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Disparities in Prenatal Care Utilization in the United States

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Abstract

Objectives: This study examined disparities in prenatal care utilization by race/ethnicity and payer using three measures of inadequate prenatal care: 1) fewer than the recommended number of prenatal care visits, 2) late initiation of prenatal care (at or after 4 months gestation), or 3) no prenatal care.

Methods: Birth records data from the National Center for Health Statistics were used. The study population consisted of singleton live births in all 50 U.S. states and the District of Columbia between January 1, 2014 and December 31, 2022 (N = 33,107,382).

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Pearl A. McElfish: Conceptualization, Funding acquisition, Investigation, Methodology, Writing – original draft, Writing – review & editing; **Aaron Caldwell:** Conceptualization, Data curation, Formal analysis, Methodology, Writing – review & editing; **James P. Selig:** Conceptualization, Data curation, Formal analysis, Methodology, Writing – review & editing; **Donya Watson:** Writing – review & editing; Jonathan Langner: Writing – original draft; **Jennifer Callaghan-Koru:** Writing – review & editing; **Austin Porter:** Writing – review & editing; **Don E. Willis:** Writing – review & editing; **Jennifer A. Andersen:** Writing – review & editing; **Nicola L. Hawley:** Writing – review & editing; **Clare C. Brown:** Conceptualization, Data curation, Formal analysis, Methodology, Writing – review & editing

Conflict of Interest: The authors declare that they have no conflict of interest.

Ethics Approval: This study was approved as exempt by the University of Arkansas for Medical Sciences Institution Review Board because it used deidentified secondary data. The study was performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments.

Availability of Data and Materials: Birth records data from the National Center for Health Statistics were used.

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Results: The average number of reported prenatal care visits was 11.2 (SD = 1.2), 36.8% reported fewer than the recommended number of prenatal care visits, 22.7% reported late initiation of prenatal care, and 1.8% reported no prenatal care. Women with a Medicaid-covered delivery were 1.06 times more likely to have fewer than the recommended number of visits, 1.36 times more likely to initiate prenatal care late, and 1.72 times more likely to have no prenatal visits (all $p<0.001$). There were significant disparities in prenatal care utilization by race/ethnicity, particularly for NHPI and AIAN women, with all minoritized racial/ethnic groups having greater risk for multiple measures of inadequate prenatal care utilization relative to White populations.

Conclusions for Practice: Racial/ethnic and economic disparities in perinatal health in the U.S. are of national concern. Differences in prenatal care utilization between women with Medicaid and private/other insurance suggest modifications to Medicaid policies may improve prenatal care access among beneficiaries.

Keywords

prenatal care; maternal child health; insurance payer; AIAN; NHPI

Introduction

The United States (U.S.) rates of maternal morbidity and mortality surpass rates in other high-income countries (Tikkanen et al., 2020). Women from racially and ethnically minoritized groups experience higher rates of maternal morbidity and mortality compared to white women (Hoyert, 2024; Interrante et al., 2022). For example, Black women experience two to three times the rates of severe maternal morbidity and maternal mortality compared to white women (Hoyert, 2024). Racially and ethnically minoritized families also experience disproportionately higher rates of neonatal and infant mortality and preterm births (Kozhimannil et al., 2018; Laurore et al., 2020; B. Wu et al., 2023); Black infants experience 60% higher rates of preterm birth and nearly double the risk of infant mortality during their first year of life (MacDorman & Mathews, 2011). Although there is limited data on Native Hawaiian and Pacific Islander (NHPI) and American Indian and Alaska Native (AIAN) communities, the available data demonstrates both groups have increased risk of maternal morbidity and mortality and increased rates of preterm birth and low birth weight (Anderson et al., 2016; Burns et al., 2023; Heck et al., 2021; Nembhard et al., 2019; Raglan et al., 2016; Rhoades et al., 2008; Wong et al., 2008; Bohao Wu et al., 2023). Births covered by Medicaid, regardless of race or ethnicity, have higher rates of severe maternal morbidity and mortality (Agency for Healthcare Research and Quality, 2024; Chen et al., 2021). Adequate prenatal care use was trending upward prior to 2020 but steeply declined afterward with severe consequences for Hispanic individuals (Lee et al., 2024).

