Differences between rural and urban residence in the detection and treatment of perinatal mood and anxiety disorders

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BACKGROUND: Perinatal mood and anxiety disorders are common, serious complications of pregnancy. Disparities exist by race and income in the prevalence and treatment of these conditions, and overall treatment rates remain low. Outside of pregnancy, a small body of literature suggests that rural residency may contribute to higher rates of depression for those who identify as women. However, among more diverse populations, evidence suggests urban residency may be associated with higher rates of depression among women of color. It is not known whether these trends hold for mood and anxiety disorders during pregnancy and postpartum.

OBJECTIVE: We examined differences in the detection and treatment of perinatal mood and anxiety disorders by rural and urban residents and assessed if the observed differences varied by maternal race or ethnicity.

STUDY DESIGN: We conducted a cross-sectional study using linked Medicaid claims and birth certificate records from Oregon and South Carolina from 2016 to 2020. We identified perinatal mood and anxiety disorder diagnoses during the perinatal period (pregnancy and within 60 days postpartum) using International Classification of Disease 10th edition codes and enumerated receipt of pharmacotherapy and psychotherapy treatment using Medicaid claims. We used logistic regression models controlling for relevant clinical and sociodemographic characteristics to estimate associations between rural residence and mood disorder detection and treatment.

RESULTS: Among the 185,809 births in our sample, 27% of births (n=50,820) were to people who lived in rural areas and 73% (n=134,989) to those in urban areas. The prevalence of any perinatal mood and anxiety disorders diagnosis was higher for urban residents (19.5%) than for rural residents (18.0%; $P<.001$). Overall treatment rates were low among people with a perinatal mood and anxiety disorder (42% [n=14,789]). In our adjusted models, those living in urban areas had higher odds of a perinatal mood and anxiety disorder diagnosis (adjusted odds ratio, 1.059 [95% confidence interval, 1.059–1.059], $P<.001$). We found a significant interaction between maternal race and rurality ($P<.001$). When we stratified by race, we found that among those who identified as Black, the odds of a perinatal mood and anxiety disorder diagnosis were increased for urban residents (odds ratio, 1.188 [95% confidence interval, 1.188–1.188]), whereas among those who identified as White, there were no such increased odds (odds ratio, 1.027 [95% confidence interval, 0.843–1.252]).

CONCLUSION: We saw small but meaningful differences between rural and urban residents in perinatal mood and anxiety disorder diagnosis rates. We detected an interaction between race and rural vs urban maternal residence that impacted the observed differences. By elucidating the intersection between race and other sociodemographic factors, we hope more targeted and meaningful investments can be made in the communities most in need.

Key words: Mental Health, Perinatal Mood and Anxiety Disorders, Racial Disparities, Rurality

Introduction

Perinatal mood and anxiety disorders (PMADs) are common, serious complications of pregnancy, occurring in at least 13% of births in the United States and increasing in prevalence.[1,2] Mental health conditions during pregnancy are associated with significantly increased risk for both maternal and fetal morbidity and mortality.[3–5]

Data demonstrates that trends in who is diagnosed with PMADs—and who is

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Why was this study conducted?

Little is known about how rurality impacts the detection and treatment of mood and anxiety disorders during pregnancy and postpartum.

Key findings

Small differences exist between urban and rural residents in rates of perinatal mood and anxiety disorder diagnosis. Treatment rates did not differ by urban and rural residence. A significant interaction between race and rurality was seen, with Black individuals in urban areas at significantly higher risk than those in rural areas in stratified models.

What does this add to what is known?

