



October 2022

MATERNAL HEALTH

Outcomes Worsened and Disparities Persisted During the Pandemic

GAO Highlights

Highlights of [GAO-23-105871](#), a report to congressional addressees

Why GAO Did This Study

The COVID-19 pandemic presented challenges for maternal health, as pregnant women with COVID-19 are more likely to experience pregnancy complications, severe illness, or death. Research also shows racial and ethnic disparities in maternal deaths. For example, Black or African-American (not Hispanic or Latina) women experienced maternal death at a rate 2.5 times higher than White (not Hispanic or Latina) women in 2018 and 2019.

The CARES Act includes a provision for GAO to report on its COVID-19 pandemic oversight efforts. GAO also was asked to review how the pandemic has affected maternal health. This report describes, among other things, what available data show about maternal health outcomes and disparities during the pandemic.

To do this work, GAO analyzed the most recently available CDC data, including data from the National Vital Statistics System, to identify trends in maternal deaths and other outcomes, such as preterm births, by race and ethnicity. In addition, GAO reviewed agency documents and selected research; and interviewed officials at relevant HHS agencies, as well as eight stakeholders—including researchers, advocacy groups, and professional organizations—who were selected based on referrals from HHS agency officials and reviews of published research.

View [GAO-23-105871](#). For more information, contact Carolyn L. Yocom at (202) 512-7114 or YocomC@gao.gov.

October 2022

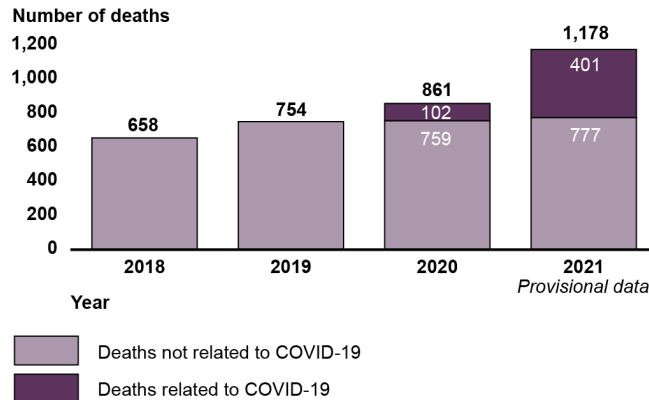
MATERNAL HEALTH

Outcomes Worsened and Disparities Persisted During the Pandemic

What GAO Found

Each year in the U.S., hundreds of women die from complications related to pregnancy and childbirth—known as maternal death. GAO's analysis of Centers for Disease Control and Prevention (CDC) data shows that maternal deaths increased during the COVID-19 pandemic. Further, the data show that COVID-19 was a contributing factor in one quarter of all maternal deaths in 2020 and 2021 combined.

Maternal Deaths, 2018 through 2021



Source: GAO analysis of Centers for Disease Control and Prevention (CDC), National Center for Health Statistics (NCHS) data. | GAO-23-105871

CDC data also show racial and ethnic disparities in the rate of maternal deaths per 100,000 live births per year. For example:

- The maternal death rate for Black or African-American (not Hispanic or Latina) women was 44.0 per 100,000 live births in 2019, then increased to 55.3 in 2020, and 68.9 in 2021. In contrast, White (not Hispanic or Latina) women had death rates of 17.9, 19.1, and 26.1, respectively.
- The maternal death rate for Hispanic or Latina women was lower (12.6) compared with White (not Hispanic or Latina) women (17.9) in 2019, but increased significantly during the pandemic in 2020 (18.2) and 2021 (27.5).

Disparities in other adverse outcomes, such as preterm and low birthweight births, persisted for Black or African-American (not Hispanic or Latina) women, according to GAO analysis of CDC data.

Stakeholders and Department of Health and Human Services (HHS) officials told GAO that the pandemic exacerbated the effects of social determinants of health—factors such as access to care, transportation, or technology; living environment; and employment—on maternal health disparities. For example, service reductions in public transportation and child care worsened existing barriers to accessing care. In addition, stakeholders and officials said the pandemic highlighted the effect racism has on maternal health. For example, physiological changes caused by chronic stress can increase the risk of maternal death, as well as severe illness from COVID-19.

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Abbreviations

CDC	Centers for Disease Control and Prevention
CMS	Centers for Medicare & Medicaid Services
HHS	Department of Health and Human Services
HRSA	Health Resources and Services Administration
NCHS	National Center for Health Statistics
NIH	National Institutes of Health

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October 19, 2022

Congressional Addressees

Maternal Death

Death from any cause related to or aggravated by pregnancy or its management (excluding accidental or incidental causes) during pregnancy and childbirth, or within 42 days of the end of pregnancy, irrespective of the duration and site of pregnancy.

Maternal Death Rate

Number of maternal deaths per 100,000 live births.

Source: Centers for Disease Control and Prevention. | GAO-23-105871

Each year in the U.S., hundreds of women die from complications related to pregnancy or childbirth, known as a maternal death.¹ According to the Centers for Disease Control and Prevention (CDC), the U.S. averaged about 700 maternal deaths out of 3.7 million live births per year in recent years—a rate that exceeds almost every other developed, high-income country.² For example, in 2018, the maternal death rate in the U.S. (17.4 per 100,000 births) was more than two times greater than Canada (8.6) and the United Kingdom (6.5). In addition, there have been persistent racial and ethnic disparities in rates of maternal deaths in the U.S., with Black women experiencing maternal deaths at a rate 2.5 times higher than White women in 2018 and 2019.³ These concerns prompted the Department of Health and Human Services (HHS) in December 2020 to state that maternal deaths are a public health crisis.⁴

Since the COVID-19 pandemic began, CDC has found that pregnant women may be at higher risk for adverse outcomes from COVID-19, such as pregnancy complications, severe illness, and death. These adverse outcomes may be related to physiological changes that occur during

¹See Centers for Disease Control and Prevention, “Maternal Mortality” (Aug. 13, 2020), accessed July 21, 2022, <https://www.cdc.gov/reproductivehealth/maternal-mortality>. We use the term “women” in this report based on definitions in the data sources, but acknowledge this term does not include all people who may become pregnant, such as people who do not identify as either male or female, and some transgender men.

²See D.L. Hoyert, “Maternal Mortality Rates in the United States, 2019,” NCHS Health E-Stats (2021). The rate for the United Kingdom is from 2017. See Organization for Economic Cooperation and Development, accessed August 1, 2022, <https://stats.oecd.org/index.aspx?queryid=30116>.

³See D.L. Hoyert, “Maternal Mortality Rates in the United States, 2019.” Hispanic women had lower rates of maternal death as compared with non-Hispanic women in 2018 and 2019. The CDC data we cite in this report use the term “Hispanic origin,” which refers to a person of Cuban, Dominican, Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin regardless of race. For purposes of this report, we use the term Hispanic to refer to Hispanic or Latina women. Additionally, we use the term Black to refer to Black or African American women who are not Hispanic, and White to refer to White women who are not Hispanic.

⁴See Department of Health and Human Services, *Healthy Women, Healthy Pregnancies, Healthy Futures: Action Plan To Improve Maternal Health In America and Surgeon General’s Call to Action to Improve Maternal Health* (December 2020).

pregnancy, such as decreased lung capacity and a weakened immune system.⁵ Furthermore, CDC data and other research have shown racial and ethnic disparities in the number of COVID-19 cases among pregnant women. For example, CDC data show that among women testing positive for COVID-19, pregnant Hispanic women make up a larger proportion of COVID-19 cases as compared with pregnant women who are not Hispanic.⁶

The CARES Act includes a provision for GAO to monitor and oversee federal efforts to address the COVID-19 pandemic, as well as the effect of the pandemic on the health, economy, and public and private institutions of the U.S.⁷ We also received a request to review issues related to maternal health outcomes and disparities during the COVID-19 pandemic. In this report we describe

1. what available data show about maternal health outcomes and disparities during the COVID-19 pandemic; and
2. HHS agencies' efforts initiated during or in response to the COVID-19 pandemic to address maternal health outcomes and disparities.