Initiating prenatal care early and attending all recommended prenatal care visits throughout pregnancy allows for early detection and management of maternal and infant health concerns and increases the likelihood of delivering a healthy infant (Michel & Fontenot, 2023; S. Partridge et al., 2012). Early and adequate prenatal care has also been associated with reduced risk of adverse maternal and infant outcomes by improving management of preexisting conditions as well as by detecting conditions that emerge during pregnancy, such as gestational diabetes (Michel & Fontenot, 2023; S Partridge et al., 2012; S. Partridge et

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al., 2012). Variations in prenatal care utilization may contribute to racial/ethnic disparities in perinatal outcomes. Previous studies have shown Black women are more likely to receive inadequate prenatal care, a factor associated with increased risks of maternal mortality and poor infant outcomes (Green, 2018). The American College of Obstetricians and Gynecologists recommends initiating prenatal care by the first trimester (ACOG, 2017). The recommended number and frequency of prenatal care visits depends on the stage of pregnancy in which prenatal care was initiated, the weeks of gestation when birth occurs, and risk factors. For example, a woman with a low-risk pregnancy who gives birth at 40 weeks would attend 12 to 14 in-person prenatal care visits following the recommended schedule (Peahl & Howell, 2021).

Given the importance of prenatal care utilization on the health of women and infants, this study examined differences in prenatal care utilization by race/ethnicity and payer using three separate measures of inadequate prenatal care, including having 1) fewer than the recommended number of prenatal care visits, 2) late initiation of prenatal care (at or after 4 months gestation), or 3) no prenatal care.

Methods

Data and Population

Birth records data from the National Center for Health Statistics were used. The study population consisted of singleton live births in all 50 U.S. states and the District of Columbia between January 1, 2014 and December 31, 2022 (N = 33,107,382). We examined prenatal care utilization based on sociodemographic characteristics including insurance coverage; therefore, records were excluded if the delivery was reported as self-pay or if the payer was unknown (N = 2,581,860). When excluding for missing covariates, the study population was reduced 28,769,646. When excluding for missingness variables on prenatal care, the study population for analysis was 28,120,391 singleton births. Characteristics of the study population of all singleton births included for analysis are listed in Table 1.

Variable Definitions

The primary outcomes of interest included: 1) fewer than the recommended number of prenatal care visits, 2) late initiation of prenatal care, or 3) no prenatal care. Fewer than the recommended number of prenatal care visits was defined as receiving less than 80% of the recommended number of prenatal care visits for low-risk pregnancies based on gestational age at birth. Late initiation of prenatal care was defined as not receiving a prenatal care visit until after the third month of pregnancy (i.e., month 4 or later) or not receiving any prenatal care. No prenatal care was defined as receiving zero prenatal care visits.

To assess differences in prenatal care utilization, we considered three main sociodemographic variables of interest: payer, race/ethnicity, and urbanicity. Payer was defined as the payer for the delivery and included Medicaid or private/other (i.e., private, TRICARE, or Indian Health Service). Maternal race/ethnicity included Hispanic (regardless of race) and non-Hispanic AIAN, Asian, white, Black, NHPI, and multiracial. The Rural-Urban Continuum Codes (RUCC) from 2023 were used to designate the maternal

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county of residence. We utilized the U.S. Department of Agriculture (USDA) dichotomous classification system. The USDA classifies RUCC codes 1-3 as metropolitan/urban and codes 4-9 as nonmetropolitan/rural counties (Economic Research Service, 2025).

Covariates included birth year, state of residence, nativity of the woman (U.S. vs foreign-born), and maternal age (continuous); maternal education (less than high school, graduated from high school or received a GED, or some post-secondary, college, or higher); and live birth order (1, 2, or ≥3).

Statistical Analyses

Descriptive statistics included chi square tests to assess differences in the three outcomes for each of the study covariates. We used generalized linear models with a Bernoulli distribution and a logit link to calculate marginal risk ratios (RRs) for all study variables. The generalized linear models included maternal age, maternal education, nativity, live birth order, year of birth, and state of residence as covariates. Our primary variables of interest were urbanicity (rural vs. urban counties), as well as payer type, race/ethnicity, and their interaction term (payer by race interaction term), which allowed us to examine how the association between payer type and outcomes varied across racial/ethnic groups.. This interaction was included due to potential modification of payer effects by race/ethnicity (Daw et al., 2020). We used the "emmeans" R package for estimated marginal predicted probabilities and adjusted confidence intervals (C.I.) for multiple comparisons. Statistical significance was set at $p < 0.01$, and 99% C.I.s are reported. All analyses were conducted in R version 4.3.2. This study was reviewed by the institutional review board at the lead author's university and deemed non-human subjects, and the study was performed in accordance with the ethical standards outlined in the 1964 Declaration of Helsinki and its later amendments.