This large, population-based study is the first to show the impact of rurality on rates of detection and treatment of perinatal mood and anxiety disorders. We show how other sociodemographic factors intersect with race in this high-risk and understudied population.

treated—vary by key sociodemographic characteristics. Compared with White counterparts, Black and Latinx people seem to be more likely to self-report symptoms of mood disorders during pregnancy and postpartum,[6–8] but less likely to be diagnosed.[2] In addition, the rates of PMADs are higher for those who are low income, with reports of the prevalence of postpartum depression among Medicaid recipients ranging >30%, well above the national estimate of 8% to 11%.[1,9] Despite this high prevalence and implications for health equity, gaps exist in screening for PMADs, and these conditions likely remain underdiagnosed, particularly among communities of color and people who are low-income.[6,10,11]

Treatment for PMADs with psychotherapy or pharmacotherapy reduces the morbidity of symptoms.[12] However, even for those who screen positive, treatment rates remain low.[1,10,13] In one systematic review of 32 studies, only 13.6% of those with antenatal depression and 15.3% of those with postpartum depression received any treatment, and even fewer received adequate treatment (defined as >6 weeks of appropriate medication or therapy; 8.6% and 6.3%, respectively).[10] Little research has investigated factors associated with access to and uptake of treatment for PMADs. In fact, the US Preventive Services Task Force in 2019 identified interventions around perinatal depression as a high-priority evidence gap.[14]

Despite well-documented disparities by race and income in PMADs, little is known about how rurality impacts the detection and treatment of PMADs.[6,7,9] Outside of pregnancy, a small body of literature suggests that rural residency may be linked with higher rates of depression among women.[15,16] However, among more diverse populations, data suggest an interaction between rurality and race on women's mental health, with Black women in urban areas more likely to experience depression than their rural counterparts and the opposite being true for White women.[17] It is unknown if these trends hold in pregnancy.

Disparities exist in treatment for PMADs as well, although evidence is limited. In one study using national survey data of about 1500 women, Dagher et al[7] found that Latinas and low-income people were less likely to seek consultation for postpartum mental health reasons. Another study in Philadelphia found that White Medicaid recipients were twice as likely as Black recipients to use mental health services during pregnancy and postpartum.[18] Limited data exists on how the rurality of maternal residence may impact treatment for PMADs.

This study aimed to describe differences between rural and urban residents in perinatal mental health and identify whether rurality interacts with race to contribute to PMAD diagnoses and treatment. We hypothesized that rural residents would have higher rates of PMAD diagnoses and lower rates of treatment and that race would impact these differences.

Materials and Methods

We conducted a cross-sectional study using linked Medicaid claims and birth certificate records from Oregon and South Carolina, 2 states with large rural populations and urban centers. Data was linked by Medicaid identification number before being transferred to the research team. Our study period was from January 1, 2016 through December 31, 2020. We followed the Strengthening the Reporting of Observational Studies in Epidemiology and Reporting of Studies Conducted using Observational Routinely-collected Data extension guidelines.[19,20] The institutional review board at Oregon Health & Science University approved this study.

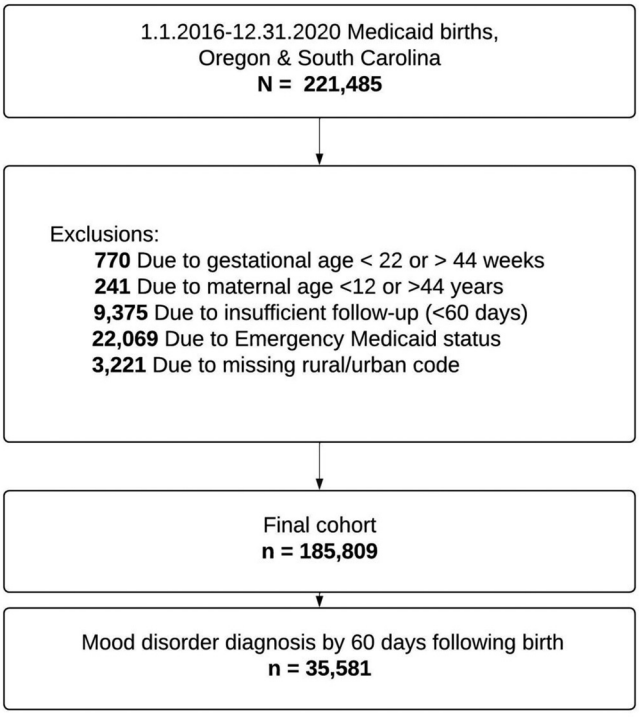
Study population

Our study population included live singleton births among Medicaid recipients aged 12–44 years. We restricted our sample to births that occurred between 22 and 44 weeks gestation. We excluded those covered by Emergency Medicaid because of the systemic differences in care coverage (Figure).

