Rural and Urban Differences in Insurance Coverage at Prepregnancy, Birth, and Postpartum

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OBJECTIVE: To measure insurance coverage at prepregnancy, birth, and postpartum, and insurance coverage continuity across these periods among rural and urban U.S. residents.

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METHODS: We performed a pooled, cross-sectional analysis of survey data from 154,992 postpartum individuals in 43 states and two jurisdictions that participated in the 2016–2019 PRAMS (Pregnancy Risk Assessment Monitoring System). We calculated unadjusted estimates of insurance coverage (Medicaid, commercial, or uninsured) during three periods (prepregnancy, birth, and postpartum), as well as insurance continuity across these periods among rural and urban U.S. residents. We conducted subgroup analyses to compare uninsurance rates among rural and urban residents by sociodemographic and clinical characteristics. We used logistic regression models to generate adjusted odds ratios (aORs) for each comparison.

RESULTS: Rural residents experienced greater odds of uninsurance in each period and continuous uninsurance across all three periods, compared with their urban counterparts. Uninsurance was higher among rural residents compared with urban residents during prepregnancy (15.4% vs 12.1%; aOR 1.19, 95% CI 1.11–1.28), at birth (4.6% vs 2.8%; aOR 1.60, 95% CI 1.41–1.82), and postpartum (12.7% vs 9.8%, aOR 1.27, 95% CI 1.17–1.38]. In each period, rural residents who were non-Hispanic White, married, and with intended pregnancies experienced greater adjusted odds of uninsurance compared with their urban counterparts. Rural–urban differences in uninsurance persisted across both Medicaid expansion and non–expansion states, and among those with varying levels of education and income. Rural inequities in perinatal coverage were experienced by Hispanic, English-speaking, and Indigenous individuals during prepregnancy and at birth.

CONCLUSION: Perinatal uninsurance disproportionately affects rural residents, compared with urban residents, in the 43 states examined. Differential insurance coverage may have important implications for addressing rural–urban inequities in maternity care access and maternal health.

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Addressing rural inequities in maternal and infant health care and health is a national policy priority.[1] Rural residents face declining access to obstetric services[2–4] and greater risk of severe maternal morbidity and mortality at birth.[5] The pregnancy-related mortality ratio increases with rurality.[6] The Centers for Disease Control and Prevention (CDC) has identified lack of timely access to health care as a key contributor to pregnancy-related mortality.[7,8]

Health insurance is an important prerequisite for accessing quality health care before, during, and after pregnancy.[9] In the general adult population, individuals who reside in rural counties in the United States experience higher rates of uninsurance compared with urban residents.[10] Being uninsured in the prepregnancy period has been associated with later and less adequate prenatal care,[11] which decreases the likelihood of optimizing management of chronic conditions or addressing other important risk factors for adverse gestational outcomes before pregnancy. Postpartum uninsurance and insurance disruptions are associated with lower rates of receiving recommended care, including a postpartum visit.[12] Further, many individuals who become uninsured postpartum report conditions that require ongoing care after birth, such as complications related to hypertension or depression, and nearly a quarter report at least one unmet need for medical care.[13]

The objective of this cross-sectional analysis was to describe differences in perinatal health insurance coverage for rural and urban residents in 43 states. To do so, we measured insurance status in each period (prepregnancy, birth, and postpartum) and assessed insurance continuity across these periods.

METHODS

We conducted a pooled, cross-sectional analysis using data from PRAMS (the Pregnancy Risk Assessment Monitoring System) collected in 43 states and two jurisdictions (the District of Columbia and New York City) from 2016 to 2019. PRAMS is an ongoing state-level, population-based surveillance system conducted by state, territorial, or local health departments in partnership with the CDC's Division of Reproductive Health.[14] Each month, each participating state draws a random, stratified sample of state residents who gave birth to a liveborn neonate. Sampled individuals are contacted 2–6 months after giving birth to participate in a mixed-mode (mail and telephone) survey that collects data on sociodemographic characteristics such as geographic location of residence and health insurance coverage before, during, and after pregnancy. We limited our sample to respondents

with complete insurance information (97.2% of the total sample).[12,15–18]

We used PRAMS data to classify insurance at three periods: 1) prepregnancy, measured as 1 month before pregnancy; 2) birth, measured at delivery; and 3) postpartum, measured as insurance held at the time of the postpartum survey (mean 4 months, interquartile range 3–5 months after birth). Prepregnancy and postpartum insurance statuses were self-reported. Insurance status at birth is the primary source of payment for childbirth as recorded by the hospital on the birth certificate.

We followed methods previously used by the CDC to hierarchically categorize insurance coverage in each period (prepregnancy, birth, and postpartum) into one of three categories: Medicaid, commercial, or uninsured.[15] The Medicaid category included respondents who reported enrollment in Medicaid or a state-named Medicaid program. The commercial insurance category included respondents who reported commercial insurance alone or in combination with Medicaid insurance and those who reported TRICARE or other military insurance. The uninsured category included respondents who indicated no insurance. Consistent with the United States Census,[19] other national surveys,[20] and previous analyses of PRAMS,[15,17] individuals who reported only Indian Health Service (IHS) were also classified as uninsured. This is because the IHS provides a system of health care delivery, largely primary care and not health insurance.[19] The only exception was Alaska, where the IHS response option on PRAMS included other state-specific programs and, thus, was classified as Medicaid.[15] We also generated six measures of insurance continuity between prepregnancy and postpartum: 1) continuous commercial, 2) continuous Medicaid, 3) continuous insurance with a commercial–Medicaid discontinuity, 4) one period of uninsurance, 5) two periods of uninsurance, and 6) continuous uninsurance.

