



Published in final edited form as:

J Perinatol. 2024 January ; 44(1): 20–27. doi:10.1038/s41372-023-01763-9.

Differences in delivery hospitalization experiences during the COVID-19 pandemic by maternal race and ethnicity, Pregnancy Risk Assessment Monitoring System, 2020

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Abstract

OBJECTIVE: We investigated maternal COVID-19 related experiences during delivery hospitalizations, and whether experiences differed by maternal race and ethnicity.

STUDY DESIGN: Data from the Pregnancy Risk Assessment Monitoring System among women with live births between April–December 2020 were used. Adjusted prevalence ratios (aPR) and 95% confidence intervals (CI) estimated associations between maternal race and ethnicity and COVID-19 related delivery experiences.

RESULTS: Among 12,879 women, 3.6% reported infant separation and 1.8% reported not being allowed support persons. Compared with non-Hispanic White women, American Indian/Alaska Native (AI/AN) (aPR = 2.7; CI: 1.2–6.2), Hispanic (aPR = 2.2; CI: 1.5–3.1), non-Hispanic Black (aPR = 2.4; CI: 1.7–3.6), and non-Hispanic Asian (aPR = 2.8; CI: 1.6–4.9) women reported more

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AUTHOR CONTRIBUTIONS

All authors contributed to the conceptualization, data interpretation, and manuscript review and editing. MM, JM, LZ, and RS were involved with conceptualization, formal analysis, data interpretation, methodology, validation, and writing – review and editing. RS additionally contributed writing – original draft. RG, BS, AD, and SR were involved with conceptualization, methodology, data interpretation, and writing – review and editing.

COMPETING INTERESTS

The authors declare no competing interests.

DISCLAIMER

The findings and conclusions in this article are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The PRAMS study protocol was approved by the Institutional Review Boards of Centers for Disease Control and Prevention and participating jurisdictions. An informed consent document is included with the mailed questionnaire or read over the telephone. Consent is assumed with questionnaire completion.

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Supplementary information The online version contains supplementary material available at <https://doi.org/10.1038/s41372-023-01763-9>.

infant separation due to COVID-19. Not being allowed support persons was more common among AI/AN (aPR = 5.2; CI: 1.8–14.8) and non-Hispanic Black (aPR = 2.3; CI: 1.3–4.1) women.

CONCLUSIONS: COVID-19 related delivery hospitalization experiences were unequally distributed among racial and ethnic minorities.

INTRODUCTION

The World Health Organization declared COVID-19, the disease caused by SARS-CoV-2, a pandemic in March of 2020 [1]. Healthcare systems rapidly implemented COVID-19 mitigation procedures, including in facilities providing labor and delivery care [2, 3].

While infection prevention and control guidance for healthcare facilities and clinical considerations for inpatient obstetric care were evolving, healthcare facilities implemented recommendations based on their policies and local situations [4, 5]. Some systems changed policies rapidly as new guidance became available [4, 6]. Examples of hospital mitigation approaches included universal masking for all persons in healthcare facilities, restrictions on support persons, and mother-infant separation to reduce transmission from women testing positive for COVID-19 to their infant [4, 6–10]. There were potential unintended consequences to these approaches, as some of these factors can impact maternal autonomy, respectful care, breastfeeding initiation, and mother-infant bonding [6–9].

Some COVID-19 mitigation procedures during labor and delivery may have been experienced more often among people from racial and ethnic minority groups. Understanding how COVID-19 mitigation measures were experienced during delivery can inform future efforts to ensure protection from pathogens while also treating all pregnant people and infants equitably. The objective of this study was to describe various COVID-19 delivery hospitalization experiences and to examine the associations between these experiences and maternal race and ethnicity.

MATERIALS AND METHODS

We used data from the 2020 Pregnancy Risk Assessment Monitoring System (PRAMS). PRAMS is a population-based, jurisdiction-specific surveillance system. It is designed to describe self-reported behaviors and experiences before, during, and shortly after pregnancy. Sampling occurs between 2 and 6 months postpartum; respondents can complete the survey up to 9 months postpartum via a mailed questionnaire or telephone follow up. An informed consent document is included with the mailed questionnaire or read over the telephone. Consent is assumed with questionnaire completion. PRAMS data are weighted to account for sample design, non-coverage, and non-response, and are representative of the population of women with a live birth in each jurisdiction [11].

PRAMS survey supplements are used during regular data collection to obtain information on emerging issues [12]. We used data from 29 U.S. jurisdictions that implemented the PRAMS COVID-19 Maternal Experiences Supplement [13]. This supplement was administered from October of 2020–June of 2021, among women with a live birth occurring April–December

2020. Jurisdictions that achieved at least a 50% response rate were included. Jurisdictions varied in the start dates of data collection.