To describe what available data show about maternal health outcomes and disparities during the COVID-19 pandemic, we reviewed data from CDC's National Center for Health Statistics' (NCHS) National Vital Statistics System, the most complete source of data on births and deaths in the U.S., and its Pregnancy Risk Assessment Monitoring System, a state-level surveillance system of survey-based data on maternal behaviors, attitudes, and experiences before, during, and shortly after pregnancy.⁸ Specifically, we reviewed the following:

⁵See L.D. Zambrano et al., "Update: Characteristics of Symptomatic Women of Reproductive Age with Laboratory-Confirmed SARS-CoV-2 Infection by Pregnancy Status — United States, January 22–October 3, 2020," *Morbidity and Mortality Weekly Report*, vol. 69 (2020).

⁶For example, see L.D. Zambrano et al., "Update: Characteristics of Symptomatic Women of Reproductive Age." COVID-19 cases are reported by local health departments to CDC, and are limited to laboratory-confirmed infection in symptomatic women aged 15 to 44 years in the U.S.

⁷Pub. L. No. 116-136, § 19010(b), 134 Stat. 281, 580 (2020).

⁸Responses to the Pregnancy Risk Assessment Monitoring System are obtained from an annual sample of 1,000 to 3,000 women per state who recently had a live birth. The population from which the sample is drawn covers approximately 83 percent of U.S. births.

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- NCHS data on the number of maternal deaths, including those with COVID-19 also listed as a contributing cause of death on the death certificate, by race and ethnicity.⁹ We analyzed these data from 2018, the earliest year of comparable data, through 2021, the most recent year of available data.¹⁰
 - NCHS data on the number of live births, preterm births (including early and late preterm births), low and very low birthweight births, and women admitted to the intensive care unit during delivery, by race and ethnicity.¹¹ We analyzed these data from 2016, the earliest year of comparable data, through 2021, the most recent year of available data.¹²
 - Maternal death rates—which are calculated from NCHS data as the number of maternal deaths per 100,000 live births per year, to account for changes and differences in population—by race and ethnicity.¹³ We analyzed these data from 2018, the earliest year of available data on maternal deaths, through 2021, the most recent year of available data on deaths and births.

⁹The underlying cause of death is defined as “the disease or injury which initiated the train of events leading directly to death, or the circumstances of the accident or violence which produced the fatal injury” and is assigned from the conditions entered on the death certificate. Maternal deaths are those assigned to diagnostic code numbers A34, O00–O95, and O98–O99, while COVID-19-related deaths are identified using multiple cause-of-death code U07.1 of the *International Classification of Diseases, 10th Revision*.

¹⁰We reported data on maternal deaths from 2018 onward, because of changes in data collection and coding that were revised as of 2018. The NCHS 2021 mortality data are provisional and subject to change; however, the data are based on over 99 percent of deaths for 2021, as of August 2, 2022. Provisional data provide an early estimate of deaths before the release of final data that are fully reviewed by CDC. Final mortality data for a given year are typically released 11 months after the end of the calendar year.

¹¹Births occurring before 37 weeks of gestation based on the obstetric estimate are considered to be preterm. CDC further categorizes births at less than 34 weeks as early preterm and births at 34 to 36 weeks as late preterm. Low birthweight is defined as birthweight of less than 2,500 grams and very low birthweight is defined as less than 1,500 grams. Data were not available for maternal admission to the intensive care unit for 2021 at the time of our analysis.

¹²We report NCHS birth data from 2016 onward, because of changes in the coding of race as of 2016. The NCHS birth 2021 data are provisional and subject to change; however, the data are based on over 99 percent of births for 2021, as of February 10, 2022.

¹³In this report we use the term “maternal death rate” to refer to the maternal mortality rates—specifically, maternal deaths per 100,000 live births—reported in the National Vital Statistics System.

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- Pregnancy Risk Assessment Monitoring System data on self-reported depression symptoms before, during, and after pregnancy from a sample of postpartum women from 2016, the earliest year of comparable data, through 2020, the most recent year of available data.¹⁴

We focused our data analysis on the years 2020 and 2021 to illustrate changes in maternal health outcomes and disparities during the pandemic, as compared to earlier years. To describe racial and ethnic data, we relied on the Office of Management and Budget's *Revisions to the Standards for the Classification of Federal Data on Race and Ethnicity*.¹⁵ We also focused our analysis on the three largest racial and ethnic groups of women in available data—White, Black, and Hispanic—because the data elements we reviewed were suppressed or less reliable for other racial groups due to fewer observations; however, we acknowledge these other groups also face disparities in maternal health outcomes.¹⁶ For example, we previously reported that American Indian or Alaskan Native women are more than two times as likely to experience maternal deaths as White women.¹⁷ Women of all races and ethnicities are included in totals and national averages. We reviewed CDC documentation regarding how these data are collected, interviewed agency officials, and compared our tabulations with published reports to assess the reliability and accuracy of the data. We determined that the portions of the data we used are sufficiently reliable for the purpose of this

¹⁴CDC revises this survey periodically; the current version began in 2016. These data were not available by race and ethnicity at the time of our analysis.

¹⁵These standards list race and ethnicity as follows: American Indian or Alaska Native, Asian, Black or African American, Hispanic or Latino, Native Hawaiian or Other Pacific Islander, and White. See U.S. Office of Management and Budget, *Revisions to the Standards for the Classification of Federal Data on Race and Ethnicity* (Washington, D.C.: Oct. 30, 1997). The CDC data we cite in this report use the term “Hispanic origin,” which refers to a person of Cuban, Dominican, Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin regardless of race. For purposes of this report, we use the term Hispanic to refer to Hispanic or Latina women. Additionally, we use the term Black to refer to Black or African American women who are not Hispanic, and White to refer to White women who are not Hispanic.

¹⁶Data suppression is when a record or certain parts of a record are not included in the published data to ensure that data cannot be re-identified.

¹⁷See GAO, *Maternal Mortality: Trends in Pregnancy-Related Deaths and Federal Efforts to Reduce Them*, [GAO-20-248](#) (Washington, D.C.: Mar. 12, 2020).

report.¹⁸ Comparisons between years and race and ethnic groups are statistically significant at the 95 percent confidence level unless otherwise noted.

We interviewed officials from HHS agencies including CDC, Office of the Assistant Secretary for Planning and Evaluation, and Health Resources and Services Administration (HRSA), and reviewed written responses from these agencies—as well as the National Institutes of Health (NIH) and Centers for Medicare & Medicaid Services (CMS)—about maternal health outcomes and disparities during the COVID-19 pandemic, and factors that may be associated with such disparities.¹⁹ We also interviewed a sample of eight knowledgeable stakeholders—individual researchers, research organizations, and professional or advocacy associations—that we identified through our background research and recommendations from agency officials.²⁰ We reviewed agency documents and selected research that we identified through background research or that were provided by agency officials or stakeholders.

To describe efforts the HHS agencies initiated during or in response to the COVID-19 pandemic, we reviewed prior GAO work and agency websites and documents to identify efforts related to maternal health and COVID-19. We reviewed written responses officials from HHS agencies provided to determine which agency efforts were initiated during or in response to the pandemic, and to obtain information on the status or any results of these efforts.

We conducted this performance audit from March 2022 to October 2022 in accordance with generally accepted government auditing standards.

¹⁸We excluded other NCHS data measures of maternal health outcomes from our analysis, because they were not sufficiently reliable for our purposes. In addition, we did not review severe maternal morbidity (as defined by CDC, a specific set of 21 conditions reflecting unexpected outcomes of labor and delivery that result in short- or long-term health consequences) or pregnancy-related deaths (deaths that occur up to one year after pregnancy), because data were not available for 2020 or 2021 at the time of our analysis.

¹⁹NIH supports research, including on maternal mortality and morbidity, through various grants, contracts, and other funding mechanisms. HRSA is the primary federal agency charged with improving health care for the medically vulnerable, including pregnant women. CMS administers the Medicaid program, which covers approximately 42 percent of births in the U.S.

²⁰We interviewed officials from the American College of Obstetricians and Gynecologists, the Association of Maternal & Child Health Programs, the Maternal Child Research Oversight Committee at Columbia University, the National Birth Equity Collaborative, and four university-affiliated researchers with knowledge about maternal health and disparities.

Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

Maternal Health Outcomes

CDC's NCHS collects and reports data through the National Vital Statistics System on several maternal health outcomes, such as maternal deaths. According to CDC officials, the agency receives information from death certificates from all states, as well as other jurisdictions, such as the District of Columbia, and uses the underlying cause listed on the death certificates to identify maternal deaths and compile national statistics. These data also contain information on the person's race, ethnicity, and age, among other information.