Other demographic and clinical covariates included maternal age; income; highest level of education achieved; state Medicaid expansion status; marital status; parity; pregnancy intention; and the presence of preexisting chronic conditions that are available in the PRAMS data: obesity, diabetes, hypertension, and depression. The PRAMS data also include maternal race and ethnicity variables collected from the birth certificate, and a survey question reflecting language spoken at home. We chose to include these variables because they may represent histories of racism and societal marginalization. Studies of uninsurance among reproductive-aged women

have found that nearly one in three noncitizen individuals are uninsured, compared with just 9% of U.S.-born citizens.[21] Thus, we used primary language (English or Spanish) as a proxy for country of origin for Hispanic respondents. Language is one of the most frequently used, and strongest predictors of, acculturation,[22] and has been used as a proxy for nativity or acculturation in other studies of health disparities among Hispanic populations in the United States.[23] As such, we used the following racial and ethnic categories in the PRAMS data: Asian, non-Hispanic (combined categories Asian Pacific Islander, Chinese, Filipino, Japanese, and "other Asian;" henceforth Asian); Black, non-Hispanic; Hispanic, English-speaking; Hispanic, Spanish-Speaking; American Indian/Alaska Native, non-Hispanic (henceforth Indigenous); and a composite of "other, non-White" and "mixed race", non-Hispanic (henceforth additional races and ethnicities or mixed). Income data were missing for 8.8% of respondents, so missing was included as a categorization to retain these observations; all other covariates had very low proportions of missing data. As such, complete case-based analysis was used in our analytic models.

The PRAMS variable that describes a rural respondent's county of residence, compared with an urban respondent's county of residence, is based on the 2013 National Center for Health Statistics' Urban-Rural Classification Scheme for Counties.[24] This classification scheme contains six categories, which are frequently collapsed into a dichotomous variable distinguishing urban areas (all metropolitan statistical areas, including four different National Center for Health Statistics categories of urban–metropolitan areas) and rural areas (all nonmetropolitan statistical areas, including both micropolitan and noncore counties in the original National Center for Health Statistics categorization). The rural–urban dichotomized variable is commonly used in rural–urban analysis and is also the only geographic variable available consistently across all states (not all states report all six of the National Center for Health Statistics categories).

Survey weighting allows researchers to generate state-level estimates using the PRAMs data.[14] The sampling frame for each PRAMS state is all resident individuals who gave birth to a liveborn neonate during the surveillance year. The PRAMS sample is stratified so that subpopulations of public health interest can be oversampled. Statistical weighting schemes account for the different sampling rates in different strata, allowing estimates from these groups to be combined to obtain state-level estimates that ulti-

mately reflect the actual proportions of births attributed to these subpopulations.

We calculated survey weighted estimates of insurance status in each period and for each measure of insurance continuity separately for urban and rural residents. We similarly calculated survey weighted estimates of uninsurance for rural and urban residents within each sociodemographic and clinical subgroup. We used survey weighted logistic regression models to calculate the unadjusted and adjusted (for covariates described above) odds of uninsurance in each period among rural residents, compared with urban residents, overall and for each subgroup. All analyses were conducted in STATA 16.0. This analysis of deidentified data was considered exempt from review by the study site's institutional review board. This study follows the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) reporting guidelines for reporting in observational studies.[25]

RESULTS

The analytic sample included 154,992 postpartum individuals. Rural residents comprised 15.6% (n=32,178) of the sample. Table 1 presents the demographic and clinical characteristics of rural and urban residents. Higher proportions of rural residents were non-Hispanic White (75.9%, vs 55.4% of urban residents), reported incomes up to 138% of the federal poverty level (42.7%, vs 31.2% of urban residents), and lived in Medicaid non–expansion states (47.5%, vs 33.6% of urban residents). Higher proportions of rural residents were in younger age categories, had unintended pregnancies, and reported diagnoses of the chronic conditions examined (obesity, diabetes, hypertension, and depression).

Rural residents were less often commercially insured (57.4% vs 66.5%; adjusted odds ratio [aOR] 0.87, 95% CI 0.82–0.92) and more often uninsured (15.4% vs 12.1%; aOR 1.19, 95% CI 1.11–1.28) during the prepregnancy period, compared with urban residents (Fig. 1 and Table 2). In examining uninsurance by race and ethnicity, the highest rates of prepregnancy uninsurance among rural residents were identified among Spanish-speaking Hispanic individuals (64.2%); English-speaking Hispanic individuals (25.3%); and Indigenous individuals (22.6%) (Table 3). More than 20% of rural residents with less than a high school education, with incomes less than 138% of the federal poverty level, and who live in Medicaid non–expansion states were also uninsured. Rural–urban differences in uninsurance were significant for respondents in all age categories above 24 years; those

Table 1. Sociodemographic and Clinical Characteristics of the Overall Study Sample, Rural Residents, and Urban Residents (N=154,992)