Women were asked to report on the person (or persons) allowed in the delivery room as a support person during their labor and delivery. This was categorized as being allowed to have at least one support person or not being allowed to have a support person (Appendix A). Women were also asked about experiences in the hospital after delivery that occurred because of COVID-19: baby being tested for COVID-19 in the hospital, being separated from baby to protect baby from COVID-19, wearing a mask when other people came into the hospital room, wearing a mask while alone caring for baby, and being given information about protecting their baby from COVID-19 (Appendix A). These responses were categorized as yes or no. Women were included in the analysis if they responded to at least one of the COVID-19 supplement questions of interest and their infant was alive at the time of survey completion.

Maternal race and ethnicity was obtained from the birth certificate. We categorized race and ethnicity first as American Indian/Alaska Native (AI/AN), followed by women who indicated being of Hispanic ethnicity. Those with an ethnicity of non-Hispanic were grouped hierarchically as non-Hispanic Black, non-Hispanic Asian, non-Hispanic White, or non-Hispanic other race/multiple races, which includes non-Hispanic Native Hawaiian/Pacific Islander (sample size was not sufficient to present results for this community as a single category). Additional birth certificate covariates were maternal age (<20 years, 20–24 years, 25–34 years, 35 years), maternal education (<high school, high school, >high school), and delivery insurance (private, Medicaid, and other/none). From the COVID-19 supplement, we assessed whether a woman was told by a healthcare provider that she or someone in her household had COVID-19 during her pregnancy. To capture variation in jurisdiction-level COVID-19 mitigation measures, we used a composite score, known as the state government response index (GRI) [14]. States received a total score out of 100 for COVID-19 mitigation measures based on 9 criteria: school closures; workplace closures; cancellation of public events; restrictions on public gatherings; closures of public transport; stay-at-home requirements; public information campaigns; restrictions on internal movements; and international travel controls [14]. We downloaded time series data from the Oxford COVID-19 Government Response Tracker [15] or input data point directly when data were not available as time series data [16]. We categorized participating PRAMS jurisdictions into quartiles of GRI scores [14, 16–18]. Scores ranged from 39.06 to 93.52. Higher scores indicated increased levels of mitigation measures. Daily GRI scores were averaged from April 1 to December 31, 2020. For New York City, GRI scores for New York State were used.

We calculated unweighted counts, and weighted percentages and confidence intervals, for maternal characteristics and maternal delivery hospitalization experiences overall and stratified by race and ethnicity. We tested for overall differences in maternal characteristics and maternal delivery hospitalization experiences by maternal race and ethnicity using Chi-square tests for independence. We examined the associations between specific COVID-19 hospitalization experiences and maternal race and ethnicity by estimating adjusted prevalence ratios (aPRs) using an adjusted marginals prediction approach. Non-Hispanic

White women were the reference group. Based on directed acyclic graphs, we a priori selected maternal age, delivery insurance, being told by a healthcare provider that she had COVID-19 during pregnancy, month of delivery, and quartile of GRI score as potential confounders and controlled for them in our models. Maternal education and insurance were considered mediators on the causal path between maternal race and ethnicity and delivery hospitalization experiences. Because of variation in start month of survey implementation, a sensitivity analysis was conducted in which we restricted to those with live births from October–December, 2020, during which all jurisdictions participated. Analyses were conducted in SAS version 9.4 (SAS Institute Inc., Cary, NC) and SAS-callable SUDAAN version 11.0 (RTI International, Research Triangle Park, NC) to account for sampling weights and complex survey design. No adjustments were made for multiple comparisons. A two-sided p-value with $\alpha < 0.05$ was considered statistically significant. Analytic code is available upon request to the first author. The PRAMS study protocol was approved by the Institutional Review Boards of Centers for Disease Control and Prevention and participating jurisdictions.

RESULTS

Overall, 29 jurisdictions implemented the COVID-19 supplement and achieved a response rate of at least 50%. The sample consisted of 12,879 women who had a live, in-hospital, birth from April 1 to December 31, 2020 and who answered at least one delivery hospitalization question of interest. Over half of the sample was non-Hispanic White (54.3%), followed by Hispanic (21.0%), and non-Hispanic Black (15.4%) (Table 1). Most respondents were aged 25–34 years (57.8%), had greater than a high school education (62.8%), and had private delivery insurance (53.1%). There were differences in maternal characteristics by race and ethnicity. Approximately a quarter of AI/AN (22.8%) and Hispanic (25.9%) women had less than a high school education, whereas almost 73% of non-Hispanic White women and 78.3% of non-Hispanic Asian women had more than a high school education. While most respondents had private insurance, over 60% of AI/AN, Hispanic, and non-Hispanic Black women had Medicaid for their delivery insurance. Overall, 16.5% of women resided in jurisdictions with the highest quartile GRI index; however, by race and ethnicity, only 7.2% of AI/AN women, 10.3% of non-Hispanic White women, and 11.8% of non-Hispanic other race/multiple races women resided in states with the highest quartile of GRI index.