Results

Descriptive Statistics

Among the study population, the average number of reported prenatal care visits was 11.2 (SD = 1.2), 36.8% reported fewer than the recommended number of prenatal care visits, 22.7% reported late initiation of prenatal care, and 1.8% reported no prenatal care.

Figure 1 displays the adjusted predicted probability of having fewer than the recommended number of prenatal care visits, late initiation of prenatal care, or no prenatal care by payer and race/ethnicity.

Individuals with Medicaid as the primary payer had higher adjusted rates of inadequate prenatal care utilization across all three outcomes (Table 2). Women with a Medicaid-covered delivery were 1.06 times more likely to have fewer than the recommended number of visits, 1.36 times more likely to initiate prenatal care late, and 1.72 times more likely to have no prenatal visits (all $p<0.001$).

The adjusted risk ratios associated with Medicaid for each racial/ethnic group is displayed in Table 3. Medicaid was associated with increased risk of inadequate prenatal care for all

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three prenatal care metrics and for every racial/ethnic group. The effect of Medicaid on the recommended number of visits was the smallest among Asian (RR = 1.12 99% C.I. [1.093, 1.138], p < 0.001) and Hispanic women (RR = 1.06, 99% C.I. [1.032, 1.008], p < 0.001) compared to AIAN, multiracial, NHPI, and white women (Table 3). The effect of Medicaid on late initiation of care was smallest among AIAN (RR = 1.27, 99% C.I. [1.228, 1.307], p < 0.001) and Black women (RR = 1.31, 99% C.I. [1.291, 1.392], p < 0.001) and largest among Asian (RR = 1.72, 99% C.I. [1.678, 1.760], p < 0.001) and white women (RR = 1.67, 99% C.I. [1.639, 1.696], p < 0.001). Similarly, the effect of Medicaid on not receiving any prenatal care was smallest among AIAN women (RR = 1.32, 99% C.I. [1.174, 1.495], p < 0.001) and largest among white women (RR = 2.69, 99% C.I. [2.538, 2.846], p < 0.001).

There were significant racial/ethnic differences for all three outcomes, with every minoritized racial/ethnic group having higher adjusted risks of inadequate prenatal care compared to white women (Table 4). Across all outcomes, NHPI women had an increase in the risk of inadequate prenatal care, including having fewer than recommended number of visits (RR = 1.40, 99% C.I. [1.372, 1.421], p < 0.001), late initiation of prenatal care (RR = 1.64, 99% C.I. [1.614, 1.676], p < 0.001), and no prenatal care (RR = 2.15, 99% C.I. [1.967, 2.343], p < 0.001). AIAN women had higher risk of having fewer than the recommended number of visits (RR = 1.27, 99% C.I. [1.254, 1.294], p < 0.001), late initiation of prenatal care (RR = 1.31, 99% C.I. [1.283, 1.330], p < 0.001), and no prenatal care (RR = 1.82 99% C.I. [1.706, 1.949], p < 0.001). Also, Black women had higher risk of having fewer than the recommended number of visits (RR = 1.14, 99% C.I. [1.135, 1.155], p < 0.001), late initiation of prenatal care (RR = 1.20, 99% C.I. [1.187, 1.1.210], p < 0.001), and no prenatal care (RR = 1.41, 99% C.I. [1.353, 1.467], p < 0.001). Asian, Hispanic, and multiracial women also tended to have an increase in the risk of worse prenatal care outcomes when compared to white women (Table 4), although the increase in relative risk was less than the other minoritized groups.

Women residing in urban counties less frequently demonstrated adequate prenatal care utilization compared to those in rural counties (Table 5). Women in urban counties had a higher risk of no prenatal care compared to women from rural counties (RR=1.51, 99% CI [1.452, 1.567]). Additionally, women from urban counties demonstrated a slightly higher risk of having fewer than the recommended number of visits (RR=1.02, 99% CI [1.018, 1.031]) and a slightly higher risk of late initiation of care (RR=1.04, 99% CI [1.029, 1.043]).