Variables

We measured 2 outcomes of interest. Our primary outcome was any PMAD during pregnancy or within 60 days after delivery. We used the International Classification of Disease (ICD) 10th edition codes to identify PMADs within Clinical Classifications Software Refined categories of depressive disorders (depression), anxiety and fear-related disorders (anxiety), and bipolar and related disorders (bipolar; Supplementary Table). Anxiety included obsessive-compulsive and related disorders but excluded trauma- and stressor-related disorders. Our secondary outcome was the treatment of PMADs among those with a diagnosis. We defined treatment as the receipt of at least 1 prescription for pharmacotherapy (antidepressants, anxiolytics, and drugs used for

FIGURE
Cohort selection diagram



Cohorts for this study of perinatal mood and anxiety disorders were selected from Medicaid births in Oregon and South Carolina occurring from 2016 through 2020.

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treatment of bipolar disorder) or at least 1 encounter for talk therapy or counseling prenatally through 60 days postpartum.

Relevant maternal demographic and clinical independent variables were abstracted from birth certificate records, and Medicaid claims data. We measured rural vs urban residences using the Rural-Urban Commuting Area Codes zip code classification.[21] Maternal age was categorized by <20, 20−34, and ≥35 years. In addition, we included race and ethnicity, as self-reported on the birth certificate, and parity. We included clinical variables associated with maternal birth outcomes and PMAD diagnosis, including mode of delivery, adequacy of prenatal care (>7 prenatal visits), preterm birth, maternal substance use disorder diagnosis, neonatal intensive care unit (NICU) admission, and pregnancy complications including pregestational diabetes, pregestational hypertension, gestational diabetes, or hypertensive disorders of pregnancy.

Analysis

We first compared maternal demographic and clinical characteristics across urban vs rural residences using chi-square tests. In addition, we compared PMAD diagnosis, timing (prenatal vs postpartum), and receipt of treatment by urban vs rural status using chi-square tests.

We then built logistic regression models to assess the association between rural vs urban residence and our outcomes of interest. We first evaluated the outcome of PMAD diagnosis during the prenatal through 60 days postpartum period. Among those who were diagnosed with PMAD, we then measured the association between maternal residence and those who received any form of treatment, compared with those who received no treatment. We then stratified these models by race and ethnicity. In addition we compared psychotherapy vs pharmacotherapy intervention in a subanalysis among those who received any treatment. In all models, we adjusted for the adequacy of prenatal care, maternal age, state (Oregon vs South Carolina), pregnancy complications, and NICU admission. Associations between these pregnancy factors and PMADs have been well documented.[1,22,23] All tests were two-sided, with an accepted α of $\leq$0.05. Data management and analyses were conducted using R statistical software (version 4.2.3, R Core Team, Vienna, Austria).

Results

Among the 185,809 births in our sample, 27% of births (n=50,820) were to people who lived in rural areas and 73% (n=134,989) to those in urban areas. South Carolina had a higher proportion of births to rural residents (29.8%) than Oregon (24.3%). A higher proportion of births in rural areas were to Black residents (31.5%) than in urban areas (25.8%), with similar proportions of births to White residents (55.6% of rural births vs 56.2% of urban births). Parity and preterm birth rates did not differ by rurality. Small but significant differences by rurality were seen across maternal age and in rates of pregnancy complications, cesarean delivery, substance use disorder, fetal anomalies, and attendance at a postpartum visit (Table 1).

The prevalence of any PMAD diagnoses was higher for urban residents (19.5%) than for rural residents (18.1%; P<.001) (Table 2). Of those with a PMAD diagnosis, 70.6% were diagnosed during pregnancy and 29.4% in the postpartum period. The timing of diagnosis did not differ by rurality of residence (P=.514).