The most common hospital experience reported was wearing a mask when others were in the room (75.0%) (Fig. 1). Approximately half (53.0%) of the sample reported receiving information about protecting their baby from COVID-19 after leaving the hospital, and 22.6% reported wearing a mask while alone caring for their baby. The least common hospitalization experiences were being separated from their baby to protect the baby from COVID-19 (3.6%) and not being allowed a support person (1.8%). There was variation in hospital experiences by maternal race and ethnicity (Fig. 1). Non-Hispanic White women had the lowest prevalence of each of the six experiences. Hispanic (20.7%) and non-Hispanic Black (20.5%) women had the highest prevalence of their baby being tested for COVID-19 and wearing a mask while alone caring for their baby (40.2% and 38.6%, respectively). Being separated from their baby to protect their baby from COVID-19 was

most prevalent among AI/AN (6.2%), Hispanic (6.5%), and non-Hispanic Black (6.4%) women; 5% of non-Hispanic Asian women also reported this outcome. AI/AN women had the highest prevalence of not being allowed a support person (7.0%) (Fig. 1).

After adjustment, maternal race and ethnicity was significantly associated with all outcomes (Table 2). Compared to non-Hispanic White women, women of all other racial and ethnic groups were more likely to report being given information about protecting their infant from COVID-19 (aPR ranged from 1.1 [non-Hispanic Asian women] to 1.4 [AI/AN women]). The prevalence of their baby being tested for COVID-19 was significantly higher among non-Hispanic Black (aPR: 2.0, 95% CI: 1.6, 2.4), Hispanic (aPR: 1.8, 95% CI: 1.4, 2.2), non-Hispanic Asian (aPR: 1.8, 95% CI: 1.4, 2.4), and AI/AN (aPR: 1.6, 95% CI: 1.0, 2.4) women, and elevated among non-Hispanic other race/multiple races women (aPR: 1.3, 95% CI: 0.8, 2.3) (Table 2).

Mask wearing was also associated with maternal race and ethnicity. Compared to non-Hispanic White women, non-Hispanic Black, Hispanic, and non-Hispanic Asian women were all more than twice as likely to report mask wearing while alone with their infant (aPRs ranged from 2.5–2.7); AI/AN women were almost two times as likely to report mask wearing while alone (aPR: 1.9, 95% CI: 1.4, 2.7) (Table 2).

Being separated from their infant due to COVID-19 was almost three times as prevalent among AI/AN women and non-Hispanic Asian women (aPR: 2.7, 95% CI: 1.2, 6.2; aPR: 2.8, 95% CI: 1.6, 4.9, respectively) compared to non-Hispanic White women, and 2.2 to 2.4 times as prevalent among Hispanic and non-Hispanic Black women (Table 2). Not being allowed a support person was over five times as prevalent among AI/AN women compared to non-Hispanic White women (95% CI: 1.8, 14.8) and over twice as prevalent among non-Hispanic Black women compared to non-Hispanic White women (95% CI: 1.3, 4.1). Women of non-Hispanic other race/multiple races and ethnicity were less likely to report not being allowed a support person compared to non-Hispanic White women (aPR: 0.2, 95% CI: 0.1, 0.7). In a sensitivity analysis in which we restricted the sample to 6,718 women delivering from October–December of 2020, when all jurisdictions participated in the sample, results were similar to the main analysis (Appendices B and C).

DISCUSSION

This study of delivery hospitalization experiences during the first nine months of the COVID-19 pandemic in the United States showed that various COVID-19 experiences were not reported equally among women of different racial and ethnic minority groups. Across all races and ethnicities, non-Hispanic White women were the least likely to report any of the six COVID-19 delivery hospitalization experiences, including being given information about protecting their baby from COVID-19 and wearing a mask. Hispanic, AI/AN, and non-Hispanic Black women, in general, were most likely to report experiencing the six COVID-19 delivery hospitalization experiences. Women who reported being of AI/AN race were the most likely to report not being allowed a support person during their labor and delivery and had an elevated prevalence of being separated from their infant. In adjusted

models maternal race and ethnicity was significantly associated with most COVID-19 delivery hospitalization experiences.

COVID-19 mitigation measures changed rapidly, especially in the early months of the pandemic [4, 6]. With imperfect information on the impact of COVID-19 on maternal health, transmission, and limited testing and personal protective equipment (PPE) [19–21], hospitals and obstetricians implemented mitigation measures and guidance based on the knowledge at the time [22]. In this context, women were subject to uncertain birthing plans [23, 24], limitations to support persons, including doulas [6–8, 24], separation from their infants [25, 26], and stress and uncertainty of keeping themselves and their infant healthy during and after delivery [9].