Characteristic	Rural (n=32,178)*		Urban (n=122,744)*	
	N	Survey Weighted % (95% CI)	n	Survey Weighted % (95% CI)
Age (y)				
19 or younger	2,083	6.4 (6.0–6.9)	5,004	3.8 (3.6–3.9)
20–24	7,546	25.9 (25.0–26.7)	20,468	16.9 (16.6–17.3)
25–29	10,370	33.1 (32.2–34.0)	34,754	28.4 (28.0–28.8)
30–34	7,806	22.9 (22.1–23.6)	37,868	30.9 (30.5–31.3)
35 or older	4,373	11.8 (11.3–12.4)	24,645	20.0 (19.7–20.3)
Missing	0		5	0.0 (0.0–0.0)
Race and ethnicity				
Asian[†]	614	1.0 (0.8–1.1)	9,862	6.1 (6.0–6.3)
Black, non-Hispanic	2,701	8.1 (7.6–8.6)	25,533	16.5 (16.2–16.8)
Hispanic, English-speaking	2,027	4.7 (4.4–5.1)	11,984	9.5 (9.2–9.7)
Hispanic, Spanish-speaking	1,252	3.3 (3.0–3.7)	9,048	7.6 (7.3–7.8)
Indigenous[‡]	3,867	2.9 (2.7–3.0)	2,375	0.4 (0.4–0.5)
Additional races and ethnicities or mixed[§]	1,641	2.6 (2.3–2.8)	6,402	3.2 (3.1–3.4)
White, non-Hispanic	17,863	75.9 (75.3–76.6)	55,104	55.4 (55.0–55.8)
Missing	2,213	1.5 (1.4–1.6)	2,436	1.2 (1.2–1.3)
Income (% FPL)				
138 or less	13,874	42.7 (41.7–43.6)	41,484	31.2 (30.8–31.6)
139–199	3,890	12.7 (12.0–13.3)	12,443	9.9 (9.6–10.1)
200–399	7,585	24.6 (23.8–25.4)	28,206	24.1 (23.8–24.5)
400 or more	4,408	12.7 (12.1–13.3)	28,713	25.8 (25.4–26.2)
Missing	2,421	7.4 (6.9–7.9)	11,898	9.0 (8.8–9.3)
State Medicaid expansion				
Adopted	18,224	52.5 (52.3–52.8)	83,815	66.4 (66.4–66.5)
Not adopted	13,954	47.5 (47.2–47.7)	38,929	33.6 (33.5–33.7)
Missing	0		0	
Education				
Less than high school	4,643	14.1 (13.4–14.8)	14,257	11.0 (10.7–11.3)
High school	9,410	31.4 (30.5–32.3)	27,692	22.9 (22.6–23.3)
More than high school	17,986	54.2 (53.2–55.1)	79,561	65.2 (64.8–65.6)
Missing	139	0.4 (0.3–0.5)	1,234	0.9 (0.8–1.0)
Marital status				
Married	17,870	57.3 (56.3–58.2)	74,931	63.0 (62.5–63.4)
Not married	14,272	42.6 (41.7–43.6)	47,723	37.0 (36.6–37.4)
Missing	36	0.0 (0.0–0.2)	90	0.0 (0.0–0.1)
Parity				
Primiparous	11,689	35.6 (34.7–36.5)	48,149	39.1 (38.7–39.6)
Multiparous	20,451	64.4 (63.4–65.3)	74,373	60.7 (60.3–61.1)
Missing	38	0.1 (0.0–0.2)	222	0.2 (0.1–0.2)
Pregnancy intendedness				
Yes	17,617	54.6 (53.7–55.6)	71,299	59.1 (58.7–59.5)
No	14,206	44.2 (43.3–45.2)	49,944	39.6 (39.2–40.1)
Missing	355	1.1 (0.9–1.3)	1,501	1.3 (1.2–1.4)
Chronic conditions				
Obesity				
Yes	9,194	29.9 (29.0–30.8)	30,452	23.5 (23.2–23.9)
No	21,809	66.7 (65.8–67.6)	86,610	71.7 (71.4–72.1)
Missing	1,175	3.5 (3.1–3.9)	5,682	4.8 (4.6–4.9)
Diabetes				
Yes	1,161	3.7 (3.4–4.1)	4,139	3.2 (3.0–3.3)
No	30,730	95.5 (95.1–95.9)	117,318	95.8 (95.6–95.9)
Missing	287	0.8 (0.7–1.0)	1,287	1.1 (1.0–1.2)

(*continued*)

Table 1. Sociodemographic and Clinical Characteristics of the Overall Study Sample, Rural Residents, and Urban Residents (N=154,992) (*continued*)

	Rural (n=32,178)*		Urban (n=122,744)*	
Characteristic	N	Survey Weighted % (95% CI)	n	Survey Weighted % (95% CI)
Hypertension				
Yes	2,173	6.3 (5.8–6.7)	7,369	5.1 (5.9–5.3)
No	29,757	93.1 (92.6–93.5)	114,298	94.0 (93.8–94.2)
Missing	248	0.7 (0.6–0.9)	1,077	0.9 (0.8–1.0)
Depression				
Yes	6,000	19.7 (19.0–20.5)	16,910	12.8 (12.5–13.1)
No	25,956	79.6 (78.8–80.4)	104,732	86.3 (86.0–86.6)
Missing	222	0.7 (0.6–0.9)	1,100	0.9 (0.8–1.0)

FPL, federal poverty level.
* N values are unweighted; percentages are survey weighted to account for sample design, nonresponse, and noncoverage.
† Combined categories Asian Pacific Islander, Chinese, Filipino, Japanese, and "other Asian" from PRAMS (Pregnancy Risk Assessment Monitoring System) data, non-Hispanic.
‡ Combined categories Alaska Native" and American Indian from PRAMS data, non-Hispanic.
§ Combined categories mixed race and other, non-White from PRAMS data, non-Hispanic.

identifying as Hispanic, English-speaking, Indigenous, and non-Hispanic White; those who were married, reported intended pregnancies, and were living in either Medicaid expansion or non–expansion states; and across varying levels of income and education.

At birth, rural residents remained less often commercially insured compared with urban residents (45.9%, vs 57.7%; aOR 0.76, 95% CI 0.72–0.81) and experienced greater odds of Medicaid coverage at birth (49.5%, vs 39.5%; aOR 1.19, 95% CI 1.12–1.26; Table 4). Although the prevalence of uninsurance was lower overall at birth compared with the prepregnancy period, the rural–urban difference in uninsurance remained (rural: 4.6%; urban 2.8%; aOR 1.60, 95% CI 1.41–1.82). The highest rates of uninsurance at birth were identified among respondents who identified as Hispanic and were Spanish speakers (rural: 24.2%; urban: 14.1%) and reported having less than a high school education (rural: 17.3%; urban: 9.3%). Rural residents, compared with urban residents, experienced greater odds of uninsurance in all age categories above 19 years; for those identifying as Hispanic, English-speaking, Indigenous, or non-Hispanic White; those who were married, reported intended pregnancies, had obesity or depression, and were living in either Medicaid expansion or non–expansion states; and across varying levels of income and education.

During the postpartum period, rural residents remained less often commercially insured (52.1% vs 62.5%; aOR 0.84, 95% CI 0.79–0.89) and were more often uninsured (12.7% vs 9.8%; aOR 1.27, 95% CI 1.17–1.38), compared with urban residents (Table 5). There were substantial rural–urban differences in

postpartum uninsurance rates identified among individuals who identified as Hispanic, Spanish-speaking, or non-Hispanic White, who were married, reported intended pregnancies, and were living in either Medicaid expansion or non–expansion states; and individuals across varying levels of education. Those with some chronic conditions, such as obesity and hypertension, also experienced greater odds of uninsurance, compared with urban residents.

Rural residents, compared with urban residents, experienced greater odds of continuous uninsurance (rural: 2.7%, urban: 1.3%; aOR 2.02, 95% CI 1.65–2.49) and continuous Medicaid coverage (rural: 21.9%, urban: 16.5%; aOR 1.08, 95% CI 1.01–1.16) across all three periods. Similarly, rural residents, compared with urban residents, experienced lower odds of continuous commercial coverage (rural: 40.2%, urban: 51.9%; aOR 0.80, 95% CI 0.75–0.85) across all three periods. Discontinuities between commercial insurance and Medicaid insurance and the odds of experiencing one or two periods of uninsurance were not statistically different across groups.

