteristics as regressors simultaneously in addition to birth year fixed effects. Abbreviations: aOR: adjusted odds ratio; CI: confidence interval; HS: high school; MOUD: medications for opioid use disorder; OR: odds ratio; OUD: opioid use disorder; ref.: reference group; **p* < .05; ***p* < .01; ****p* < .001.

certificate. Results were consistent in the subsample of dyads in which mothers had near-continuous enrollment during the gestational period (Online Supplement 2).

Examination of the models including interactions between maternal race/ethnicity and education showed that lacking a high school degree was associated with lower likelihood of receipt for Hispanic mothers, while no other interactions were significant (Online Supplement 2). Figure 1 depicts the predicted probabilities of MOUD receipt. For mothers with a high school degree, Hispanic ethnicity was not associated with a difference in MOUD receipt compared to likelihood of receipt by non-Hispanic White mothers. For mothers without

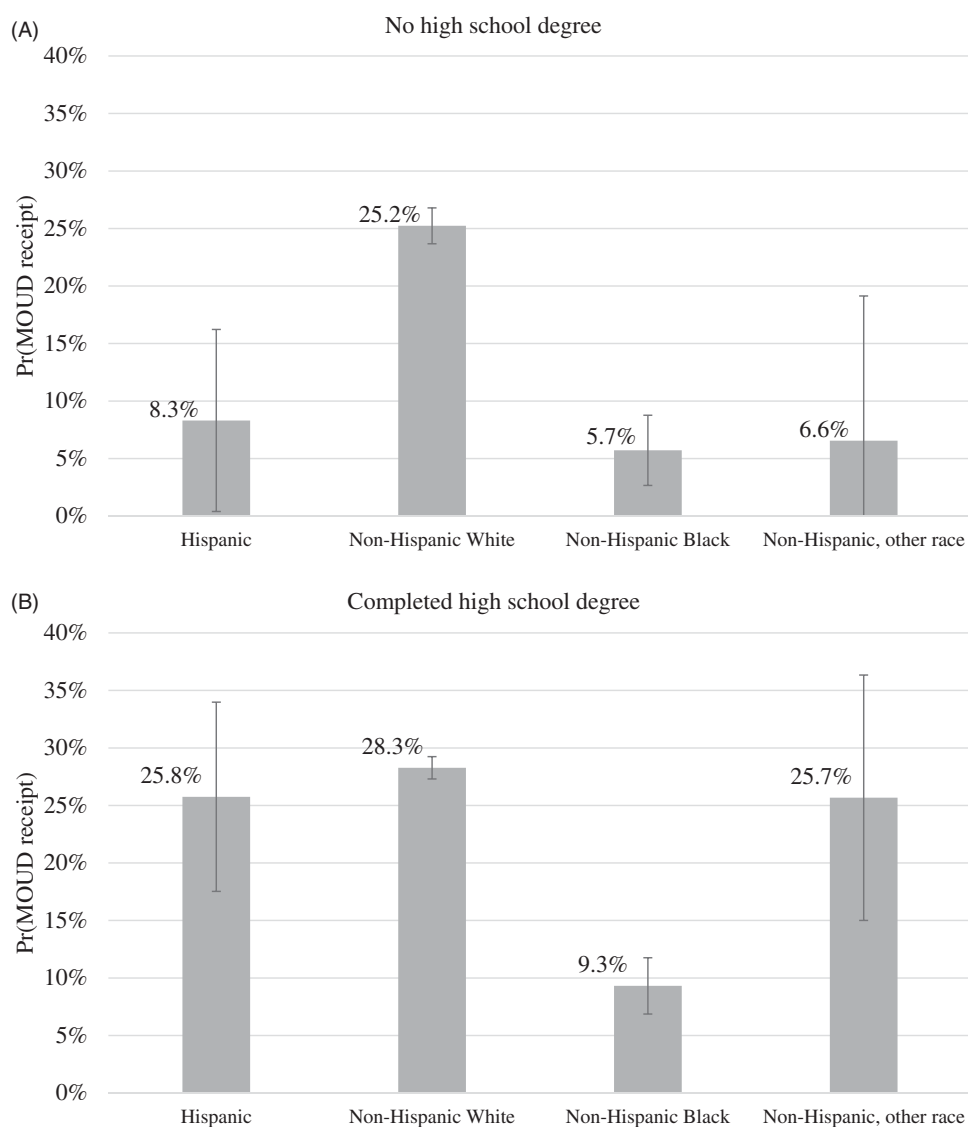


Figure 1. Predicted probabilities of MOUD receipt by maternal race/ethnicity and education level.