Individuals who are from racial and ethnic minority groups, which have been disproportionately affected by the COVID-19 pandemic [27, 28], are also more likely to report lower quality maternity care and lower birth satisfaction [29, 30], and experience adverse maternal and pregnancy outcomes at a higher rate than non-Hispanic White individuals irrespective of the pandemic [31]. The mitigation measures implemented during the pandemic could have a disproportionate impact on women from racial and ethnic minority groups, who often report desiring extended family and doula support to improve their birth and postpartum outcomes [8, 32]. While the COVID-19 pandemic necessitated rapid mitigation, care is needed to ensure equitable implementation of pandemic safety measures.

Studies of maternal experiences during the birth hospitalization observed more visitor and support flexibilities were extended to non-Hispanic White women, whereas women from racial and ethnic minority groups were more likely to experience stricter visitor and support person policies [7], or to be more negatively impacted by such policies [8]. Other studies have found that mother-infant separation was experienced more frequently among racial and ethnic minority groups during the COVID-19 pandemic [33, 34]. Historically, mother-infant and child separation policies in the United States have been disproportionately applied towards Black, American Indian/Alaska Native, Hispanic, and Asian populations [34–38]. These experiences could negatively impact the health and wellbeing of the mother and infant [23, 26, 39]. For example, lack of support persons has been associated with increased risk of unnecessary interventions (e.g., cesarean delivery or induction) [9, 40], and mother-infant separation reduces the likelihood of successful breastfeeding initiation [41]. Delivery of equitable practices that align with best practices for care can improve maternal delivery experiences and maternal and infant health for these populations.

Only 53% of women reported receiving information about protecting their infant from COVID-19 after discharge. This represents a missed opportunity for counseling, especially considering this was before the COVID-19 vaccine was available. Although mask wearing in healthcare settings was common for much of 2020 [42], only 75% of women reported wearing a mask while others were in the room. Concerns about masking and PPE have been noted in other studies, with some reporting concerns that masking impacted mother-infant bonding and the overall delivery experience [43]. It is unclear why racial and ethnic minorities were more likely to report their infant being tested for COVID-19 in

the hospital, but this could be related to these communities being more likely to be infected with COVID-19 at delivery [44, 45], indicate infant complications, or differential testing practices.

In studies of the impact of the COVID-19 pandemic on delivery hospitalization experiences, many women expressed concerns about not being allowed support persons [9, 23], pressure to have an induction or cesarian delivery [9, 46], or concerns about themselves or their infants contracting COVID-19 in the hospital [9]. Because of this, many women considered changing, or did change, their birth plans from an in-hospital delivery to a home birth [23, 32]. Policies limiting support persons in the delivery room often required that women choose between their partner, parent, or a doula [6, 47]. These policies generally required the same individual to stay for the duration of the delivery hospitalization, or made it challenging to change support persons during the delivery hospitalization [8], likely having differential impact on women from lower income groups, as these groups are less likely to have adequate work, leave, or childcare available to spend multiple days in the hospital [31]. The impact of these experiences on mothers and infants is unknown. Care is needed to ensure that pandemic mitigation policies do not further exacerbate existing racial inequities in delivery of care.

Strengths and limitations

Our study had several strengths. This was a large geographically and racially diverse sample, allowing reporting on multiple racial and ethnic groups, including AI/AN women. Additionally, PRAMS data are representative of each jurisdiction. Questions about specific hospitalization experiences were asked, rather than relying on hospital report of policies, which may be differentially implemented.

The results of this study should be interpreted alongside several limitations. First, data are generalizable only to the 29 jurisdictions included in the study. Additionally, as this study only surveyed women who delivered in 2020, more recent changes to COVID-19 mitigation measures could have altered delivery hospitalization experiences. Second, while we attempted to control for COVID-19 mitigation measures at the state-level using the GRI, there could have been variations within states at the local or hospital level. New York City, for example, experienced a large wave of cases earlier in the pandemic compared to the rest of the state, likely impacting hospital mitigation policies [48]. Further, hospital characteristics (e.g., academic vs. non-academic hospitals) may have differed in the type of mitigation measures, ease of changes in hospital mitigation procedures, and timing of any changes in mitigation measures [49], which could not be assessed. Third, COVID-19 mitigation measures and delivery hospitalization experiences could have changed throughout 2020. Fourth, results were self-reported and subject to recall bias. Fifth, timing of COVID-19 diagnosis during pregnancy was not available, meaning it may not represent infection at the delivery hospitalization. While many hospitals implemented universal screening of women prior to delivery in the spring of 2020, some did not [50, 51]. Women delivering with COVID-19 likely experienced more stringent mitigation measures in the hospital. Our analyses would ideally have controlled for maternal COVID-19 infection at the delivery hospitalization, which was not available in the PRAMS data. Using a

less specific measure of COVID-19 at any point during pregnancy could have biased the results. Sixth, the population prevalence of COVID-19 likely varied substantially across jurisdictions during 2020, potentially impacting variation in reported experiences. Further, the distribution of different racial and ethnic minorities is not uniformly distributed within states and specific hospitals, which could not be assessed. Finally, while we examined multiple racial and ethnic minority groups, we were unable to present results for women of non-Hispanic Native Hawaiian and other Pacific Islander descent, which is a group that has been disproportionately impacted by COVID-19 [52].