DISCUSSION

Using multistate data from 2016 to 2019, we found substantial rural–urban differences in perinatal insurance coverage during the years leading into the coronavirus disease 2019 (COVID-19) public health emergency. Cross-sectional estimates reveal that rural residents experienced greater adjusted odds of uninsurance during prepregnancy, birth, and postpartum and they experienced greater adjusted odds of continuous uninsurance across these periods compared with urban residents. In each period, rural residents who
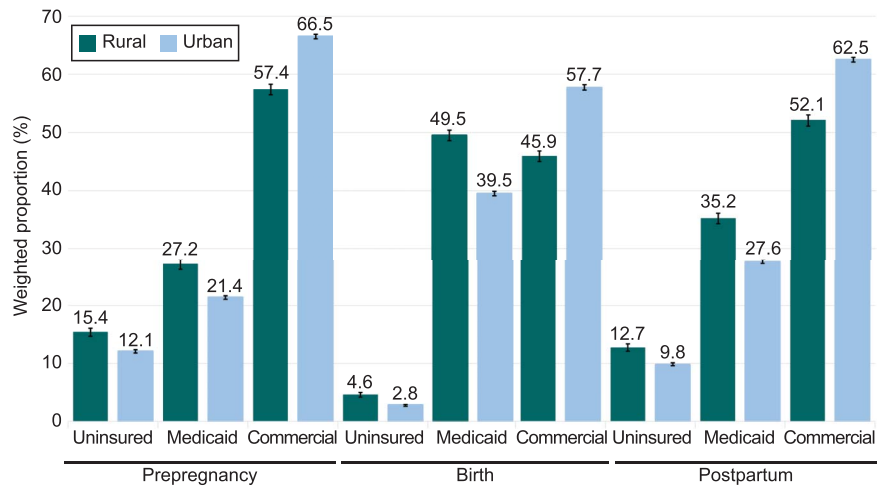
Fig. 1. Insurance status at prepregnancy, birth, and postpartum among rural residents vs urban residents (N=154,922).

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were non-Hispanic White, married, and with intended pregnancies experienced greater adjusted odds of uninsurance compared with their urban counterparts. Rural inequities persisted across both Medicaid expansion and non–expansion states and varying levels of education and income. Rural residents who were Hispanic, English-speaking and Indigenous experienced greater adjusted odds of uninsurance in two of the three periods. These data have important implications for maternal health policymakers, clinicians, and advocates.

Health insurance coverage is driven by federal and state health policy and, thus, amenable to policy intervention.[26] This analysis found that nearly 13% of rural residents were uninsured by 3 months postpartum, representing approximately 156,000 rural residents across the 43 states, and two jurisdictions examined who became uninsured after giving birth from 2016 to 2019. As rural residents are more likely than urban residents to be insured by Medicaid[27] at the time of birth, they may face greater risk of becoming uninsured postpartum, as pregnancy-related Medicaid coverage has historically ended at 60 days postpartum for nearly all enrollees. Our findings are concerning and reveal that rural residents with postpartum uninsurance were more likely to be older than age 35 years and to have obesity or chronic hypertension compared with urban residents who are uninsured postpartum. These conditions place postpartum individuals at greater risk of medical complications in the postpartum year–including maternal morbidity and mortality.

The 15 states that do not currently plan to adopt Medicaid extensions through the first year postpartum are home to a disproportionate number of rural-residing U.S. residents.[28] The data presented in the present study may inform active state and federal policymaking on the topic of perinatal health insurance coverage and the need for continued Medicaid eligibility beyond 60 days postpartum, particularly in rural counties.

Higher rates of uninsurance (and concomitantly lower rates of commercial insurance) were also identified at prepregnancy and birth among rural residents. Multiple policy approaches may be warranted to increase insurance enrollment during these periods, and such policies must account for rural differences in employment and employment-based insurance.[29,30] Rural residents are more likely to work at smaller and family-owned firms and are less likely to have benefits such as health insurance or paid leave, which contributed to inequities in rural health outcomes during the COVID-19 pandemic.[31,32] Improving access to commercial insurance could be accomplished, for instance, through employer-based programs and state policies that incentivize employers, including smaller employers, to provide affordable health insurance coverage or to directly subsidize it through the creation of high-risk pools or other programs, such as incentives to offer spousal and family coverage to employees.[33,34] Additionally, rural residents have more limited access to health information,[35] and targeted investments that address health insurance literacy in the rural United States have been instrumental in increasing insurance enrollment among eligible, but unenrolled, individuals for Medicaid and subsidized health plans and increasing the use of "health insurance navigators" and other rural-tailored health programs.[36] Future work is needed to further disentangle whether the high proportions of rural residents who are uninsured in the perinatal period reflect lack of eligibility, lack of enrollment, or both among eligible individuals.

Table 2. Perinatal Insurance Status and Continuity Among Rural Residents Compared With Urban Residents (N=154,992)