Discussion

Early and adequate prenatal care utilization improves health outcomes for both women and infants (S Partridge et al., 2012). This national study of birth records found significant variation in prenatal care utilization by race/ethnicity, with all minoritized racial/ethnic groups having greater risk for multiple measures of inadequate prenatal care utilization relative to white populations and with Medicaid-covered births having increased risk of inadequate prenatal care for every minoritized racial/ethnic group. Given the improvements in maternal and infant outcomes associated with prenatal care and the large racial/ethnic disparities in perinatal outcomes (Hoyert, 2024; MacDorman & Mathews, 2011),

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understanding factors associated with prenatal care is important for reducing inequities in perinatal outcomes.

When assessing differences in prenatal care utilization by race/ethnicity, the largest disparities were found for NHPI and AIAN women. Specifically, NHPI women had more than twice the risk of late initiation of prenatal care or no prenatal care and approximately 40% higher risk of having fewer than the recommended number of visits. AIAN women similarly had more than twice the risk of no prenatal care and approximately 31% higher risk of having late initiation of prenatal care.

Although prior literature has documented disparities in prenatal care utilization in other minoritized populations (Green, 2018), our study provides new information documenting disparities in prenatal care utilization among NHPI and AIAN women, who have been underrepresented in the maternal health literature, either because of the relatively smaller size of this population compared to other groups or the frequent aggregation of their data with Asian populations. To our knowledge, this is the one of the first national studies to report prenatal care utilization among NHPI and AIAN. Prior qualitative research has identified several barriers to prenatal care including difficulty understanding and navigating Medicaid, a lack of transportation or financial resources to get to appointments, language barriers, and concerns about lack of culturally congruent care (Ayers et al., 2018; Hanson, 2012). Prior research with NPHI subpopulations has also identified a lack of awareness of the importance of early and consistent prenatal care among some groups and experiences with discrimination and fear when seeking prenatal care (Ayers et al., 2018; Hanson, 2012). Experiences of language barriers, discrimination, and fear are unsurprising given NHPI populations are underrepresented in many facets of medicine (e.g., the physician workforce, clinical research) and are the least represented racial/ethnic group in U.S. medical schools (Association of American Medical Colleges, 2023; Sakala et al., 2018). Many extant studies fail to disaggregate Asian and NHPI individuals (Heyrana et al., 2023; Taparra, 2021); however, survey research of California revealed Asian and NHPI birthing individuals in composite are less likely to seek certain types of care and more likely to experience biased care related to their languages (Sakala et al., 2018). The stark disparities in prenatal care utilization among NHPI and AIAN women compared to white women found in our study is concerning. Given the prior research documenting both NHPI and AIAN have poor maternal and infant health outcomes (Anderson et al., 2016; Burns et al., 2023; Heck et al., 2021; Nembhard et al., 2019; Raglan et al., 2016; Rhoades et al., 2008; Wong et al., 2008; Bohao Wu et al., 2023), a lack of prenatal care may contribute to or exacerbate these poor outcomes.

Women who are Medicaid recipients, regardless of race/ethnicity, were more likely to have fewer than the recommended number of prenatal care visits and were less likely to have early prenatal care than those with private/other insurance. This finding supports a national study of delivery hospitalizations that reported the highest rates of maternal morbidity and mortality among Black, AIAN, Asian, and NHPI women with Medicaid (Interrante et al., 2022). Further analysis demonstrated there was a significant interaction between race/ethnicity and payer across all three prenatal care utilization variables, with the greatest impact associated with Medicaid coverage among white women who had almost three times

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the relative risk of receiving no prenatal care compared to white women with private/other insurance.