CONCLUSIONS

This study identified racial and ethnic differences in maternal COVID-19 delivery hospitalization experiences. This included higher reports of maternal-infant separation and not being allowed a support person reported among non-Hispanic Black, Hispanic, and AI/AN women. The delivery hospitalization is a unique opportunity to ensure the health of the mother and infant and educate families on infant care. During the COVID-19 pandemic, mitigation measures designed to protect healthcare workers and patients may have had unintended consequences, contributing to racial and ethnic inequities in care. This information can be used to inform future pandemic mitigation practices to ensure equitable treatment.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

ACKNOWLEDGEMENTS

We thank the Pregnancy Risk Assessment Monitoring System (PRAMS) team, Women's Health and Fertility Branch, Division of Reproductive Health, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, for its administration of the PRAMS surveillance system, including collection of the data and technical support.

DATA AVAILABILITY

PRAMS data are available by request by submitting a proposal to CDC (<https://www.cdc.gov/prams/prams-data/researchers.htm>).

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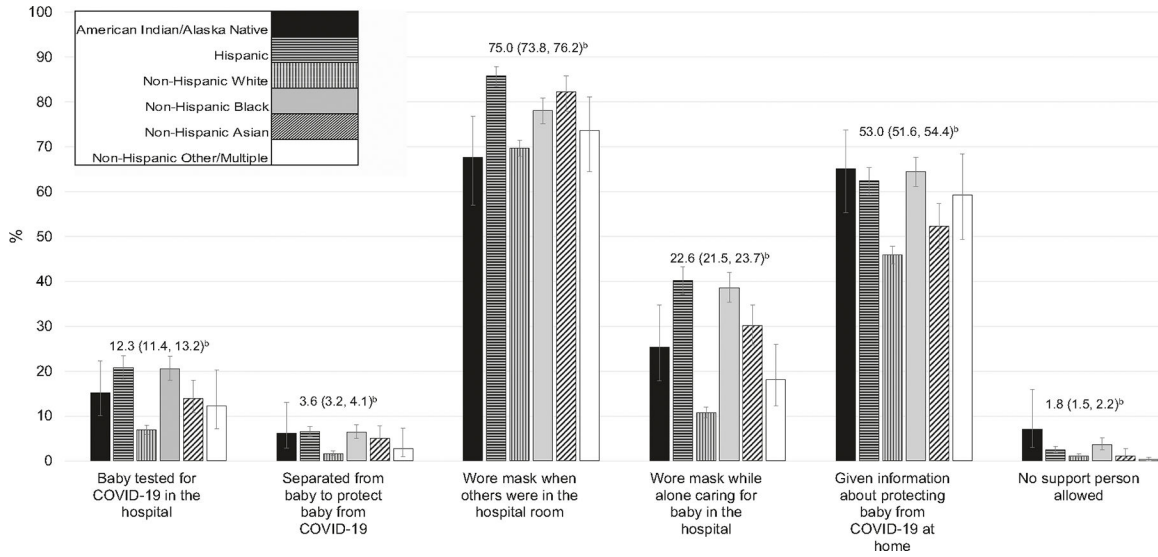


Fig. 1. Weighted percentages of maternal report of COVID-19 delivery hospitalization experiences, stratified by race and ethnicity, among women with a live, in-hospital, birth from April–December 2020, 29 jurisdictionsa, Pregnancy Risk Assessment Monitoring System. a Puerto Rico (births April–December 2020); Alaska, Connecticut, District of Columbia, Iowa, Maryland, Massachusetts, Missouri, Nebraska, Pennsylvania (Births June–December 2020); Arizona, Illinois, Louisiana, New Jersey, New York City, Oregon, South Dakota, Tennessee, Utah, Vermont, Virginia, West Virginia, Wyoming (births July–December 2020); Delaware (births August–December 2020); Arkansas, Georgia, Florida, Michigan, North Dakota (births October–December 2020). **b** Percentages above clustered bars represent the overall percentage of the COVID-19 experience. Error bars represent 95% confidence intervals.

Table 1.

Selected maternal demographic characteristics, stratified by race and ethnicity, among women with a live, in-hospital, birth from April-December 2020, 29 jurisdictions^a, Pregnancy Risk Assessment Monitoring System.