Insurance Status	Rural (n=32,178)*		Urban (n=122,744)*		Unadjusted OR	Adjusted OR[†]
	N	Survey Weighted % (95% CI)	n	Survey Weighted % (95% CI)		
Prepregnancy						
Commercial	17,746	57.4 (56.5–58.3)	78,405	66.5 (66.1–66.9)	0.68 (0.65–0.71)[‡]	0.87 (0.82–0.92)[‡]
Medicaid	9,382	27.2 (26.3–28.0)	29,807	21.4 (21.1–21.7)	1.37 (1.31–1.44)[‡]	1.05 (0.98–1.12)
Uninsured	5,050	15.4 (14.7–16.1)	14,532	12.1 (11.8–12.4)	1.32 (1.24–1.40)[‡]	1.19 (1.11–1.28)[‡]
Birth						
Commercial	14,329	45.9 (45.0–46.8)	67,292	57.7 (57.3–58.2)	0.62 (0.60–0.65)[‡]	0.76 (0.72–0.81)[‡]
Medicaid	16,405	49.5 (48.6–50.4)	52,032	39.5 (39.1–39.9)	1.50 (1.44–1.56)[‡]	1.19 (1.12–1.26)[‡]
Uninsured	1,444	4.6 (4.2–5.0)	3,420	2.8 (2.6–2.9)	1.70 (1.53–1.90)[‡]	1.60 (1.41–1.82)[‡]
Postpartum						
Commercial	16,150	52.1 (51.1–53.0)	73,382	62.5 (62.1–62.9)	0.65 (0.62–0.68)[‡]	0.84 (0.79–0.89)[‡]
Medicaid	11,976	35.2 (34.3–36.1)	37,720	27.6 (27.3–28.0)	1.42 (1.36–1.49)[‡]	1.06 (1.00–1.13)
Uninsured	4,052	12.7 (12.1–13.4)	11,642	9.8 (9.6–10.1)	1.34 (1.25–1.43)[‡]	1.27 (1.17–1.38)[‡]
Continuous insurance						
Commercial	12,483	40.2 (39.3–41.1)	60,243	51.9 (51.5–52.4)	0.62 (0.60–0.65)[‡]	0.80 (0.75–0.85)[‡]
Medicaid	7,501	21.9 (21.1–22.7)	23,494	16.5 (16.2–16.8)	1.42 (1.35–1.49)[‡]	1.08 (1.01–1.16)[§]
Commercial–Medicaid discontinuity	5,024	16.8 (16.0–17.5)	18,821	14.9 (14.6–15.2)	1.15 (1.08–1.21)[‡]	1.04 (0.97–1.1)
Any uninsurance						
1 period	2,228	6.3 (5.8–6.8)	6,474	5.5 (5.3–5.7)	1.14 (1.05–1.25)[∥]	1.11 (0.99–1.24)
2 periods	4,368	12.1 (11.5–12.7)	12,245	9.8 (9.5–10.1)	1.27 (1.19–1.36)[‡]	1.07 (1.00–1.15)
3 periods (continuously uninsured)	574	2.7 (2.3–3.0)	1,467	1.3 (1.2–1.4)	2.13 (1.82–2.50)[‡]	2.02 (1.65–2.49)[‡]

OR, odds ratio.

* N values are unweighted; all other data are survey weighted to account for sample design, nonresponse, and noncoverage.

[†] Odds ratios are adjusted for maternal age, race and ethnicity, income, highest level of education achieved, state Medicaid expansion status, marital status, parity, pregnancy intention, and the presence of preexisting chronic conditions (obesity, diabetes, hypertension, and depression).

[‡] $P<.001$.

[§] $P<.05$.

[∥] $P<.01$.

We identified increased odds of perinatal uninsurance among Hispanic, English-speaking, and Indigenous individuals residing in rural counties, compared with urban counties. In fact, approximately 40% of rural residents who were uninsured in the perinatal period were Indigenous or Hispanic, despite these populations only reflecting approximately 10% of the rural population.

Among Hispanic individuals, this likely represents more limited access to employer-sponsored coverage and restrictions on Medicaid eligibility. For instance, if lawfully residing immigrants meet income eligibility requirements, they may enroll in Medicaid after a 5-year waiting period (waived for pregnant individuals in 29 states); however, this does not apply to individuals who are residing in the United States nonlawfully or to nonpregnant individuals (as would be needed for insurance coverage in the prepregnancy period).[37] Approximately 8% of all U.S. births are to nonlawfully residing immigrants (250,000/year) as of 2016.[38] Although overall reports of maternal morbidity and mortality suggest similar rates among non-Hispanic White and Hispanic individuals,[39] attention must turn to addressing heterogeneity within the Hispanic population, including a lens toward examining intersectionality by rural residence compared with urban residence, nativity, immigration status, and acculturation, among other factors.

Many Indigenous individuals live on reservations or in highly rural or frontier communities that are long distances from care.[40] Those in federally recognized tribes may receive care from the IHS or tribal health centers, but this is not health insurance coverage—the scope of services is limited and usually does not include full-scope maternal care.[41] In a recent report, researchers describe significant barriers to

Table 3. Prepregnancy Uninsurance Among Rural Residents Compared With Urban Residents (n=19,582)