This study does not investigate why Medicaid was associated with significantly less prenatal care utilization. However, it is important to note that Medicaid policy varies state by state and several policies and practices may have contributed to the association. Many states do not offer presumptive Medicaid, requiring women to wait until their Medicaid application is complete and approved before they can access prenatal care. Additionally, states vary regarding Medicaid and Children's Health Insurance Program (CHIP) coverage for qualified immigrants, with some states not offering coverage and some states requiring a five year wait period for qualified immigrants (Interrante et al., 2024). Many health care providers will not see patients until their Medicaid is approved and will often limit the number of Medicaid patients they take (Bellerose et al., 2022). Some states utilize a bundled payment approach for perinatal care, which reduces financial incentives for additional prenatal care visits or for seeing women early in their pregnancy (MACPAC, 2021). Women qualify for Medicaid when they are pregnant if their income is at ~200% of the federal poverty limit (Healthinsurance.org, 2024). Because Medicaid eligibility is income-based, individuals enrolled in Medicaid have lower household incomes and may face additional barriers to prenatal care utilization, such as lower health literacy and challenges related to transportation and childcare (Bellerose et al., 2022). ACOG emphasizes the importance of Medicaid reimbursement rates matching the cost of care to ensure sustainable and equitable access to high-quality care for eligible patients (ACOG, 2021).

We found a statistically significant difference in prenatal care utilization between women living in rural and urban areas. Women living in urban areas were more likely to have inadequate prenatal care visits and no prenatal care compared to those living in rural area. Urban women were also more likely to experience late initiation of prenatal care compared to those living in rural areas. This finding differs from some studies which have documented higher rates of inadequate prenatal care utilization among rural women when using individual state-level birth record data (McElfish et al., 2025). Few prior studies have used a nation-wide U.S. sample to examine rural/urban difference in prenatal care utilization. Analysis of U.S. Pregnancy Risk Assessment Monitoring System data found rural women had lower odds of receiving adequate prenatal care compared to urban residents (Polavarapu et al., 2024). Additional research with more nuanced use of the RUCC codes is needed to better understand disparities in prenatal care utilization. While most prior studies have used a dichotomous classification, with the three most populus codes representing metro/urban and the six less populus codes representing non-metro/rural (Economic Research Service, 2025), scholars have begun to criticize the utility of this classification and called for classifications that consider very urban, suburban, rural, and frontier.

Limitations

There are limitations to the study. We utilized data from birth records, and some have questioned the reliability and validity of birth certificate data (Martin et al., 2013). Studies of birth certificate data quality have found moderate to substantial agreement for source

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of payment (Evans et al., 2017; Martin et al., 2013) as well as initiation of prenatal care beginning in the first trimester (Martin et al., 2013), but somewhat less reliability for number of visits (Martin et al., 2013). Since 2016, all U.S. states, D.C., Puerto Rico, U.S. Virgin Islands, Guam, and Northern Mariana Islands use the 2003 revision of the U.S. Standard Certificate of Live Birth which reports race according to the 1997 standards and allows for reporting of multiple races (Centers for Disease Control and Prevention, 2024). However, some limitations to birth certificate data on race and ethnicity remain for women whose race is not reported (Centers for Disease Control and Prevention, 2024). Women's race was imputed for 7.6% of births in 2022 (Centers for Disease Control and Prevention, 2024). The number of recommended visits is based on what is usually appropriate for low-risk women, and we could not adjust for the risk level of each individual or pregnancy. Therefore, we cannot speak to whether utilization was adequate for high-risk women. Finally, we examined associations, and those associations do not establish causality. Although there are limitations to the study, analysis of birth records can provide valuable insights across a large and diverse sample given the use of national data. The results provide valuable insights into prenatal care utilization and give new insight into disparities among those with Medicaid versus private insurance and among NHPI and AIAN women.

Conclusion

Racial/ethnic and economic disparities in perinatal health in the U.S. are of national concern. Prenatal care is an important intervention to prevent adverse maternal and newborn outcomes. This study identifies racial/ethnic differences in prenatal care utilization, particularly for NHPI and AIAN women, that may contribute to disparate maternal health outcomes. Differences in prenatal care between women with Medicaid and private/other insurance also suggest modifications to Medicaid policies may improve prenatal care access among beneficiaries.

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Significance Statement

What is already known on this subject:

Early and adequate prenatal care utilization is known to improve health outcomes for both women and infants. Some minoritized groups have inadequate utilization prenatal care, which may perpetuate disparities in maternal and child health outcomes.

What this study adds:

NHPI women had more than twice the risk of late initiation of prenatal care or no prenatal care and 50% higher risk of having fewer than the recommended number of visits. AIAN women similarly had more than twice the risk of no prenatal care and 50% higher risk of having late initiation of prenatal care. Although prior literature has documented disparities in prenatal care utilization in other minoritized populations, our study provides new information documenting disparities in prenatal care utilization among NHPI and AIAN women.