Among those with a diagnosed PMAD, rates of treatment were low, with a most individuals in our sample receiving no treatment (58.4%) (Table 3). Only 21% of those diagnosed with PMAD received at least 1 prescription for pharmacotherapy. Similarly, only 20% received at least 1 session of talk therapy or counseling. There was no difference in the type of treatment

TABLE 1
Demographic and clinical characteristics of Medicaid births in Oregon and South Carolina by rurality status, 2016–2020

Characteristics	Rural (n=50,820)	Urban (n=134,989)	Overall (n=185,809)	*P* value
Age (y)				<.001
≤19	5691 (11.2)	12,106 (9.0)	17,797 (9.6)	
20–34	41,058 (80.8)	109,147 (80.9)	150,205 (80.8)	
>35	4071 (8.0)	13,736 (10.2)	17,807 (9.6)	
State				<.001
Oregon	19,964 (39.3)	62,216 (46.1)	82,180 (44.2)	
South Carolina	30,856 (60.7)	72,773 (53.9)	103,629 (55.8)	
Multiparous	31,831 (62.6)	84,091 (62.3)	115,922 (62.4)	.155
Race and ethnicity				<.001
American Indian or Alaskan Native	1069 (2.1)	1124 (0.8)	2193 (1.2)	
Asian	273 (0.5)	2587 (1.9)	2860 (1.5)	
Black	16,006 (31.5)	34,871 (25.8)	50,877 (27.4)	
Hawaiian or Pacific Islander	64 (0.1)	586 (0.4)	650 (0.3)	
Hispanic or Latina	3957 (7.8)	15,594 (11.6)	19,551 (10.5)	
Other	905 (1.8)	3317 (2.5)	4222 (2.3)	
Unknown	278 (0.5)	1038 (0.8)	1316 (0.7)	
White	28,268 (55.6)	75,872 (56.2)	104,140 (56.0)	
Postpartum visit within 60 d	26,800 (52.7)	75,812 (56.2)	102,612 (55.2)	<.001
Adequacy of prenatal care (>7 prenatal visits)	44,711 (88.0)	119,043 (88.2)	163,754 (88.1)	.077
History of mental health diagnosis	396 (0.8)	1911 (1.4)	2307 (1.2)	<.001
Substance use disorder diagnosis				.023
Opioid use disorder	1273 (2.5)	3542 (2.6)	4815 (2.6)	
Other SUD	2487 (4.9)	6251 (4.6)	8738 (4.7)	
Pregnancy complications[a]	7993 (15.7)	25,527 (18.9)	33,520 (18.0)	<.001
Preterm birth	5269 (10.4)	14,250 (10.6)	19,519 (10.5)	.238
Cesarean delivery	15,769 (31.0)	41,088 (30.4)	56,857 (30.6)	.014
Fetal Anomaly	1203 (2.4)	3526 (2.6)	4729 (2.5)	.003
NICU Admission	4102 (8.1)	12,705 (9.4)	16,807 (9.0)	<.001

Data are presented as number (percentage).

NICU, neonatal intensive care unit; *SUD*, substance abuse disorder.

[a] Complications include gestational diabetes, gestational hypertension, prepregnancy diabetes, or prepregnancy hypertension.

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received by the rurality of residence (*P*=.079).

In our adjusted models, those living in urban areas had higher odds of a PMAD diagnosis when adjusting for relevant factors (odds ratio [OR], 1.059 [95% confidence interval (CI), 1.059 −1.059]; *P*<.001) (Table 4). We found a significant interaction between maternal race and rurality (*P*<.001). In our subanalysis stratified by race, there were no increased odds of PMAD diagnosis for urban residents who identified as White (OR, 1.027 [95% CI, 0.843−1.252]), whereas the odds of diagnosis were increased for urban residents who identified as Black (OR, 1.188 [95% CI, 1.188−1.188]).