NCHS also uses information from birth certificates received from states and other jurisdictions to identify and report statistics related to live births. These data include characteristics of the mother (such as age and race) and infant (such as gestational age and birthweight), as well as information from medical records related to the pregnancy or delivery (such as whether the mother was admitted to an intensive care unit during delivery). According to the World Health Organization, certain infant health characteristics, such as low birthweight, are indicators of poor maternal health, nutrition, or health care during pregnancy.²¹ Additionally, some pregnant women are more likely to have preterm births, such as those who are over age 35, according to CDC.²²

In addition, research shows mental health conditions, such as depression and anxiety, are the most common condition experienced during and after pregnancy.²³ We previously reported that the COVID-19 pandemic has

²¹See World Health Organization, "Low birth weight," accessed July 8, 2022, <https://www.who.int/data/nutrition/nlis/info/low-birth-weight>.

²²See Centers for Disease Control and Prevention, "Preterm Birth" (Nov. 1, 2021), accessed July 12, 2022, <https://www.cdc.gov/reproductivehealth/maternalinfanthealth/pretermbirth.htm>.

²³See, for example, E.J. Fawcett et al., "The Prevalence of Anxiety Disorders during Pregnancy and the Postpartum Period: a Multivariate Bayesian Meta-Analysis," *Journal of Clinical Psychiatry*, vol. 80, no. 4 (2019).

been found to have negatively affected mental health generally, and research suggests it may have exacerbated these conditions for pregnant and postpartum women.²⁴

Maternal Health Disparities

Health disparities are preventable differences in the burden of disease, or in opportunities to achieve optimal health experienced by socially disadvantaged racial, ethnic, and other populations. We have previously reported on racial and ethnic disparities in health outcomes, and factors that contribute to such disparities, including for maternal health.²⁵

Social determinants of health are conditions in the environments in which people are born, live, learn, work, play, worship, and age; for example, access to housing and healthy food, educational and job opportunities, and exposure to pollution. According to HHS, these conditions affect a wide range of health outcomes and risks.²⁶ According to CDC, social determinants of health are key drivers of health disparities and place communities of color at greater risk for poor health outcomes.²⁷ Research has shown that social determinants of health are associated with adverse maternal health outcomes; for example, studies suggest that factors such as lower education or exposure to pollution are associated with a higher risk of maternal death and morbidity.²⁸ Similarly, we have reported that certain health system factors (such as lack of access to care), socioeconomic factors (such as being uninsured or having Medicaid coverage), and patient factors (such as chronic health conditions or older

²⁴For example, see GAO, *Behavioral Health and COVID-19: Higher-Risk Populations and Related Federal Relief Funding*, [GAO-22-104437](#) (Washington, D.C.: Dec. 10, 2021); B. Kotlar et al., “The Impact of the COVID-19 Pandemic on Maternal and Perinatal Health: a Scoping Review,” *Reproductive Health*, vol. 18, no. 10 (2021); and A. Basu et al., “A Cross-National Study of Factors Associated with Women’s Perinatal Mental Health and Wellbeing during the COVID-19 Pandemic,” *PLoS One*, vol. 16, no. 4 (April 2021).

²⁵For example, see GAO, *Maternal Mortality and Morbidity: Additional Efforts Needed to Assess Program Data for Rural and Underserved Areas*, [GAO-21-283](#) (Washington, D.C.: April 8, 2021); and *Health Care Capsule: Racial and Ethnic Health Disparities*, [GAO-21-105354](#) (Washington, D.C.: Sept. 23, 2020).

²⁶See Department of Health and Human Services, “Social Determinants of Health,” accessed July 18, 2022, <https://health.gov/healthypeople/priority-areas/social-determinants-health>.

²⁷See Centers for Disease Control and Prevention, “Racism and Health,” accessed July 21, 2022, <https://www.cdc.gov/healthequity/racism-disparities/index.html>.

²⁸For example, see E. Wang et al., “Social Determinants of Pregnancy-Related Mortality and Morbidity in the United States: A Systematic Review,” *Obstetrics & Gynecology*, vol. 135, no. 4 (April 2020): 896-915.

age) affect maternal health outcomes. Several of these disproportionately affect certain populations, including Black women and women in rural and underserved areas.²⁹

Additionally, racism negatively affects the health of millions of people, according to CDC. We previously reported, and research has shown, that racial and ethnic disparities in maternal health outcomes persist, even after controlling for other factors like socioeconomic status, education, and access to care.³⁰ Some studies described specifically how racial discrimination can contribute to worsened maternal health outcomes. For example, chronic stress associated with racism can cause physiological changes and adverse health conditions. Moreover, bias or discrimination within the health care system can create communication challenges between providers and their patients, which may increase the risk of adverse outcomes. For example, pregnant women may be reluctant to ask questions about their condition if they faced discrimination from their provider.³¹ In addition, the COVID-19 pandemic has highlighted racial and ethnic health disparities. For example, among COVID-19 cases with known race and ethnicity reported to CDC, Hispanic persons have generally had a higher rate of cases throughout the pandemic as compared with non-Hispanic persons.³²

²⁹See [GAO-21-283](#).

³⁰For example, see two studies of severe maternal morbidity in New York City: E. Howell et al., "Race and Ethnicity, Medical Insurance, and Within-Hospital Severe Maternal Morbidity Disparities," *Obstetrics & Gynecology*, vol. 135, no. 2 (Feb. 2020): 285-293; and M. Angley et al., "Severe Maternal Morbidity in New York City, 2008–2012," New York Bureau of Maternal, Infant and Reproductive Health (New York, N.Y.: 2016).

³¹See R. Hardeman et al., "Developing Tools to Report Racism in Maternal Health for the CDC Maternal Mortality Review Information Application (MMRIA): Findings From the MMRIA Racism & Discrimination Working Group," *Maternal and Child Health Journal*, vol. 26 (2022): 661–669.

³²See Centers for Disease Control and Prevention, "COVID-19 Weekly Cases and Deaths per 100,000 Population by Age, Race/Ethnicity, and Sex," accessed August 5, 2022, <https://covid.cdc.gov/covid-data-tracker/#demographicsovertime>.

Some Maternal Health Outcomes Worsened during the Pandemic; Rate of Deaths among Black Women Increased More than for White Women

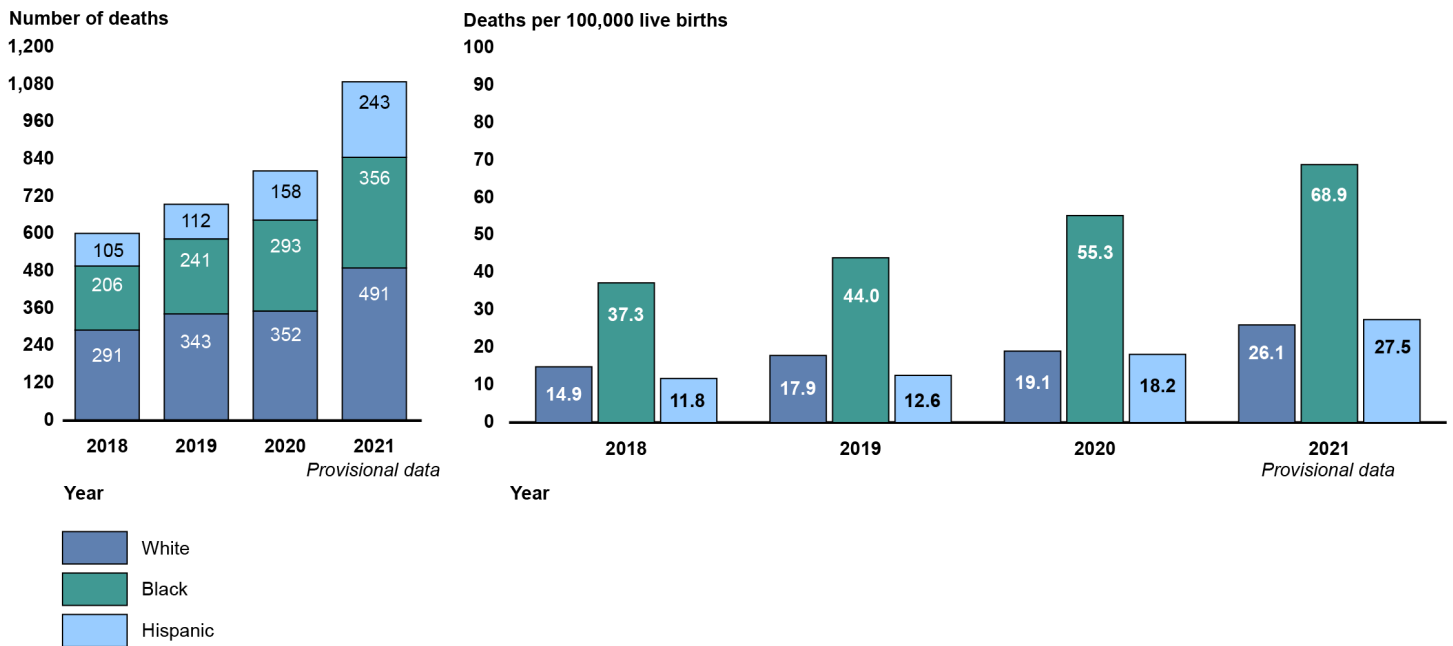
Available CDC data show that maternal deaths and maternal death rates increased overall during the COVID-19 pandemic, and trends in other maternal health outcomes generally worsened in 2021, the second year of the pandemic. These data also show that racial and ethnic disparities in maternal health outcomes continued into the pandemic.