Characteristic	Rural (n=5,050)	Urban (n=14,532)	Unadjusted OR	Adjusted OR*
Age (y)				
19 or younger	13.3 (10.6–16.1)	14.9 (13.1–16.6)	0.88 (0.67–1.16)	1.11 (0.80–1.52)
20–24	18.4 (16.9–19.9)	18.5 (17.6–19.4)	0.99 (0.88–1.11)	1.10 (0.96–1.26)
25–29	14.9 (13.7–16.1)	13.2 (12.6–13.7)	1.16 (1.04–1.29)[†]	1.14 (1.00–1.29)[‡]
30–34	13.3 (12.0–14.6)	9.2 (8.7–9.6)	1.52 (1.34–1.72)[§]	1.24 (1.06–1.45)[†]
35 or older	15.6 (13.6–17.6)	9.3 (8.7–9.8)	1.81 (1.53–2.14)[§]	1.51 (1.22–1.88)[§]
Race and ethnicity				
Asian or Pacific Islander[‖]	12.5 (6.5–18.5)	6.8 (6.0–7.5)	1.97 (1.12–3.47)[‡]	1.50 (0.85–2.66)
Black, non-Hispanic	15.7 (13.0–18.4)	11.5 (10.8–12.2)	1.42 (1.15–1.77)[†]	1.03 (0.82–1.30)
Hispanic, English-speaking	25.3 (21.5–29.1)	15.0 (14.0–16.0)	1.92 (1.55–2.38)[§]	1.28 (1.01–1.63)[‡]
Hispanic, Spanish-Speaking	64.2 (59.7–68.7)	52.0 (50.3–53.6)	1.66 (1.35–2.03)[§]	1.22 (0.94–1.58)
Indigenous[¶]	22.6 (20.1–25.0)	15.6 (13.7–17.5)	1.58 (1.29–1.93)[§]	1.43 (1.15–1.78)[†]
Additional races and ethnicities or mixed[#]	15.7 (12.3–19.2)	11.8 (10.3–13.3)	1.40 (1.4–1.88)[‡]	1.07 (0.76–1.52)
White, non-Hispanic	12.5 (11.7–13.2)	7.0 (6.6–7.3)	1.91 (1.75–2.07)[§]	1.17 (1.07–1.29)[†]
Income (% FPL)				
138 or less	21.5 (20.2–26.7)	21.6 (20.9–22.2)	0.99 (0.91–1.08)	1.13 (1.02–1.25)[‡]
139–199	18.2 (16.2–20.3)	16.4 (15.3–17.4)	1.14 (0.97–1.34)	1.14 (0.96–1.36)
200–399	7.2 (6.3–8.2)	6.3 (5.9–6.8)	1.15 (0.98–1.35)	1.09 (0.91–1.31)
400 or more	2.1 (1.3–2.9)	0.9 (0.7–1.1)	2.33 (1.50–3.63)[§]	1.95 (1.16–3.27)[‡]
Missing	26.0 (22.6–29.3)	22.3 (21.0–23.5)	1.2 (1.01–1.48)[‡]	1.37 (1.06–1.78)[‡]
State Medicaid expansion				
Adopted	10.1 (9.4–10.9)	9.5 (9.2–9.8)	1.07 (0.98–1.18)	1.22 (1.09–1.36)[†]
Not Adopted	21.3 (20.1–22.5)	17.3 (16.7–18.0)	1.29 (1.19–1.40)[§]	1.15 (1.04–1.27)[†]
Education				
Less than high school	35.2 (32.6–37.7)	31.9 (30.6–33.1)	1.16 (1.02–1.32)[‡]	1.43 (1.20–1.70)[§]
High school	17.6 (16.2–18.9)	18.5 (17.8–19.3)	0.94 (0.84–1.04)	1.04 (0.92–1.17)
More than high school	9.0 (8.3–9.7)	6.5 (6.2–6.7)	1.43 (1.30–1.57)[§]	1.13 (1.01–1.26)[‡]
Marital status				
Married	13.2 (12.4–14.1)	8.3 (8.0–8.6)	1.69 (1.55–1.84)[§]	1.31 (1.18–1.45)[§]
Not married	18.3 (17.2–19.5)	18.6 (18.1–19.2)	0.98 (0.90–1.07)	1.04 (0.94–1.15)
Parity				
Multiparous	15.8 (14.9–16.7)	12.4 (12.1–12.8)	1.32 (1.22–1.42)[§]	1.21 (1.11–1.33)[§]
Primiparous	14.7 (13.6–15.9)	11.6 (11.1–12.1)	1.31 (1.19–1.45)[§]	1.14 (1.01–1.29)[‡]
Pregnancy intendedness				
Yes	13.7 (12.8–14.6)	9.8 (9.5–10.1)	1.46 (1.34–1.59)[§]	1.32 (1.19–1.47)[§]
No	17.3 (16.2–18.4)	15.4 (14.9–16.0)	1.15 (1.05–1.25)[†]	1.09 (0.98–1.20)
Chronic conditions				
Obesity	13.6 (12.4–14.8)	12.2 (11.6–12.8)	1.13 (1.01–1.27)[‡]	1.06 (0.92–1.21)
Diabetes	12.4 (9.1–15.7)	10.9 (9.4–12.4)	1.15 (0.82–1.63)	1.01 (0.67–1.5)
Hypertension	13.8 (11.2–16.5)	9.5 (8.4–10.6)	1.53 (1.18–1.98)[†]	1.28 (0.93–1.76)
Depression	13.0 (11.6–14.4)	10.6 (9.8–11.3)	1.27 (1.09–1.47)[†]	1.09 (0.92–1.29)

OR, odds ratio; FPL, federal poverty level.

Data are survey weighted % (95% CI) (weighted to account for sample design, nonresponse, and noncoverage) unless otherwise specified.

* Odds ratios are adjusted for maternal age, race and ethnicity, income, highest level of education achieved, state Medicaid expansion status, marital status, parity, pregnancy intention, and the presence of pre-existing chronic conditions (obesity, diabetes, hypertension, and depression), except for the covariate of interest in each row.

[†] $P<.01$.

[‡] $P<.05$.

[§] $P<.001$.

[‖] Combined categories Asian Pacific Islander, Chinese, Filipino, Japanese, and other Asian from PRAMS (Pregnancy Risk Assessment Monitoring System) data, non-Hispanic.

[¶] Combined categories Alaska Native and American Indian from PRAMS data, non-Hispanic.

[#] Combined categories mixed race and other, non-White from PRAMS data, non-Hispanic.

insurance enrollment and receipt of high-quality perinatal health care reported by Indigenous women in non–federally recognized tribes.[42] In the study, participants describe prepaying for childbirth when uninsured, and needing education about insurance options and enrollment. There is an urgent need to address access to perinatal care for Indigenous individuals, particularly among rural residents.

Table 4. Uninsurance at Birth Among Rural Residents Compared With Urban Residents (n=4,864)