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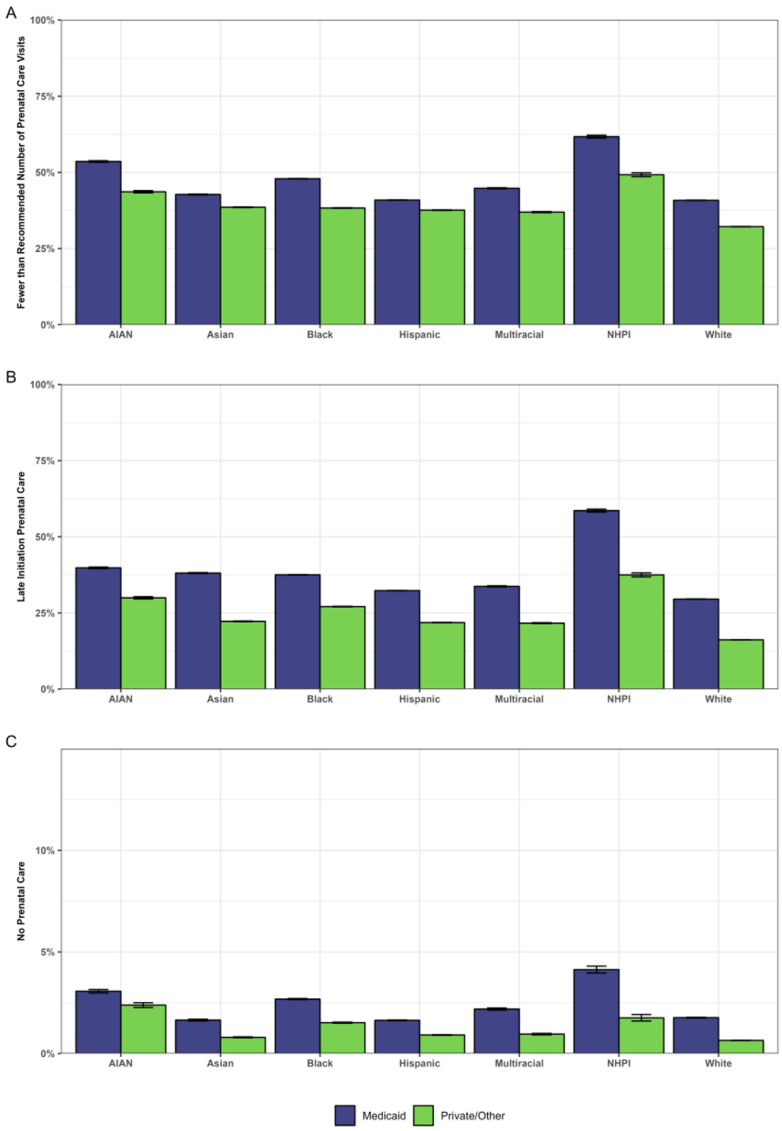

Figure 1:

Point estimates and 99% confidence intervals (some may not visually appear due to very small confidence interval widths) for the marginal means from the regression models (adjusted all covariates; year, state, nativity, urbanicity (RUCC), woman's age, woman's education, and birth order) are displayed for A) predicted probability of fewer than the recommended number of prenatal care visits, B) predicted probability of late initiation of prenatal care, and C) predicted probability of no prenatal care.

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Table 1:

Characteristics of the study population of 28,120,391 singleton births.

Characteristic	%
Nativity	
U.S.-Born	80%
Foreign-Born	20%
Rural or Urban County of Residence (RUCC)	
Urban (Metro County)	86%
Rural (Nonmetro County)	14%
Woman's Race	
White	54%
Hispanic	23%
Black	14%
Asian	5.9%
Multiracial	2.3%
AIAN	0.8%
NHPI	0.2%
Payer	
Medicaid	45%
Private	55%
Birth Order	
1	32%
2	28%
3 or more	40%
Woman's Age	
Mean (SD)	28.8 (3.6)
Min, Max	12.0, 50.0
Woman’s 's Education Level	
Elementary	2.5%
Secondary	35%
Some post-secondary or college	62%

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Table 2:

Effect of Medicaid, within racial groups, on prenatal care utilization presented as risk ratios (RR) with 99% confidence intervals (CI)

Outcome	RR	99% C.I.	Z	p-value
Fewer than Recommended Number of Prenatal Care Visits	1.06	[1.032, 1.080]	6.08	<0.001
Late Initiation of Prenatal Care	1.36	[1.334, 1.394]	36.63	<0.001
No Prenatal Care	1.72	[1.590, 1.865]	17.57	<0.001

Notes: Adjusted for year, state of residence, nativity, race/ethnicity, urbanicity (RUCC), maternal age, education, and birth order. Risk ratio (RR) calculated as Medicaid/Private. Sample size for analysis of 28,120,391.

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Table 3:

Effects of Medicaid, within each racial/ethnic group, on prenatal care utilization presented as risk ratios (RR) with 99% confidence intervals (CI)

	AIAN	Asian	Black	Hispanic	Multiracial	NHPI	White
Fewer than Recommended Number of Prenatal Care Visits							
RR	1.19	1.12	1.21	1.06	1.18	1.21	1.23
99% C.I.	[1.163, 1.227]	[1.093, 1.138]	[1.192, 1.229]	[1.032, 1.080]	[1.154, 1.202]	[1.182, 1.242]	[1.208, 1.244]
p-value	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Late Initiation of Prenatal Care							
RR	1.27	1.72	1.31	1.36	1.46	1.47	1.67
99% C.I.	[1.228, 1.307]	[1.678, 1.760]	[1.291, 1.329]	[1.334, 1.394]	[1.428, 1.487]	[1.425, 1.516]	[1.639, 1.696]
p-value	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
No Prenatal Care							
RR	1.32	2.05	1.69	1.72	2.18	2.24	2.69
99% C.I.	[1.174, 1.495]	[1.839, 2.296]	[1.588, 1.805]	[1.590, 1.865]	[1.981, 2.406]	[1.930, 2.599]	[2.538, 2.846]
p-value	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Note: Adjusted for year, state of residence, nativity, urbanicity (RUCC), maternal age, education, and birth order. Risk ratio (RR) calculated as Medicaid/Private. Sample size for analysis of 28,120,391.

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Table 4:

Effect of race on prenatal care utilization presented as risk ratios (RR) with 99% confidence intervals (CI)

	AIAN	Asian	Black	Hispanic	Multiracial	NHPI
Fewer than Recommended Number of Prenatal Care Visits						
RR	1.27	1.02	1.14	0.97	1.08	1.40
99% C.I.	[1.254, 1.294]	[1.003, 1.037]	[1.135, 1.155]	[0.958, 0.979]	[1.070, 1.090]	[1.372, 1.421]
p-value	<0.001	0.002	<0.001	<0.001	<0.001	<0.001
Late Initiation of Prenatal Care						
RR	1.31	1.13	1.20	0.97	1.10	1.64
99% C.I.	[1.283, 1.330]	[1.115, 1.149]	[1.187, 1.210]	[0.960, 0.985]	[1.088, 1.114]	[1.614, 1.676]
p-value	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
No Prenatal Care						
RR	1.82	0.95	1.41	0.89	1.16	2.15
99% C.I.	[1.706, 1.949]	[0.880, 1.016]	[1.353, 1.467]	[0.840, 0.932]	[1.100, 1.224]	[1.967, 2.343]
p-value	<0.001	0.046	<0.001	<0.001	<0.001	<0.001

Note: White as reference group. Adjusted for year, state of residence, nativity, urbanicity (RUCC), payer, maternal age, education, and birth order. Sample size for analysis of 28,120,391.

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Table 5:

Effects of urban versus rural residence (urban/rural) on prenatal care utilization presented as risk ratios (RR) with 99% confidence intervals (CI)

Outcome	RR	99% C.I.	Z	p-value
Fewer than Recommended Number of Prenatal Care Visits	1.02	[1.018, 1.031]	9.86	<0.001
Late Initiation of Prenatal Care	1.04	[1.029, 1.043]	12.72	<0.001
No Prenatal Care	1.51	[1.452, 1.567]	27.77	<0.001

Notes: Adjusted for year, state of residence, race, nativity, maternal age, education, payer, and birth order. Risk ratio (RR) calculated as urban/rural. Sample size for analysis of 28,120,391.