Maternal Deaths Increased Overall during the Pandemic, Especially for Black Women

The overall number and rate of maternal deaths increased in 2020 and 2021 during the COVID-19 pandemic, compared with 2018 and 2019, according to CDC's NCHS data.³³ White women accounted for the highest number of maternal deaths during this period followed by Black and Hispanic women. However, the rate of maternal deaths was significantly higher for Black women in 2020 and 2021, compared with White and Hispanic women. Further, the maternal death rate increased more for Black women than White women in 2020 compared to 2019. In 2018 and 2019, prior to the pandemic, the rate of maternal deaths was lower for Hispanic women as compared with White and Black women; however, in 2020 and 2021, the rate for Hispanic women increased significantly and was similar to that of White women. (See fig. 1.)

³³There were 658 maternal deaths in 2018, 754 maternal deaths in 2019, 861 maternal deaths in 2020, and 1,178 maternal deaths in 2021. The rate of maternal deaths per 100,000 live births was 17.4 in 2018, 20.1 in 2019, 23.8 in 2020, and 32.2 in 2021. These numbers represent all races and ethnicities. Data for 2021 are provisional.

Figure 1: Number and Rate of Maternal Deaths by Race and Ethnicity, 2018 through 2021



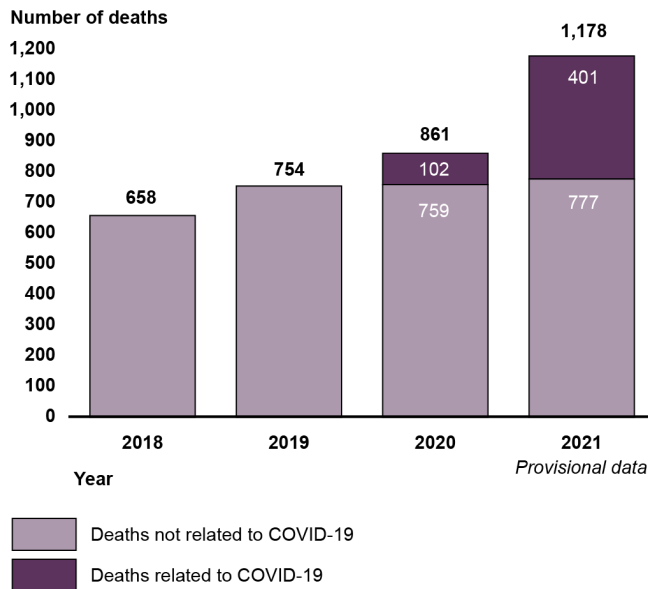
Source: GAO analysis of Centers for Disease Control and Prevention (CDC), National Center for Health Statistics (NCHS) data. | GAO-23-105871

Notes: Maternal deaths are those assigned to code numbers A34, O00–O95, and O98–O99 of the International Classification of Diseases, 10th Revision. Maternal deaths occur while pregnant or within 42 days of being pregnant. The 2021 mortality data are provisional and subject to change; however, the data are based on over 99 percent of deaths for 2021 as of August 2, 2022. Other races are not shown due to small numbers. The CDC data we cite in this figure use the term “Hispanic origin,” which refers to a person of Cuban, Dominican, Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin regardless of race. The term Hispanic refers to Hispanic or Latina women. Additionally, we use the term Black to refer to Black or African American women who are not Hispanic, and White to refer to White women who are not Hispanic.

According to CDC data, COVID-19-related deaths—those for which COVID-19 is listed on the death certificate as a cause that contributed to death—accounted for most of the increase in maternal deaths in 2020, and all of the increase in 2021; 25 percent of the total number of maternal deaths that occurred in 2020 and 2021 were COVID-19-related.³⁴ (See fig. 2.)

³⁴COVID-19-related deaths were identified using multiple cause-of-death code U07.1 from the *International Classification of Diseases, 10th Revision*. Available data do not indicate vaccination status of those who experienced COVID-19-related deaths.

Figure 2: Maternal Deaths, 2018 through 2021



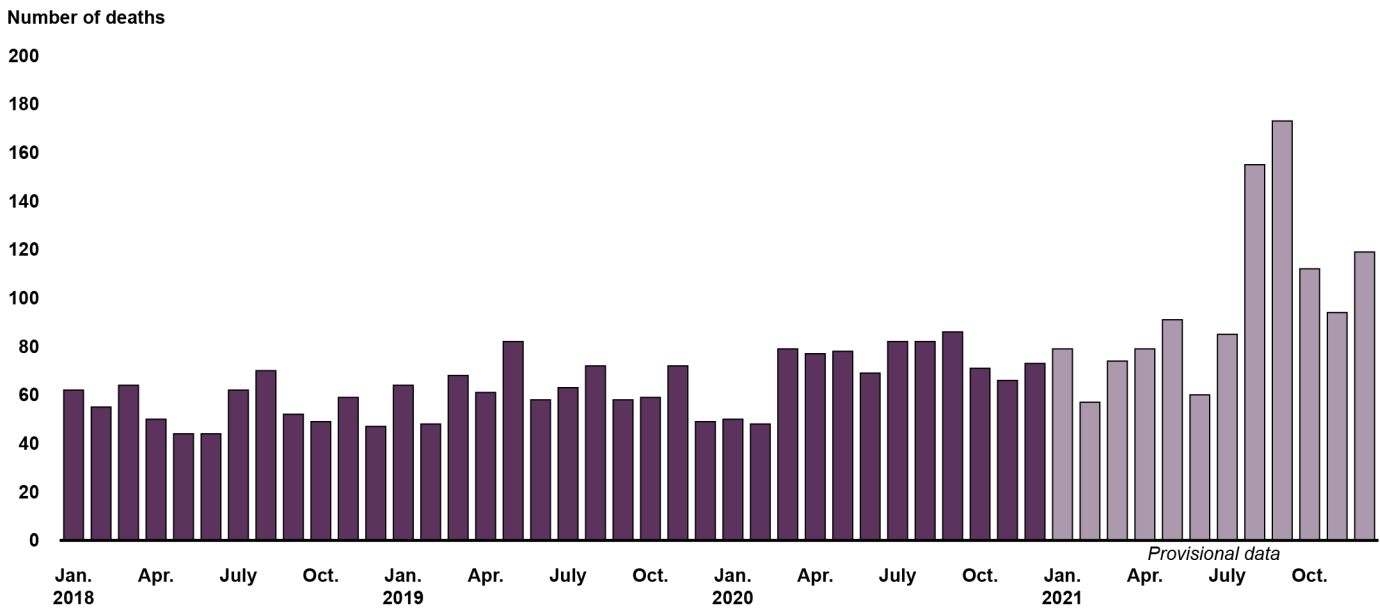
Source: GAO analysis of Centers for Disease Control and Prevention (CDC), National Center for Health Statistics (NCHS) data. | GAO-23-105871

Notes: Maternal deaths are those assigned to code numbers A34, O00–O95, and O98–O99 of the *International Classification of Diseases, 10th Revision*. Maternal deaths occur while pregnant or within 42 days of being pregnant. COVID-19-related deaths are identified using multiple cause-of-death code U07.1. The 2021 mortality data are provisional and subject to change; however, the data are based on about 99 percent of deaths for 2021 as of August 2, 2022. Data includes all races and ethnicities.