Characteristics	Total (N) ^b	Percent (95% CI) ^c	AI/AN (N) ^b	Percent (95% CI) ^c	Hispanic (N) ^b	Percent (95% CI) ^c	NH-White (N) ^b	Percent (95% CI) ^c	NH Black (N) ^b	Percent (95% CI) ^c	NH Asian (N) ^b	Percent (95% CI) ^c	NH Other (N) ^b	Percent (95% CI) ^c	Chi-square p-value
Total ^c	12 879		739	1.4 (1.2, 1.7)	2726	21.0 (19.9, 22.1)	5171	54.3 (53.0, 55.5)	2290	15.4 (14.6, 16.3)	1195	5.9 (5.4, 6.5)	328	2.0 (1.7, 2.4)	
Maternal age (years)															
<20	504	4.0 (3.5, 4.6)	62	6.4 (3.5, 11.6)	163	6.3 (5.1, 7.9)	119	2.7 (2.1, 3.5)	117	6.2 (4.6, 8.2)	8	0.5 (0.1, 1.7)	23	6.8 (3.0, 14.5)	<0.0001
20–24	2190	17.7 (16.7, 18.8)	193	27.6 (19.7, 37.2)	648	23.7 (21.2, 26.4)	734	15.0 (13.6, 16.4)	424	22.5 (19.8, 25.5)	77	4.5 (2.9, 6.8)	71	26.0 (18.9, 34.7)	
25–34	7477	57.8 (56.5, 59.1)	388	53.4 (44.1, 62.5)	1418	52.2 (49.2, 55.2)	3199	61.1 (59.2, 62.9)	1250	52.1 (48.8, 55.3)	784	66.7 (62.1, 71.0)	171	50.6 (41.5, 59.6)	
35	2708	20.5 (19.4, 21.5)	96	12.5 (7.8, 19.5)	497	17.7 (15.6, 20.1)	1119	21.3 (19.8, 22.8)	499	19.2 (16.8, 21.8)	326	28.4 (24.3, 32.8)	63	16.6 (11.5, 23.5)	
Education															
<High school	1509	11.4 (10.5, 12.3)	157	22.8 (15.2, 32.8)	651	25.9 (23.3, 28.7)	294	6.3 (5.4, 7.3)	268	10.1 (8.3, 12.2)	78	8.0 (5.5, 11.3)	35	10.0 (6.1, 16.1)	<0.0001
High school	3202	25.9 (24.7, 27.1)	260	34.6 (26.3, 44.0)	835	33.4 (30.6, 36.4)	1029	20.7 (19.2, 22.4)	775	37.0 (33.9, 40.2)	139	13.8 (10.5, 17.8)	85	32.0 (24.1, 41.1)	
>High school	8059	62.8 (61.4, 64.1)	313	42.5 (33.8, 51.8)	1212	40.7 (37.8, 43.7)	3827	73.0 (71.2, 74.7)	1227	52.9 (49.6, 56.1)	973	78.3 (73.7, 82.2)	204	58.0 (48.9, 66.6)	
Insurance at delivery															
Private	6628	53.1 (51.7, 54.4)	180	29.5 (21.8, 38.5)	863	28.9 (26.4, 31.7)	3567	67.6 (65.8, 69.4)	767	31.6 (28.7, 34.7)	854	68.6 (63.9, 73.0)	148	47.1 (38.2, 56.2)	<0.0001
Medicaid	5521	42.0 (40.7, 43.4)	486	65.1 (56.2, 73.0)	1616	62.1 (59.1, 64.9)	1332	28.1 (26.4, 29.9)	1453	65.6 (62.5, 68.6)	323	29.8 (25.5, 34.5)	164	48.6 (39.6, 57.7)	
Other	631	4.9 (4.3, 5.5)	68	5.5 (3.7, 7.9)	220	9.0 (7.3, 11.0)	225	4.2 (3.5, 5.1)	63	2.7 (1.9, 3.9)	17	1.6 (0.8, 3.1)	13	4.3 (2.0, 9.2)	
State government response index ^d															
Q1	2770	22.5 (21.6, 23.4)	222	35.7 (26.6, 45.9)	338	14.7 (12.5, 17.2)	1653	28.3 (26.8, 29.8)	409	16.4 (13.9, 19.3)	89	13.2 (9.8, 17.6)	47	17.7 (11.4, 26.5)	<0.0001
Q2	2243	27.8 (26.8, 28.9)	58	25.2 (17.3, 35.1)	371	30.4 (27.5, 33.5)	1238	27.7 (26.2, 29.3)	421	27.0 (24.4, 29.7)	97	21.1 (17.1, 25.8)	52	35.0 (26.6, 44.4)	
Q3	3953	33.2 (32.2, 34.2)	381	32.0 (25.0, 39.8)	783	29.8 (27.5, 32.3)	1333	33.6 (32.2, 35.2)	736	35.3 (32.4, 38.2)	571	36.6 (32.5, 40.9)	140	35.5 (27.4, 44.6)	
Q4	3267	16.5 (15.9, 17.2)	28	7.2 (4.3, 11.7)	1043	25.1 (23.2, 27.1)	767	10.3 (9.6, 11.2)	662	21.4 (19.1, 23.8)	298	29.0 (25.1, 33.3)	66	11.8 (7.7, 17.6)	