Characteristic	Rural (n=1,444)	Urban (n=34,200)	Unadjusted OR	Adjusted OR*
Age (y)				
19 or younger	3.3 (1.9–4.6)	3.5 (2.6–4.4)	0.92 (0.56–1.52)	1.48 (0.87–2.81)
20–24	3.6 (2.8–4.3)	2.9 (2.5–3.2)	1.26 (0.98–1.62)	1.40 (1.04–1.87)[†]
25–29	4.4 (3.7–5.1)	2.7 (2.5–3.0)	1.63 (1.33–2.00)[‡]	1.43 (1.15–1.80)[§]
30–34	5.0 (4.1–5.9)	2.4 (2.2–2.6)	2.14 (1.73–2.65)[‡]	1.84 (1.46–3.32)[‡]
35 or older	7.4 (5.9–8.9)	3.1 (2.7–3.4)	2.51 (1.96–3.21)[‡]	1.80 (1.32–2.45)[‡]
Race and ethnicity				
Asian or Pacific Islander[‖]	4.8 (0.01–1.0)	1.1 (0.7–1.4)	4.7 (1.59–14.15)[§]	1.74 (0.61–5.00)
Black, non-Hispanic	1.0 (0.3–1.6)	1.6 (1.3–1.9)	0.60 (0.28–1.27)	0.42 (0.20–0.91)[†]
Hispanic, English-speaking	6.9 (4.8–9.0)	2.3 (2.0–2.7)	3.08 (2.14–4.43)[‡]	2.91 (1.94–4.38)[‡]
Hispanic, Spanish-speaking	24.2 (19.5–28.9)	14.1 (13.0–15.3)	1.94 (1.47–2.55)[‡]	1.33 (0.94–1.87)
Indigenous[¶]	6.0 (5.3–6.8)	3.0 (2.2–3.9)	2.06 (1.50–2.83)[‡]	2.08 (1.53–2.82)[‡]
Additional races and ethnicities or mixed[#]	4.0 (1.7–6.2)	2.1 (1.3–2.9)	1.91 (0.96–3.82)	1.87 (0.91–3.85)
White, non-Hispanic	4.0 (3.5–4.5)	1.9 (1.7–2.0)	2.18 (1.87–2.53)[‡]	1.57 (1.33–1.86)[‡]
Income (% FPL)				
138 or less	4.7 (4.1–5.4)	3.9 (3.6–4.2)	1.22 (1.04–1.45)[†]	1.60 (1.29–1.93)[‡]
139–199	4.5 (3.4–5.6)	2.7 (2.3–3.1)	1.69 (1.24–2.30)[§]	1.53 (1.11–2.13)[†]
200-399	3.7 (3.0–4.4)	2.4 (2.1–2.6)	1.60 (1.27–2.01)[‡]	1.23 (0.96–1.58)
400 or more	1.6 (0.9–2.2)	0.7 (0.6–0.8)	2.17 (1.38–2.43)[§]	1.60 (1.01–2.53)[†]
Missing	12.2 (9.5–14.9)	5.7 (5.0–6.4)	2.31 (1.73–3.07)[‡]	2.49 (1.68–3.69)[‡]
State Medicaid expansion				
Adopted	3.9 (3.4–4.4)	2.2 (2.1–2.4)	1.80 (1.55–2.08)[‡]	1.72 (1.43–2.06)[‡]
Not adopted	5.4 (4.7–6.1)	3.8 (3.5–4.2)	1.43 (1.21–1.68)[‡]	1.49 (1.25–1.78)[‡]
Education				
Less than high school	17.3 (8.4–10.1)	9.3 (8.4–10.1)	2.05 (1.71–2.45)[‡]	1.87 (1.48–2.37)[‡]
High school	3.0 (2.4–3.6)	3.1 (2.8–3.5)	0.97 (0.77–1.21)	1.22 (0.93–1.58)
More than high school	2.2 (1.9–2.5)	1.5 (1.4–1.6)	1.45 (1.22–1.73)[‡]	1.40 (1.15–1.70)[§]
Marital status				
Married	6.0 (5.3–6.6)	2.6 (2.5–2.8)	2.36 (2.07–2.69)[‡]	1.69 (1.45–1.97)[‡]
Not married	2.7 (2.2–3.2)	3.0 (2.7–3.2)	0.91 (0.74–1.11)	1.23 (0.95–1.58)
Parity				
Multiparous	5.4 (4.8–6.0)	3.2 (3.0–3.4)	1.71 (1.51–1.94)[‡]	1.55 (1.33–1.80)[‡]
Primiparous	3.1 (2.6–3.7)	2.0 (1.8–2.2)	1.56 (1.25–1.93)[‡]	1.76 (1.36–2.27)[‡]
Pregnancy intendedness				
Yes	4.6 (4.0–5.1)	2.6 (2.4–2.8)	1.81 (1.56–2.09)[‡]	1.67 (1.41–1.98)[‡]
No	4.4 (3.8–5.0)	3.0 (2.7–3.2)	1.50 (1.27–1.78)[‡]	1.50 (1.23–1.83)[‡]
Chronic conditions				
Obesity	2.7 (2.1–3.3)	2.0 (1.7–2.3)	1.38 (1.05–1.79)[†]	1.43 (1.06–1.94)[†]
Diabetes	2.2 (1.0–3.4)	2.9 (2.1–3.7)	0.76 (0.40–1.44)	0.68 (0.32–1.43)
Hypertension	1.6 (0.9–2.3)	2.1 (1.5–2.6)	0.78 (0.46–1.32)	0.82 (0.41–1.62)
Depression	2.5 (1.8–3.2)	1.5 (1.2–1.8)	1.70 (1.20–2.42)[§]	1.59 (1.07–2.38)[†]

OR, odds ratio; FPL, federal poverty level.

Data are survey weighted % (95% CI) (weighted to account for sample design, nonresponse, and noncoverage) unless otherwise specified.

* Odds ratios are adjusted for maternal age, race and ethnicity, income, highest level of education achieved, state Medicaid expansion status, marital status, parity, pregnancy intention, and the presence of pre-existing chronic conditions (obesity, diabetes, hypertension, and depression), except for the covariate of interest in each row.

[†] P<.05.

[‡] P<.001.

[§] P<.01.

[‖] Combined categories Asian Pacific Islander, Chinese, Filipino, Japanese, and other Asian from PRAMS (Pregnancy Risk Assessment Monitoring System) data, non-Hispanic.

[¶] Combined categories Alaska Native and American Indian from PRAMS data, non-Hispanic.

[#] Combined categories "mixed race" and Other, non-White" from PRAMS data, non-Hispanic.

Study strengths include the use of a large, multistate survey to assess policy-relevant rural inequities in perinatal insurance coverage. However, this study has several limitations to consider when interpreting the results. First, the findings do not generalize to the seven states not included in the present study: Arizona, California, Idaho, Ohio, Nevada, South Carolina, and Texas; however, the states included

Table 5. Postpartum Uninsurance Among Rural Residents Compared With Urban Residents (n=15,694)