Certain demographic groups had higher rates of maternal deaths related to COVID-19, according to our analysis of CDC data. Specifically, the rate of maternal deaths in 2020 and 2021 that were COVID-19 related among Black and Hispanic women was 13.2 and 8.9 per 100,000 live births, respectively, while the rate among White women was 4.5.

Before the pandemic, the average number of monthly maternal deaths was 55 deaths for 2018, and 63 deaths for 2019. During the pandemic, from January 2020 through December 2021, the number of monthly maternal deaths averaged 85 deaths, and peaked in late summer of 2021. The number of maternal deaths in August (155 deaths) and September (173 deaths) of 2021 was higher compared to that of prior months, according to our analysis of CDC data. (See fig. 3.)

Figure 3: Number of Monthly Maternal Deaths, January 2018 through December 2021



Source: GAO analysis of Centers for Disease Control and Prevention (CDC), National Center for Health Statistics (NCHS) data. | GAO-23-105871

Notes: Maternal deaths are those assigned to code numbers A34, O00–O95, and O98–O99 of the *International Classification of Diseases, 10th Revision*. Maternal deaths occur while pregnant or within 42 days of being pregnant. The 2021 mortality data are provisional and subject to change; however, the data are based on about 99 percent of deaths for 2021 as August 2, 2022. Data includes all races and ethnicities.

CDC noted that the Delta variant became the predominant COVID-19 variant in the U.S in July 2021, and the risk of death for pregnant women was more than three times greater during this time (June 27, 2021, through December 25, 2021) as compared with previous months.³⁵

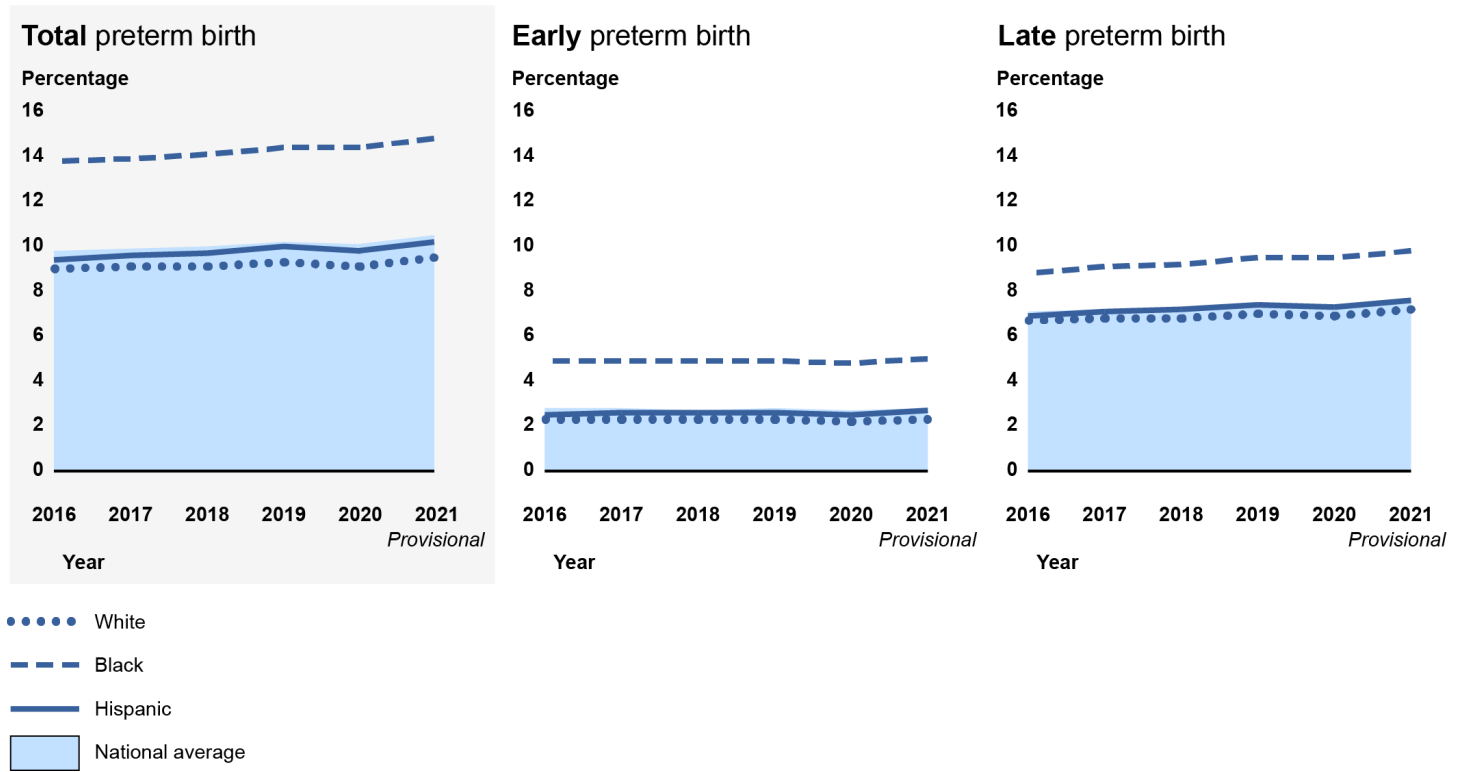
³⁵See Centers for Disease Control and Prevention, “Data on COVID-19 during Pregnancy: Severity of Maternal Illness” (July 25, 2022), accessed July 21, 2022, <https://covid.cdc.gov/covid-data-tracker/#pregnant-population>; and Centers for Disease Control and Prevention, “COVID-19 during Pregnancy” (July 1, 2022), accessed July 21, 2022, <https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/special-populations/pregnancy-data-on-covid-19/what-cdc-is-doing.html>. Also see P. Strid et al., “COVID-19 Severity Among Women of Reproductive Age with Symptomatic Laboratory-Confirmed SARS-CoV-2 by Pregnancy Status - United States, Jan 1, 2020 - Dec 25, 2021,” *Clinical Infectious Diseases* (June 19, 2022).

Preterm and Low Birthweight Births and Self-Reported Depression Increased Slightly during the Pandemic; Racial and Ethnic Disparities Persisted

As part of our analysis, we examined CDC data on other maternal health outcomes. CDC data show preterm and low birthweight births and admissions to the intensive care unit during delivery remained relatively unchanged during the first year of the pandemic, and higher rates persisted for Black women. For 2021—the second year of the pandemic—the percent of preterm and low birthweight births increased from the prior year. CDC data also showed a higher percentage of recently postpartum women reported experiencing symptoms of depression before and during pregnancy since 2016, a trend that continued in 2020, the first year of the pandemic.

Preterm and low birthweight births. According to our analysis of CDC data, the rates of preterm and low birthweight births for all women remained substantially unchanged from 2016 through 2020, and then increased from 2020 to 2021. Existing disparities in rates of preterm and low birthweight births for Black women, which were higher compared with other races and ethnicities and the national average, also continued into 2020 and 2021. (See figs. 4 and 5.)

Figure 4: Percentage of Preterm Births by Race and Ethnicity, 2016 through 2021

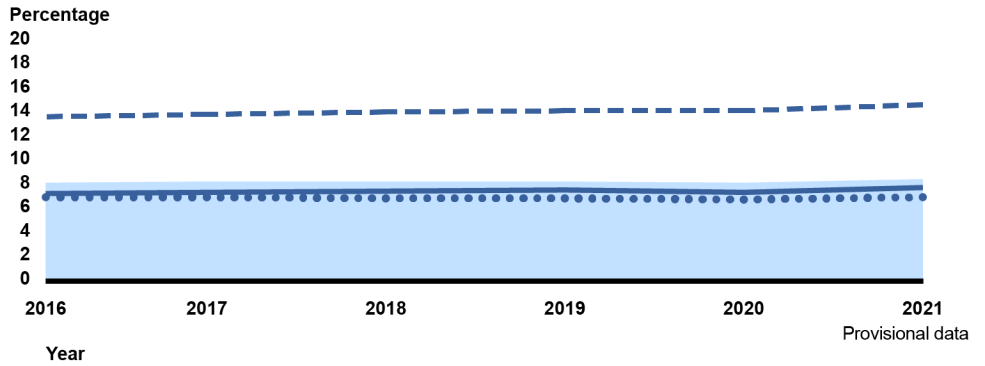


Source: GAO analysis of Centers for Disease Control and Prevention (CDC), National Center for Health Statistics (NCHS) data. | GAO-23-105871