Characteristics	Total (N) ^b	Percent (95% CI) ^c	AI/ AN (N) ^b	Percent (95% CI) ^c	Hispanic (N) ^b	Percent (95% CI) ^c	NH- White (N) ^b	Percent (95% CI) ^c	NH Black (N) ^b	Percent (95% CI) ^c	NH Asian (N) ^b	Percent (95% CI) ^c	NH Other (N) ^b	Percent (95% CI) ^c	Chi- square p-value
COVID-19 during pregnancy ^e															
Yes	769	6.3 (5.7, 7.1)	48	7.4 (4.2, 12.9)	244	9.4 (7.8, 11.3)	248	5.3 (4.5, 6.3)	150	6.1 (4.7, 7.9)	55	5.6 (3.8, 8.2)	16	6.3 (3.2, 12.2)	0.0051
No	11 557	93.7 (92.9, 94.3)	655	92.6 (87.1, 95.8)	2382	90.6 (88.7, 92.2)	4786	94.7 (93.7, 95.5)	1982	93.9 (92.1, 95.3)	1,086	94.4 (91.8, 96.2)	297	93.7 (87.8, 96.8)	
Household member with COVID-19 ^f															
Yes	867	7.3 (6.6, 8.0)	69	8.3 (4.9, 13.8)	259	10.8 (9.1, 12.9)	299	6.1 (5.2, 7.1)	155	7.2 (5.6, 9.2)	57	5.9 (4.0, 8.7)	22	9.4 (5.1, 16.9)	0.0008
No	11 452	92.7 (92.0, 93.4)	634	91.7 (86.2, 95.1)	2363	89.2 (87.1, 90.9)	4736	93.9 (92.9, 94.8)	1974	92.8 (90.8, 94.4)	1,083	94.1 (91.3, 96.0)	290	90.6 (83.1, 94.9)	
Month of delivery ^g															
April, May, and June	197	1.0 (0.8, 1.2)	17	1.4 (0.7, 2.6)	58	1.1 (0.8, 1.5)	48	0.9 (0.7, 1.3)	44	0.7 (0.5, 1.0)	29	1.7 (1.1, 2.5)	0	-	<0.0001
July	1811	13.6 (12.8, 14.5)	116	14.8 (9.6, 22.2)	400	13.5 (11.7, 15.4)	707	13.9 (12.7, 15.1)	278	11.6 (9.7, 13.8)	193	18.1 (14.8, 22.0)	45	10.4 (6.3, 16.7)	
August	2087	14.9 (14.1, 15.9)	117	17.2 (10.6, 26.9)	447	15.7 (13.8, 17.8)	833	14.9 (13.7, 16.2)	349	14.0 (12.0, 16.3)	199	16.2 (13.0, 20.0)	60	10.3 (6.7, 15.4)	
September	2066	14.4 (13.6, 15.3)	112	16.6 (11.0, 24.3)	453	14.4 (12.6, 16.4)	852	15.1 (13.8, 16.4)	335	13.0 (11.0, 15.3)	187	12.1 (9.6, 15.2)	47	14.1 (8.9, 21.7)	
October	2345	20.0 (18.9, 21.2)	115	16.3 (10.9, 23.7)	479	20.1 (17.5, 22.9)	995	20.3 (18.8, 21.9)	412	19.1 (16.7, 21.8)	214	19.6 (15.7, 24.2)	67	22.9 (15.8, 31.8)	
November	2188	17.9 (16.8, 18.9)	143	16.5 (11.0, 24.0)	450	17.9 (15.6, 20.4)	868	17.4 (16.0, 19.0)	424	20.5 (17.9, 23.3)	184	15.2 (12.1, 18.9)	51	17.6 (11.8, 25.6)	
December	2185	18.2 (17.1, 19.2)	119	17.1 (10.7, 26.2)	439	17.4 (15.1, 20.0)	868	17.5 (16.1, 19.0)	448	21.1 (18.5, 23.9)	189	17.1 (13.6, 21.1)	58	24.7 (17.4, 34.0)	

AI/AN American Indian/Alaska Native; CI confidence interval; NH non-Hispanic; NH Other non-Hispanic other race/multiple races; Q1-Q4, Quartile 1-Quartile 4.