Comment

Principal findings

In this large population-based study of births across 2 diverse states, we saw small but meaningful differences in the detection of PMADs by rural and urban residents. Our stratified analyses showed an interaction between race and rurality, with urban Black residents having higher

TABLE 2
Urban and rural differences in perinatal mood and anxiety disorders diagnosed prenatally and within 60 d postpartum among Medicaid births in Oregon and South Carolina, 2016–2020

Variables	Rural (n=50,820)	Urban (n=134,989)	Overall	*P* value
Perinatal mood and anxiety disorder				<.001
Bipolar disorder	1137 (2.2)	3260 (2.4)	4397 (2.4)	
Anxiety	3400 (6.7)	9398 (7.0)	12,798 (6.9)	
Depression	2605 (5.1)	7367 (5.5)	9972 (5.4)	
Both anxiety and depression	2061 (4.1)	6353 (4.7)	8414 (4.5)	
No evidence	41,617 (81.9)	108,611 (80.5)	150,228 (80.9)	
Among those with a PMAD diagnosis	n=9,162	n=26,265	n=35,427	
Diagnosis timing				.514
Prenatal	6474 (70.3)	18,647 (70.7)	25,121 (70.6)	
0–60 d postpartum	2729 (29.7)	7731 (29.3)	10,460 (29.4)	

Data are presented as number (percentage).

PMAD, perinatal mood and anxiety disorders.

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TABLE 3
Urban and rural differences in receipt of treatment for perinatal mood and anxiety disorders prenatally and within 60 d postpartum among Medicaid births with mood disorder diagnosis in Oregon and South Carolina, 2016–2020

	Rural (n=9,203)	Urban (n=26,378)	Overall (n=35,581)	*P* value
PMAD Treatment Type				.079
Therapy	1954 (21.2)	5293 (20.1)	7247 (20.4)	
Pharmacologic treatment	1885 (20.5)	5657 (21.4)	7542 (21.2)	
None	5364 (58.3)	15,428 (58.5)	20,792 (58.4)	

PMAD, perinatal mood and anxiety disorders.

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odds of PMAD diagnosis than Black residents but no such increased odds for White residents. We add prior research that demonstrated low treatment rates for PMADs, particularly among those with low income.[18] Most in our sample diagnosed with any PMAD received no treatment. Interestingly, no differences were seen in the rate or type of treatment received between those in rural and urban areas.

Results in the context of what is known

Our study echoes research demonstrating an interaction between race and

TABLE 4
Association between urban (vs rural) status and perinatal mood and anxiety disorders diagnosis and treatment, overall and stratified by race

	Overall[a]			White			Black		
	aOR	95% CI	*P* value	aOR	95% CI	*P* value	aOR	95% CI	*P* value
PMAD diagnosis	1.059	1.059–1.059	<.001	1.027	0.843–1.252	.101	1.188	1.188–1.188	<.001
PMAD treatment	0.940	0.914–0.967	.014	0.948	0.830–1.082	.068	1.004	0.156–6.482	.952

The odds ratio was adjusted for adequacy of prenatal care (>7 visits), maternal age, state (Oregon vs South Carolina), pregnancy complications, and neonatal intensive care unit admission.

aOR, adjusted odds ratio; *CI*, confidence interval; *PMAD*, perinatal mood and anxiety disorders.

[a] Interaction term in PMAD diagnosis model between urban status and race, *P*<.001.

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rurality on women's mental health outside of pregnancy, but ours is the first study to describe this interaction during the perinatal period.[17] Our results diverge from prior research suggesting that rural women are at higher risk of mental health conditions. Given the trend identified in our large, diverse sample, these prior results may reflect a historic lack of inclusion of women of color in research. The disparity in urban mental health is likely driven at least in part by racial disparities as opposed to a simple rural vs urban divide.

Multiple factors are likely contributing to a higher risk among urban Black residents than rural Black residents. Some rural Black residents, particularly in the South, may have resources, community, and coping mechanisms that may not be as available to their urban counterparts, such as high rates of religious participation.[24,25] These factors in the rural South may partially counterbalance the detrimental mental health effects of systemic and interpersonal racism, which remains pervasive throughout the United States.[24] Racism has been shown to play a role in rates of PMADs specifically: multiple studies have shown an increased risk of postpartum depression for Black women who report experiencing racial discrimination during their pregnancy and preceding months.[26,27]

It was perhaps surprising to see no difference in PMAD treatment rates between rural and urban residents, given recent calls to action regarding the stark lack of mental health providers in rural areas. However, deficits in mental health providers also exist in urban areas, where population and demand may be higher, creating an effective scarcity in these areas as well. One study from 2009 in a nonpregnant population also showed no difference in formal treatment rates for depression between rural and urban residents, though it saw significantly higher rates of pharmacotherapy vs psychotherapy among rural residents.[28]

Finally, diagnosis depends on screening and clinical recognition. The paucity of providers in rural areas with comfort in treating mental health in the perinatal period may also disincentivize universal screening, thus leading to underdiagnosis. Furthermore, studies suggest that non-White patients are less likely to be screened for postpartum depression,[11] which may contribute to the findings presented here.