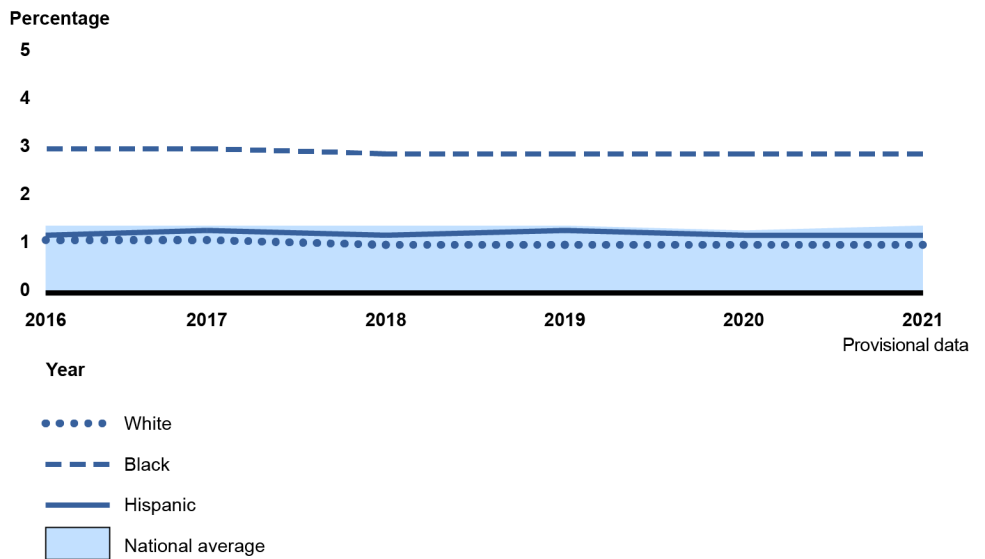
Notes: Births occurring before 37 weeks of gestation based on the obstetric estimate are considered to be preterm. CDC further categorizes births at less than 34 weeks as early preterm and births at 34 to 36 weeks as late preterm. Other races are not shown separately due to small numbers, but are included in the national average. The 2021 birth data are provisional and subject to change; however, the data are based on over 99 percent of births for 2021 as of February 10, 2022. The CDC data we cite in this figure use the term “Hispanic origin,” which refers to a person of Cuban, Dominican, Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin regardless of race. The term Hispanic refers to Hispanic or Latina women. Additionally, we use the term Black to refer to Black or African American women who are not Hispanic, and White to refer to White women who are not Hispanic.

Figure 5: Percentage of Low Birthweight Births by Race and Ethnicity, 2016 through 2021

Low birthweight



Very low birthweight



Source: GAO analysis of Centers for Disease Control and Prevention (CDC), National Center for Health Statistics (NCHS) data. | GAO-23-105871

Note: Low birthweight is birthweight of less than 2,500 grams and very low birthweight is less than 1,500 grams. Other races are not shown separately due to small numbers, but are included in the national average. The 2021 birth data are provisional and subject to change; however, the data are based on over 99 percent of births for 2021 as of February 10, 2022. The CDC data we cite in this figure use the term “Hispanic origin,” which refers to a person of Cuban, Dominican, Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin regardless of race. The term Hispanic refers to Hispanic or Latina women. Additionally, we use the term Black to refer to Black or African American women who are not Hispanic, and White to refer to White women who are not Hispanic.

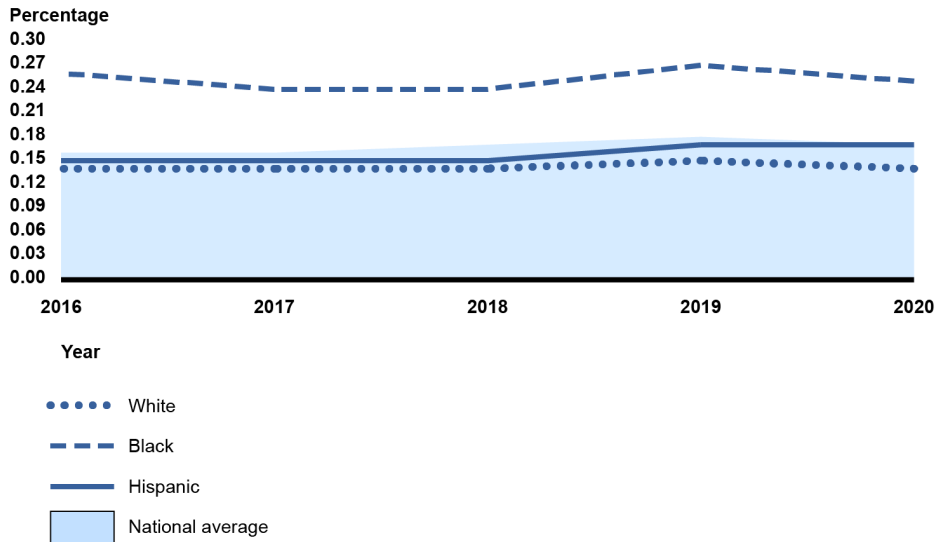
According to CDC data, pregnant women who had COVID-19 during pregnancy were at higher risk of having preterm and low birthweight births. Data reported by 14 states and the District of Columbia to the CDC show that between April 2020 and April 2021, the rates of preterm and low birthweight births were significantly higher for infants born to women with COVID-19 during pregnancy (12.2 percent and 9.0 percent, respectively) compared with those without COVID-19 (9.9 percent and 7.9 percent, respectively).³⁶

Admission to the intensive care unit. The percentage of live births where the mother was admitted to the intensive care unit during delivery also showed some change from 2016 through 2020, though these changes were small in magnitude, according to our analysis of CDC data.³⁷ Moreover, the existing disparities in rates of intensive care unit admissions for Black women, which are higher compared with other races and ethnicities and the national average, also continued into 2020. (See fig. 6.)

³⁶See J. Martin, M. Osterman, and C. Valenzuela, "Maternal and Infant Characteristics and Outcomes among Women with Confirmed or Presumed COVID-19 during Pregnancy: 14 States and the District of Columbia," *Vital Statistics Rapid Release*, no. 17 (Hyattsville, Md.: National Center for Health Statistics, December 2021.)

³⁷Data for women admitted to the intensive care unit during delivery was not available for 2021 at the time of our analysis.

Figure 6: Percentage of Births with Mother Admitted to Intensive Care Unit during Delivery, by Race and Ethnicity, 2016 through 2020



Source: GAO analysis of Centers for Disease Control and Prevention (CDC), National Center for Health Statistics (NCHS) data. | GAO-23-105871

Note: Other races are not shown separately, but are included in the national average. The CDC data we cite in this figure use the term “Hispanic origin,” which refers to a person of Cuban, Dominican, Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin regardless of race. The term Hispanic refers to Hispanic or Latina women. Additionally, we use the term Black to refer to Black or African American women who are not Hispanic, and White to refer to White women who are not Hispanic.