^a Puerto Rico (births April-December 2020); Alaska, Connecticut, District of Columbia, Iowa, Maryland, Massachusetts, Missouri, Nebraska, Pennsylvania (Births June-December 2020); Arizona, Illinois, Louisiana, New Jersey, New York City, Oregon, South Dakota, Tennessee, Utah, Vermont, Virginia, West Virginia, Wyoming (births July-December 2020); Delaware (births August-December 2020); Arkansas, Georgia, Florida, Michigan, North Dakota (births October-December 2020).

^b Unweighted counts.

^c Weighted percentages and 95% confidence intervals; the total row represents weighted row percentages; the remaining rows represent weighted column percentages; calculated excluding missing data.

^d Quartiles of state government response index score, based on average scores from April 1-December 31, 2020; Q1: GRI 39.06–57.03 (Indiana, Iowa, Montana, North Dakota, South Dakota, Tennessee, Utah, Virginia); Q2: GRI 57.04 to 59.89 (Arizona, Arkansas, Florida, Illinois, West Virginia, Wyoming, Michigan); Q3: GRI 59.90 to 65.02 (Alaska, Georgia, Louisiana, Massachusetts, New Jersey, Oregon, Pennsylvania); Q4: GRI 65.03 to 95.52 (Connecticut, Delaware, District of Columbia, Maryland, New York City, Puerto Rico, Vermont). Q1 represents jurisdictions with the lowest government response index scores (fewest containment measures) and Q4 represents jurisdictions with the highest scores (most containment measures) (<https://www.bsg.ox.ac.uk/research/covid-19-government-response-tracker>).

^eWhile you were pregnant during the COVID-19 pandemic, did you have any of the following experiences ... I was told by a healthcare provider that I had COVID-19.

^fWhile you were pregnant during the COVID-19 pandemic, did you have any of the following experiences ... Someone in my household was told by a healthcare provider that they had COVID-19.

^gBirths in April, May, and June were combined due to small sample size.

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Table 2.

Adjusted^a prevalence ratios for the associations between maternal race and ethnicity and COVID-19 delivery hospitalization experiences, among women with a live, in-hospital, birth from April-December 2020, 29 jurisdictions^b, Pregnancy Risk Assessment Monitoring System.

Maternal race and ethnicity	Baby tested for COVID-19 in the hospital	Separated from baby to protect baby from COVID-19	Wore a mask when others were in the hospital room	Wore a mask while alone caring for baby in the hospital	Given information about protecting baby from COVID-19 at home	No support person allowed
American Indian/Alaska Native	1.6 (1.0, 2.4)	2.7 (1.2, 6.2)	1.0 (0.9, 1.2)	1.9 (1.4, 2.7)	1.4 (1.2, 1.6)	5.2 (1.8, 14.8)
Hispanic	1.8 (1.4, 2.2)	2.2 (1.5, 3.1)	1.2 (1.2, 1.3)	2.6 (2.2, 3.0)	1.2 (1.1, 1.3)	1.4 (0.8, 2.5)
Non-Hispanic White	Reference	Reference	Reference	Reference	Reference	Reference
Non-Hispanic Black	2.0 (1.6, 2.4)	2.4 (1.7, 3.6)	1.1 (1.1, 1.2)	2.7 (2.3, 3.1)	1.3 (1.2, 1.4)	2.3 (1.3, 4.1)
Non-Hispanic Asian	1.8 (1.4, 2.4)	2.8 (1.6, 4.9)	1.1 (1.1, 1.2)	2.5 (2.1, 3.0)	1.1 (1.0, 1.2)	0.8 (0.3, 2.3)
Non-Hispanic other/multiple	1.3 (0.8, 2.3)	1.1 (0.4, 3.5)	1.1 (0.9, 1.2)	1.4 (0.9, 2.1)	1.2 (1.0, 1.5)	0.2 (0.1, 0.7)

^aModels were adjusted for maternal age (<20 years, 20–24 years, 25–34 years, 35 years), delivery insurance (private, public, other/uninsured), quartile of state Government Response Index Score, mother being told by a healthcare provider that she had COVID-19 during pregnancy, and month of delivery (April/May/June, July, August, September, October, November, December); April, May, and June were combined due to small sample size.

^bPuerto Rico (births April-December 2020); Alaska, Connecticut, District of Columbia, Iowa, Maryland, Massachusetts, Missouri, Nebraska, Pennsylvania (Births June-December 2020), Arizona, Illinois, Louisiana, New Jersey, New York City, Oregon, South Dakota, Tennessee, Utah, Vermont, Virginia, West Virginia, Wyoming (births July-December 2020); Delaware (births August-December 2020); Arkansas, Georgia, Florida, Michigan, North Dakota (births October-December 2020).