Notes. This figure displays the predicted probabilities of MOUD receipt from logistic regression which included as predictors: mother's age at childbirth, whether the mother had a high school degree, whether the mother's primary language was English, mother's race and ethnicity, whether paternity was recorded on the birth certificate, rural versus urban county of residence, interactions between maternal race/ethnicity and high school degree, and birth year fixed effects. Using the fitted values from the regression, predicted probabilities were calculated separately by race/ethnicity and high school degree completion intersections, holding all other regressors at mean levels. In Panel A, the 95% confidence interval for Non-Hispanic, other race includes zero.

a high school degree, however, Hispanic versus non-Hispanic White race was associated with about 17 percentage points lower likelihood of MOUD receipt. Regardless of high school degree attainment, non-Hispanic Black race was associated with even lower likelihood of MOUD receipt – almost 20 percentage points lower than likelihood of receipt by non-Hispanic White pregnant women.

Discussion

While maternal opioid use during the gestational period was common, about 72 percent of pregnant women with presumed OUD did not receive MOUD. More than four percent of mother-infant dyads had a diagnosis of OUD, NOWS, or received MOUD in this cohort of Medicaid-covered deliveries in Tennessee over an eight-year period. MOUD receipt was associated with lower rates of preterm

birth, as observed previously,^{6–8} and very preterm birth. Receipt of these medications varied by family sociodemographic characteristics. Residence in rural versus urban areas, maternal education below a high school degree, mother's primary language other than English, and missing paternity on the birth certificate were associated with lower likelihoods of MOUD receipt. Our findings, combined with a recent analysis in Massachusetts,¹³ provide additional evidence of inequitable receipt of MOUD among non-Hispanic Black and Hispanic pregnant women. Indeed, non-Hispanic Black race was associated with much lower likelihood of MOUD receipt, regardless of high school degree attainment.

There are multiple mechanisms through which race and racism might lead to inequitable receipt of MOUD among pregnant women. Residential segregation – which is most pronounced for Black individuals^{25–28} – might result in reduced availability of MOUD providers in neighborhoods with

greater proportions of people from historically marginalized groups. Previous literature describes how residential segregation in the U.S. has contributed to reduced access to health care for historically marginalized groups.²⁶ For example, research in New York City has shown that buprenorphine treatment was concentrated in areas with the highest percentage of White residents.²⁴ In addition, experienced or expected interpersonal racism and provider characteristics might deter pregnant women from historically marginalized groups from seeking or receiving treatment for OUD. Prior systematic review has described that experiences of interpersonal racism were associated with lower levels of trust of health care workers, lower perceived quality of care, and reduced adherence to medical recommendations.²³ Measured clinician racial bias has been associated with poor communication with patients and lower patient ratings of care, particularly among Black patients.¹⁶

This paper has certain limitations common to research utilizing administrative claims and vital records. Our cohort definition of mother-infant dyads required live birth, eliminating ability to identify women who may have died, including from an overdose, while pregnant. Thus, disparities in MOUD receipt may be larger than measured here. A separate limitation of our cohort is that we focused on Medicaid-covered dyads in Tennessee during a period predating recent state policy change, thus we were unable to measure disparities across the broader U.S. or how new policies to improve MOUD access might reduce or expand existing disparities. During the study period, observed MOUD receipt was largely buprenorphine because TennCare covered methadone only for chronic pain. The nature of disparities in receipt of methadone may be different.²⁴

Recent changes in policy and federal practice guidelines have increased access to MOUD through expansions in the type of health care providers who can prescribe buprenorphine^{9,29} and the number of patients to whom a provider can prescribe buprenorphine.^{9,30} State scope of practice laws still govern who can prescribe buprenorphine,³¹ and in July and August 2020, new Tennessee legislation went into effect to allow nurse practitioners and physician assistants to prescribe buprenorphine under certain restrictions at approved facilities meeting a series of requirements.^{32,33} In June 2020, another important state policy change occurred: TennCare began coverage of methadone for OUD.³⁴ Future research should continue to examine racial disparities in MOUD receipt for pregnant women under changing policy landscapes to understand to what extent particular policies can drive increases in treatment rates and reduce disparities in receipt of MOUD. Also, as policymakers consider mechanisms to improve access to MOUD among pregnant women, they should consider the role that structural barriers may play and work to promote MOUD receipt among groups with lower rates of use – for the health of mothers and their newborns.

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Disclosure statement

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Author contributions

L.E.H. and S.W.P. contributed to the study concept and design as well as the drafting of the manuscript. M.B.B. and S.C.H. contributed to the acquisition of data. L.E.H. and P.L. contributed to the statistical analysis. L.E.H., M.B.B., and S.W.P. contributed to interpretation of data. L.E.H., M.B.B., S.C.H., P.L., and S.W.P. contributed to revisions and approved the final manuscript.

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