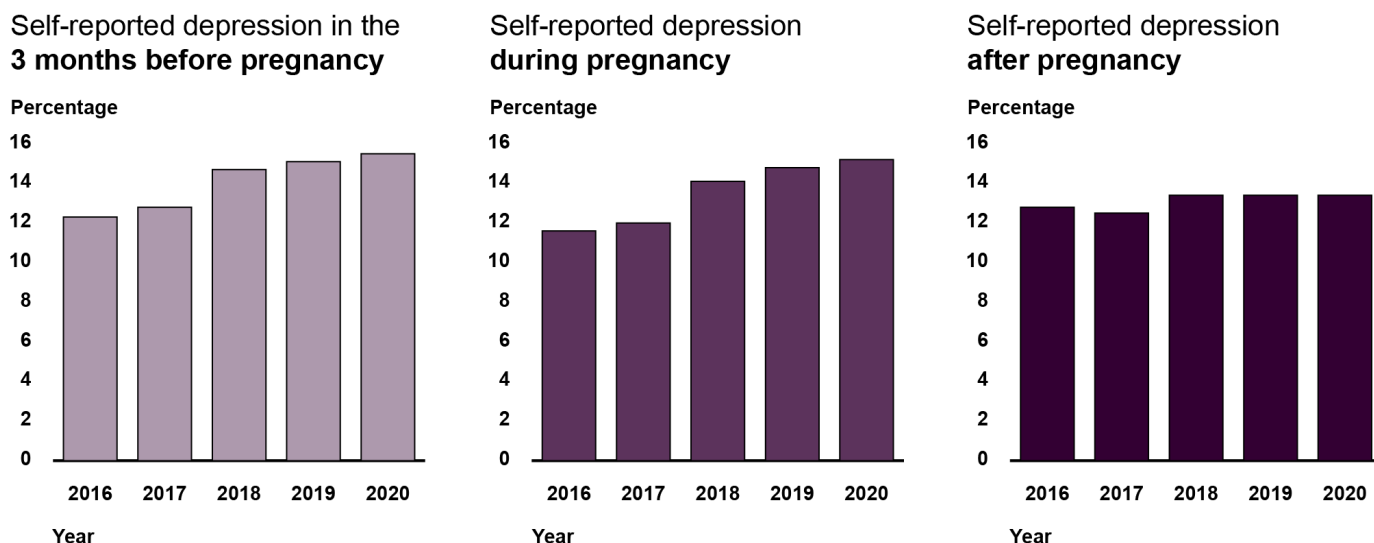
According to CDC data, pregnant women who had COVID-19 were at higher risk of being admitted to the intensive care unit during delivery as compared with other pregnant women. Data reported by 14 states and the District of Columbia to the CDC show that between April 2020 and April 2021, intensive care unit admissions were significantly higher for pregnant women with COVID-19 (0.7 percent) compared with those without COVID-19 (0.1 percent).³⁸

Depression. The percentage of women who reported experiencing symptoms of depression before and during pregnancy continued to increase during the pandemic. Prior to the pandemic, mental health conditions affected a substantial number of U.S. adults—especially

³⁸These data represent approximately 27 percent of U.S. births. See Martin, Osterman, and Valenzuela, “Maternal and Infant Characteristics and Outcomes.”

pregnant and postpartum women.³⁹ The estimated rates of depression symptoms reported before and during pregnancy rose from 2016 through 2019, according to CDC data. These increases continued into 2020, the first year of the pandemic.⁴⁰ The percentage of women reporting symptoms of depression after pregnancy has remained steady between 2016 and 2020. (See fig. 7.)

Figure 7: Percentage of Postpartum Women Who Reported Experiencing Symptoms of Depression Before, During, or After Pregnancy, 2016 to 2020



Source: GAO analysis of Centers for Disease Control and Prevention (CDC), Pregnancy Risk Assessment Monitoring System data. | GAO-23-105871

Notes: Respondents to the Pregnancy Risk Assessment Monitoring System survey reflect an annual sample of between 1,000 and 3,000 women per state who recently had a live birth. The population from which the sample is drawn covers approximately 83 percent of U.S. births. Postpartum depression symptoms are defined in the survey as “always” or “often” feeling down, depressed, or

³⁹We previously reported that over 60 million adults in the U.S. had a mental illness in 2019, the year prior to the pandemic, and that data suggest the pandemic may have contributed to new or exacerbated mental health symptoms or conditions, particularly among women. Also, research shows mental health conditions are the most common condition experienced during and after pregnancy. See [GAO-22-104437](#) and E.J. Fawcett et al., “The Prevalence of Anxiety Disorders during Pregnancy and the Postpartum Period: a Multivariate Bayesian Meta-Analysis.”

⁴⁰Respondents to the CDC Pregnancy Risk Assessment Monitoring System survey reflect a sample of women who recently had a live birth. Depression is defined in the survey as “always” or “often” feeling down, depressed, or hopeless, or having little interest or little pleasure in doing things the person usually enjoyed. Data from 30 states met CDC’s response rate threshold to be included in the results. Data for 2021 were not available at the time of our analysis.

hopeless or having little interest or little pleasure in doing things the person usually enjoyed since delivery. On average, 75 percent of states have met or exceeded the data quality threshold since 2007. As such, not all states are included in the survey results.

Moreover, selected research, stakeholders, and NIH officials indicated that anxiety, depression, or stress may have worsened for pregnant and postpartum women due to the pandemic—in particular, due to social isolation and fears of COVID-19 infection.⁴¹ Additionally, NIH officials noted that there are racial and ethnic disparities in the prevalence and severity of depression; however, data on the percentage of women who reported experiencing symptoms of depression were not available by race and ethnicity at the time of our analysis.

Pandemic Exacerbated Factors that Likely Contribute to Disparities in Maternal Health Outcomes

Stakeholders we interviewed, as well as CDC, HRSA, and NIH officials, stated that the COVID-19 pandemic exacerbated certain social factors that contribute to disparities in maternal health outcomes. In particular, stakeholders and officials said social determinants of health—such as access to care, transportation, or technology; the living environment; and employment—are key factors that contribute to disparities in maternal health outcomes. They said that during the COVID-19 pandemic these factors adversely affected women from racial and ethnic minorities or other socially disadvantaged groups more than others. For example:

- Stakeholders and HHS officials noted, and we previously reported, that women from racial and ethnic minorities and other socially disadvantaged groups (e.g., those in underserved areas) have faced barriers to accessing maternal health care.⁴² The pandemic caused reductions in services, such as public transportation, and increased child care challenges, according to some stakeholders; this exacerbated existing barriers to accessing care and likely affected women from these groups more than others.
- Similarly, several stakeholders and NIH officials noted that increased use of telehealth during the pandemic highlighted existing challenges

⁴¹For example, see Kotlar et al., “The Impact of the COVID-19 Pandemic on Maternal and Perinatal Health”; and Basu et al., “A Cross-National Study of Factors Associated with Women’s Perinatal Mental Health and Wellbeing.”

⁴²See [GAO-21-283](#).

in using telehealth for those without reliable access to the internet.⁴³ For example, two stakeholders described pregnant women needing to drive to places with free internet to access telehealth from their car. Others faced challenges carrying out certain health care activities at home that would usually be conducted in person during a health care office visit, such as monitoring their blood pressure, according to two stakeholders.

- Additionally, research shows that women from low-income neighborhoods already were generally at higher risk for severe maternal morbidity or death before the pandemic.⁴⁴ During the pandemic, some stakeholders reported and research found that pregnant women who lived in such neighborhoods were also more likely to test positive for COVID-19 than others, in part, because they were not able to maintain distance from others to prevent infection.⁴⁵ Because COVID-19 infection during pregnancy increases the risk of maternal death, it could exacerbate existing disparities for low-income women.
- Similarly, data show that Hispanic women had higher rates of COVID-19 infection. Two stakeholders said, and some research suggests, this may be because these women were more likely to be essential workers who could not work from home or had more people living in

⁴³Certain clinical services can be provided via telehealth, such as through audio-only, audio/video, or other telecommunication technologies, and has been used during the pandemic to provide health care, while reducing patients' risk of exposure to COVID-19. We previously reported on barriers Medicaid beneficiaries faced accessing telehealth services. See GAO, *Medicaid: CMS Should Assess Effect of Increased Telehealth Use on Beneficiaries' Quality of Care*, [GAO-22-104700](#) (Washington D.C.: Mar. 31, 2022).

⁴⁴For example, see Wang et al., "Social Determinants of Pregnancy-Related Mortality and Morbidity in the United States"; and K. Kozhimannil et al., "Rural-Urban Differences In Severe Maternal Morbidity and Mortality in the U.S., 2007–15," *Health Affairs*, vol. 38, no. 12 (2019): 2077–2085.