Characteristic	Rural (n=4,052)	Urban (n=11,642)	Unadjusted OR	Adjusted OR*
Age (y)				
19 or younger	13.4 (10.6–16.2)	12.2 (10.6–13.7)	1.12 (0.84–1.49)	1.36 (0.97–1.90)
20–24	13.9 (12.5–15.2)	14.0 (13.2–14.8)	0.99 (0.87–1.13)	1.13 (0.96–1.32)
25–29	12.4 (11.2–13.5)	10.49.9–10.9)	1.22 (1.08–1.37)[†]	1.18 (1.02–1.36)[‡]
30–34	10.9 (9.8–12.1)	7.6 (7.1–8.0)	1.50 (1.31–1.72)[§]	1.33 (1.12–1.58)[†]
35 or older	14.4 (12.4–16.4)	8.6 (8.0–9.1)	1.80 (1.50–2.14)[§]	1.62 (1.28–2.07)[§]
Race and ethnicity				
Asian or Pacific Islander[‖]	14.8 (7.8–21.9)	5.4 (4.7–6.2)	3.04 (1.7–5.4)[§]	1.76 (1.01–3.07)[‡]
Black, non-Hispanic	11.4 (9.0–13.7)	8.4 (7.8–9.1)	1.39 (1.08–1.79)[‡]	1.01 (0.77–1.32)
Hispanic, English-speaking	21.2 (17.6–24.8)	12.9 (11.9–13.9)	1.82 (1.44–2.30)[§]	1.20 (0.92–1.56)
Hispanic, Spanish-Speaking	67.0 (62.6–71.4)	48.6 (46.9–50.2)	2.15 (1.75–2.65)[§]	1.49 (1.16–1.92)[†]
Indigenous[¶]	17.9 (15.7–20.1)	13.1 (11.1–15.0)	1.45 (1.15–1.83)[†]	1.27 (0.99–1.63)
Additional races and ethnicities or mixed[#]	12.9 (9.8–15.9)	8.7 (7.3–10.1)	1.55 (1.12–2.14)[†]	1.13 (0.78–1.62)
White, non-Hispanic	9.8 (9.1–10.5)	5.0 (4.7–5.3)	2.08 (1.89–2.30)[§]	1.27 (1.14–1.42)[§]
Income (% FPL)				
138 or less	16.7 (15.6–17.8)	16.9 (16.3–17.5)	0.99 (0.90–1.08)	1.21 (1.08–1.35)[†]
139–199	15.3 (13.3–17.2)	13.3 (12.3–14.3)	1.18 (0.99–1.40)	1.19 (0.99–1.45)
200–399	6.2 (5.3–7.0)	5.2 (4.8–5.6)	1.20 (1.01–1.42)[‡]	1.10 (0.90–1.34)
400 or more	2.2 (1.3–3.0)	0.6 (0.5–0.8)	3.28 (2.08–5.19)[§]	2.53 (1.47–4.32)[†]
Missing	25.4 (22.1–28.8)	20.0 (18.8–21.3)	1.35 (1.12–1.65)[†]	1.53 (1.14–2.06)[†]
State Medicaid expansion				
Adopted	7.5 (6.8–8.2)	7.1 (6.8–7.3)	1.07 (0.96–1.19)	1.37 (1.20–1.56)[§]
Not Adopted	18.5 (17.4–19.6)	15.3 (14.7–15.9)	1.26 (1.15–1.37)[§]	1.20 (1.08–1.33)[†]
Education				
Less than high school	31.5 (27.1–29.6)	28.4 (27.2–29.6)	1.16 (1.02–1.33)[‡]	1.50 (1.24–1.81)[§]
High school	13.8 (12.6–15.0)	14.3 (13.6–15.0)	0.96 (0.86–1.08)	1.13 (0.98–1.30)
More than high school	7.2 (6.5–7.8)	5.1 (4.8–5.3)	1.45 (1.30–1.62)[§]	1.15 (1.02–1.31)[‡]
Marital status				
Married	12.4 (11.6–13.3)	7.3 (7.0–7.6)	1.80 (1.65–1.97)[§]	1.41 (1.26–1.58)[§]
Not married	13.2 (12.1–14.2)	14.1 (13.5–14.6)	0.92 (0.84–1.02)	1.07 (0.94–1.20)
Parity				
Multiparous	14.2 (13.3–15.0)	11.1 (10.7–11.4)	1.33 (1.22–1.43)[§]	1.26 (1.14–1.40)[§]
Primiparous	10.1 (9.1–11.1)	7.9 (7.5–8.3)	1.31 (1.16–1.48)[§]	1.26 (1.09–1.46)[†]
Pregnancy intendedness				
Yes	11.6 (10.8–12.5)	8.3 (8.0–8.6)	1.45 (1.32–1.59)[§]	1.36 (1.21–1.53)[§]
No	13.8 (12.8–14.9)	12.0 (11.5–12.5)	1.18 (1.07–1.30)[†]	1.18 (1.05–1.33)[†]
Chronic conditions				
Obesity	11.7 (10.6–12.9)	9.6 (9.0–10.1)	1.26 (1.11–1.43)[†]	1.26 (1.08–1.47)[†]
Diabetes	11.5 (8.2–14.8)	9.7 (8.3–11.1)	1.22 (0.85–1.74)	1.19 (0.74–1.91)
Hypertension	11.2 (8.8–13.7)	8.3 (7.2–9.4)	1.40 (1.05–1.85)[‡]	1.49 (1.07–2.08)[‡]
Depression	10.0 (8.8–11.3)	8.0 (7.3–8.7)	1.28 (1.08–1.52)[†]	1.12 (0.92–1.36)

OR, odds ratio; FPL, federal poverty level.

Data are survey weighted % (95% CI) (weighted to account for sample design, nonresponse, and noncoverage) unless otherwise specified.

* Odds ratios are adjusted for maternal age, race and ethnicity, income, highest level of education achieved, state Medicaid expansion status, marital status, parity, pregnancy intention, and the presence of pre-existing chronic conditions (obesity, diabetes, hypertension, and depression) except for the covariate of interest in each row.

[†] $P<.01$.

[‡] $P<.05$.

[§] $P<.001$.

[‖] Combined categories Asian Pacific Islander, Chinese, Filipino, Japanese, and other Asian from PRAMS (Pregnancy Risk Assessment Monitoring System) data, non-Hispanic.

[¶] Combined categories Alaska Native and American Indian from PRAMS data, non-Hispanic.

[#] Combined categories mixed race and other, non-White from PRAMS data, non-Hispanic.

represent a broad range of geographies. Second, we were unable to assess changes in insurance coverage within insurance categories (eg, transitions from a Medicaid program designed for a low-income adult to

a pregnancy-related Medicaid program), which often result in care disruptions. Therefore, our estimates of discontinuities are likely conservative. In addition, insurance status at prepregnancy and postpartum

were self-reported and subject to recall bias. For measures of coverage continuity, we would expect this to apply equally to each period studied, thus, not affecting our estimates of insurance changes over time. Finally, we were unable to assess citizenship in the present study, which often affects insurance eligibility.

We identified substantial rural–urban differences in perinatal insurance coverage in the prepandemic period and outline possible strategies for addressing rural inequities in perinatal insurance coverage. National attention has been directed toward declining access to obstetric care in rural counties, often creating long drive times to care, and the high rates of severe maternal morbidity and mortality among rural residents, including Indigenous people.[6,43] Insurance coverage represents the first step in the pathway toward accessing high-quality perinatal care.[9] It is imperative that further policy attention be directed toward the inequities in access to and receipt of care, including through perinatal insurance coverage, faced by rural residents.

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