Clinical implications

This study further describes disparities in the detection and treatment of PMADs, which may help guide screening and treatment interventions for more marginalized subgroups, in particular, urban Black residents. The implications of our findings extend beyond perinatal mental health to birth outcomes more broadly. For example, a prior study of young, urban women of color suggests that depressive symptoms mediate the relationship between experiences of discrimination and low birthweight.[29] Thus, these data may be of interest to those working to achieve equity in birth outcomes more broadly.

It is well-understood that treatment for PMADs can help alleviate morbidity and mortality associated with these conditions.[12] The low rates of treatment seen in this study serve as a call to action for providers who care for pregnant and postpartum women. Although some of the low rates of treatment may be related to patient preference, there is likely a gap between those who may benefit from and desire treatment and the number who received it. In addition, our results underscore a dire need for increased access to mental healthcare in the US.

Research implications

Our study defined treatment as at least 1 claim for either a prescription or a visit with a counselor, which does not equate to symptomatically controlled perinatal mental health. Future research can investigate whether rates of hospital admission or emergency department visits for reasons related to mental health during pregnancy and postpartum differ between rural and urban residents to better quantify the current morbidity in these areas.

Strengths and limitations

Strengths of this study include its large, diverse population that spans 2 states with distinct population distributions. Both Oregon and South Carolina have urban centers and large rural populations. In addition, by linking Medicaid birth certificate records and claims data, we were able to reliably identify both ICD codes used in diagnosis in any clinical encounter and prescription and counseling claims. Our study is the first to examine the interaction between race and rurality in a pregnant population.

This study is not without limitations. PMADs are likely underdiagnosed, which affects the rates seen in any observational analysis. Analysis of Pregnancy Risk Assessment and Monitoring System data in Oregon, which surveys a representative sample of parents in the immediate postpartum period, found a rate closer to 35% for the prevalence of depressive symptoms among individuals with low income in the postpartum period. This suggests that a large proportion of symptomatic people are not receiving a formal diagnosis in the clinical setting.[30] This may be related to both gaps in screening at postpartum visits and low rates of attendance to these visits. Attendance at postpartum visits is historically poor, with 1 systematic review reporting an average rate of attendance of 72%.[31] Furthermore, our study did not evaluate treatments beyond medications and formal counseling, such as interpersonal or community support, that individuals may have received. There may be unmeasured regional differences in these informal and adjunctive supports that contribute to our results. Rurality was defined by zip code, which inherently brings heterogeneity to this variable, though more precise demographic demarcation was not available in the dataset. Finally, we only investigated receipt of any 1 treatment during the perinatal period among those who had been diagnosed and cannot address whether this treatment was adequate.

Conclusions

Our findings suggest an interaction between race and rural vs urban residence on the rates of detection and treatment of PMAD. By elucidating the intersection between race and other sociodemographic factors, we hope

more targeted and meaningful investments can be made in the communities most in need. ■

CRediT authorship contribution statement

Erin C. Nacev: Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Data curation, Conceptualization. **Ann C. Martinez Acevedo:** Writing – review & editing, Validation, Methodology, Formal analysis, Data curation. **Menolly Kaufman:** Validation, Methodology, Formal analysis, Data curation. **Megan F. Fuerst:** Writing – review & editing, Methodology, Conceptualization. **Jacquelyn M. Knapp:** Writing – review & editing, Conceptualization. **Maria I. Rodriguez:** Writing – review & editing, Supervision, Software, Resources, Methodology, Funding acquisition, Data curation, Conceptualization. ■

Supplementary materials

Supplementary material associated with this article can be found in the online version at doi:10.1016/j.xagr.2024.100351.

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