⁴⁵For example, see U. Emeruwa, C. Gyamfi-Bannerman, and R. Miller, "Health Care Disparities in the COVID-19 Pandemic in the United States: A Focus On Obstetrics," *Clinical Obstetrics and Gynecology*, vol. 65, no. 1 (March 2022): 123-133; H. Burris et al., "Neighborhood Characteristics and Racial Disparities in Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) Seropositivity in Pregnancy," *Obstetrics & Gynecology*, vol. 139, no. 6 (June 2022): 1018-1026; and C. Buhimschi et al., "Prevalence and Neighborhood Geomapping of COVID-19 in an Underserved Chicago Pregnant Population," *American Journal of Perinatology Reports*, vol. 10, no. 4 (Sept. 16, 2020): 413-416.

their household, and thus faced increased exposure to COVID-19, as compared with other groups.⁴⁶

Stakeholders and HHS officials also stated that racism is a key factor that contributes to disparities in maternal health outcomes. This includes structural racism (historical and contemporary social factors that systematically disadvantage people of color through inequities in housing, education, employment, health care, etc.) and bias or discrimination (conscious or unconscious assumptions that result in differential actions toward others based on their race) on the part of providers. They provided examples of how the pandemic highlighted the impact racism has on maternal health outcomes and disparities. For example:

- Most stakeholders and HHS officials stated that structural racism contributes to disparities in social determinants of health, like access to healthy food and health care. Racism has also been shown to cause direct physiological changes due to stress.⁴⁷ Research shows that Black women have higher rates of chronic conditions like hypertension and diabetes (as compared with White women) and that women with these conditions are at higher risk for pregnancy-related complications and maternal death, as well as severe illness from COVID-19.⁴⁸ CDC data and research indicate that pregnant Hispanic and Black women are more likely to experience higher rates of severe illness and death relative to their distribution among pregnant women with reported cases of COVID-19.⁴⁹
- Several stakeholders said racial discrimination has led women from racial and ethnic minority populations to distrust the health care

⁴⁶For example, see Zambrano et al., “Update: Characteristics of Symptomatic Women of Reproductive Age”; Burris et al., “Neighborhood Characteristics and Racial Disparities”; and A. Sakowicz et al., “Risk Factors for Severe Acute Respiratory Syndrome Coronavirus 2 Infection in Pregnant Women,” *American Journal of Obstetrics & Gynecology MFM*, vol. 2, no. 4 supplement (Nov. 2020).

⁴⁷For example, see Hardeman et al., “Developing Tools to Report Racism in Maternal Health.”

⁴⁸See Centers for Disease Control and Prevention, “Disparities in Preconception Health Indicators — Behavioral Risk Factor Surveillance System, 2013–2015, and Pregnancy Risk Assessment Monitoring System, 2013–2014,” *Morbidity and Mortality Weekly Report*, vol. 67 (Jan. 19, 2018); and J. Allotey et al., “Clinical Manifestations, Risk Factors, and Maternal and Perinatal Outcomes of Coronavirus Disease 2019 in Pregnancy: Living Systematic Review and Meta-Analysis,” *BMJ*, vol. 370 (2020).

⁴⁹For example, see Zambrano et al., “Update: Characteristics of Symptomatic Women of Reproductive Age.”

system or feel they are not listened to by providers. Most stakeholders and HHS officials said there was mistrust among pregnant women in general during the pandemic. According to these stakeholders and officials, this was due to factors such as frequently changing guidance and lack of or misinformation about COVID-19, and added stress from hospital policies that did not allow partners or other support persons in the delivery room. Some stakeholders said these issues particularly affected Black women and may have worsened disparities.

HHS Agencies' Efforts to Address Maternal Health Outcomes and Disparities during COVID-19

Our review of agency websites and interviews with officials found that HHS agencies, including CDC, CMS, HRSA, and NIH, utilized various efforts to address maternal health outcomes and disparities during the COVID-19 pandemic.⁵⁰ Table 1 describes selected initiatives from the HHS agencies.

Table 1. Selected Department of Health and Human Services Agencies' Initiatives to Address Maternal Health Outcomes and Disparities during the COVID-19 Pandemic

Agency	Initiative	Description
Centers for Disease Control and Prevention (CDC)	CDC-supported research	<p>Research on the effects of COVID-19 on maternal health. For example, CDC reviewed electronic health records to assess complications in delivery for women with and without COVID-19 diagnosis at the time of hospitalization, and disseminated research on COVID-19-associated maternal deaths and infant outcomes after COVID-19 infection during pregnancy.</p> <p>Supported efforts to better understand experiences of pregnant and postpartum women during the pandemic and COVID-19 vaccine hesitancy by including questions on types of prenatal and postpartum barriers to care in its Pregnancy Risk Assessment Monitoring System survey for 2020 and questions on vaccinations for 2021, and funding focus groups on vaccine perception.</p>
	COVID-19 Data Tracker	<p>Began reporting COVID-19 case surveillance data on the number of cases and severity of illness (e.g., hospitalization, death) for pregnant women on its COVID-19 tracker. Updated this information weekly starting in early 2020 and ending on July 25, 2022.</p> <p>Reported data related to COVID-19 and pregnant women using its existing Surveillance for Emerging Threats to Mothers and Babies Network on timing of infection during pregnancy, and pregnancy and infant outcomes.</p>
	Guidance on COVID-19 and pregnancy	<p>Issued guidance on the risk for severe COVID-19 illness and pregnancy complications among pregnant people with COVID-19.</p> <p>Developed public health messaging on pregnancy and COVID-19 vaccine safety, and partnered with community-based organizations to promote vaccination, in particular for women from racial and ethnic minority groups.</p>

⁵⁰We focused our review on HHS efforts that specifically address maternal health outcomes and disparities in response to the COVID-19 pandemic. As such, it does not include other broader efforts aimed at improving maternal health.

Agency	Initiative	Description
	Perinatal Quality Collaboratives	Provided supplemental funding to collaborative teams for COVID-19-related activities, such as working with providers to improve vaccination confidence for pregnant women.
Centers for Medicare & Medicaid Services (CMS)	Maternal and Infant Health Initiative	Offers technical assistance to states to address foregone postpartum care visits, which according to CMS, declined during the pandemic.
Health Resources and Services Administration (HRSA)	National Maternal Mental Health Hotline	A free, confidential 24/7 hotline for women experiencing mental health challenges before, during, and after pregnancy. Launched on May 8, 2022, as part of HHS efforts to address mental health challenges exacerbated by the pandemic. Counselors can provide real-time support, resources, and referrals in English and Spanish to providers and support groups, with interpreters available in 60 languages.
	Maternal Telehealth Access Project	Aims to increase telehealth access and infrastructure for families and providers, and to improve access to maternity care, including mental health care, during the pandemic. Focuses on increasing access for women at highest risk of maternal death and morbidity, and who have experienced the effects of the pandemic the hardest, including Native American, Black, and Hispanic women, and women who live in rural areas.
National Institutes of Health (NIH)	Guiding Principles: Sex and Gender Influences in COVID-19	Created guiding principles for the study of the effect of COVID-19 on women's health.
	Implementing a Maternal Health and Pregnancy Outcomes Vision for Everyone	Supports research to reduce preventable causes of maternal deaths and improve health for women before, during, and after delivery, and emphasizes mitigating health disparities. In fiscal year 2021, NIH officials reported awarding over \$13 million to 22 projects focusing on the impacts of the pandemic, structural racism, and discrimination on maternal health outcomes in the context of COVID-19.
	NIH-Supported Research	Evaluating ways that COVID-19 affects pregnancy outcome, the efficacy of COVID-19 vaccinations in pregnant and recently postpartum women; and the psychological, behavioral, and socioeconomic impact of the pandemic on vulnerable groups, including pregnant women.

Source: GAO analysis of interviews with agency officials and websites. | GAO-23-105871

Note: CDC collects and reports health-related data on maternal health and COVID-19, and works to improve maternal health through research, scientific assistance, and partnerships. NIH supports research, including on maternal deaths, through various grants, contracts, and other funding mechanisms. HRSA is the primary federal agency charged with improving health care for the medically vulnerable, including pregnant women. CMS administers the Medicaid program, which covers approximately 42 percent of births in the U.S.

Agency comments

We provided a draft of this report to the Department of Health and Human Services for review and comment. HHS provided technical comments, which we incorporated as appropriate.

We are sending copies of this report to the Secretary of Health and Human Services and appropriate congressional committees. In addition, the report will be available at no charge on the GAO website at <http://www.gao.gov>.

If you or your staff have any questions about this report, please contact me at (202) 512-7114 or yocomc@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs are on the last page of this report. GAO staff who made major contributions to this report are listed in appendix I.



Carolyn L. Yocom
Director, Health Care

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The Honorable Lauren Underwood
House of Representatives

Appendix I: GAO Contact and Staff Acknowledgements

GAO Contact

Carolyn L. Yocom, (202) 512-7114 or yocomc@gao.gov

Staff Acknowledgements

In addition to the contact named above, Karen Doran (Assistant Director), Erika Huber (Analyst-in-Charge), Rotimi Adebajo, Drew Long, Jeanne Murphy-Stone, Eric Peterson, and Sirin Yaemsiri made key contributions to this report. Also contributing were Joycelyn Cudjoe, Leia Dickerson, Christie Enders, Naomi Joswiak, Jennifer Rudisill, and Ethiene Salgado-Rodriguez.

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