## Cover Page

**Title:**
# Data Analysis Report on U.S. Maternal Mortality

**Prepared by:**
Nathan Reid

**Date:**
December 8th, 2024

**Purpose:**
This report analyzes U.S. maternal mortality trends, uncovering key disparities and risk factors to provide actionable insights and targeted recommendations aimed at reducing preventable deaths and improving maternal health nationwide.

# Table of Contents

# Executive Summary

Overview of the Analysis:

This analysis examines the maternal mortality rate (MMR) in the United States. By focusing on trends, disparities, and the key factors contributing to maternal deaths and rising rates. It explores data from multiple years and sources to examine the disparities in maternal mortality across different racial and regional differences in MMR. The analysis also looks at the impact of socioeconomic factors, healthcare access, systemic barriers and pre-existing conditions on maternal mortality. The report aims to uncover patterns, highlight critical risk factors, and provide evidence-based recommendations for policy interventions and improvements in maternal healthcare to reduce maternal mortality nationwide.

Statement of the Problem:

The United States has the highest maternal mortality rate among developed nations. Despite being a global leader in medical advancements, the U.S. consistently ranks poorly in maternal health. Maternal deaths continue to rise, posing critical challenges to healthcare systems, policies, and communities. Key factors contributing to the high U.S. maternal mortality rate include limited access to care, healthcare disparities, racial inequities, poverty, fragmented systems, poverty and un-insurance, pre-existing chronic conditions, untreated mental health issues, policy gaps, and systemic inequities. Addressing this issue is vital to ensuring the health and well-being of mothers and families nationwide.

Key Questions Addressed:

***Trends and Patterns***

1. What are the overall trends in U.S. maternal mortality rates over the past decade?

2. Are there significant variations in maternal mortality rates across different states or regions?
3. How have maternal mortality rates changed across different racial, ethnic, or socioeconomic groups?

***Risk Factors***

4. What are the most common medical and non-medical risk factors associated with maternal mortality?
5. How do age, pre-existing conditions, and access to prenatal care influence maternal mortality rates?
6. What role do mental health conditions, such as postpartum depression, play in maternal mortality?

***Disparities and Inequities***

7. How do maternal mortality rates differ among racial and ethnic groups?
8. What are the underlying causes of racial and socioeconomic disparities in maternal mortality?
9. What access barriers exist for vulnerable populations, such as rural communities or uninsured women?

***Healthcare Systems***

10. What role does the quality of maternal healthcare play in maternal mortality outcomes?
11. How does access to emergency obstetric care affect maternal outcomes?

***Policy and Interventions***

12. Which policies or programs have been most effective in reducing maternal mortality rates?
13. Are existing maternal health interventions targeted toward the populations at greatest risk?

***Broader Impacts***

14. How does maternal mortality impact families and communities?
15. What are the economic costs associated with high maternal mortality rates in the U.S.?

# Methodology

## Data Sources and Collection

The analysis incorporates maternal mortality data from the Centers for Disease Control and Prevention (CDC), including the Pregnancy Mortality Surveillance System and findings on pregnancy-related deaths. Additional sources include maternal morbidity data from the U.S. Commonwealth Fund, preterm birth statistics from March of Dimes Peristats, and state-specific maternal mortality information from USAFacts.org's article, "Which States Have the Highest Maternal Mortality Rates?" Supplementary references include articles such as "Maternal Mortality Rates Double Over 20 Years, with Black and American Indian Mothers Faring the Worst" and "New Study Shows That Black Mothers in New Jersey Were More Likely to Deliver Babies by Unscheduled C-Section" (WHYY.org), as well as Joli Hunt's paper, "Maternal Mortality Among Black Women in the United States." Maternal health hospital data was sourced from CMS's data repository (data.cms.gov). The analysis also includes state-level maternal health statistics, racial and ethnic disparities, and socioeconomic data derived from national health surveys and public health databases. All data were collected from reputable governmental and public health sources to ensure accuracy and comprehensiveness.

## Analysis Process and Framework

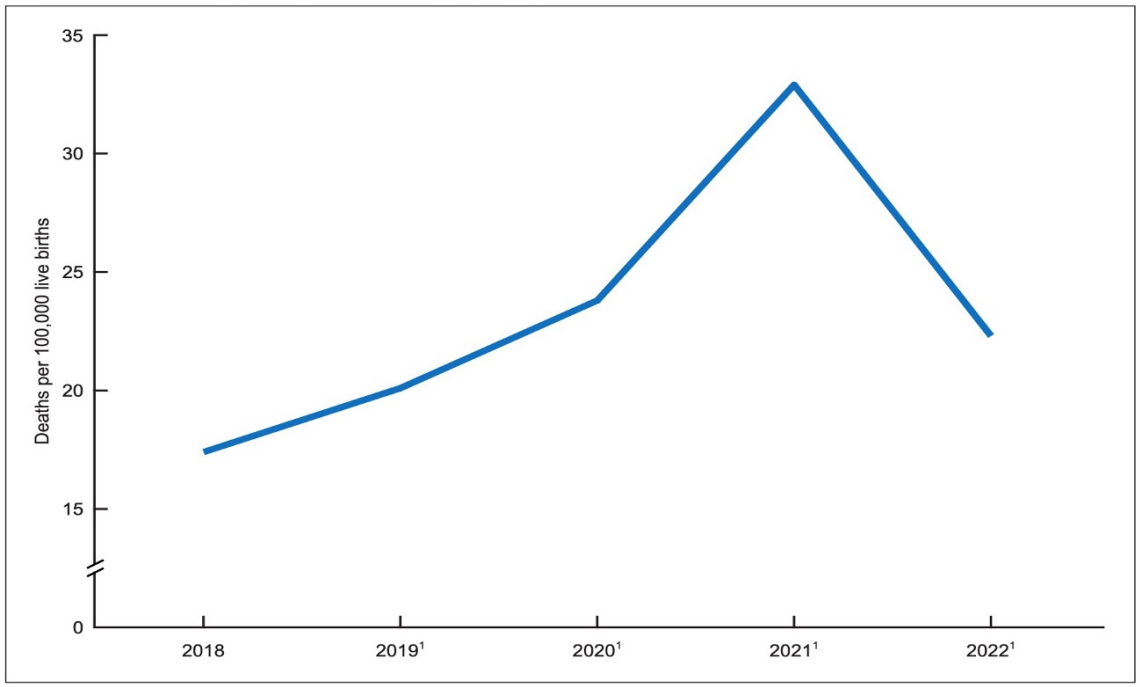
I have reviewed articles, and CDC charts and figures to gather insights on maternal mortality rates (MMR). I created dashboards in Excel for visual analysis and cleaned the data using MySQL to ensure accuracy and consistency. Through diagnostic analysis, I am identifying patterns and trends in the data to understand the underlying causes of disparities in maternal mortality. By extracting and analyzing the data, I am uncovering key factors that contribute to maternal mortality, such as healthcare access, socioeconomic status, and pre-existing conditions. Using prescriptive analysis, I will provide recommendations for actions that both government, healthcare providers, and maternal patients can take together to reduce MMR in the United States. These recommendations will focus on improving and implementing policies that promote maternal health equity.

# Results

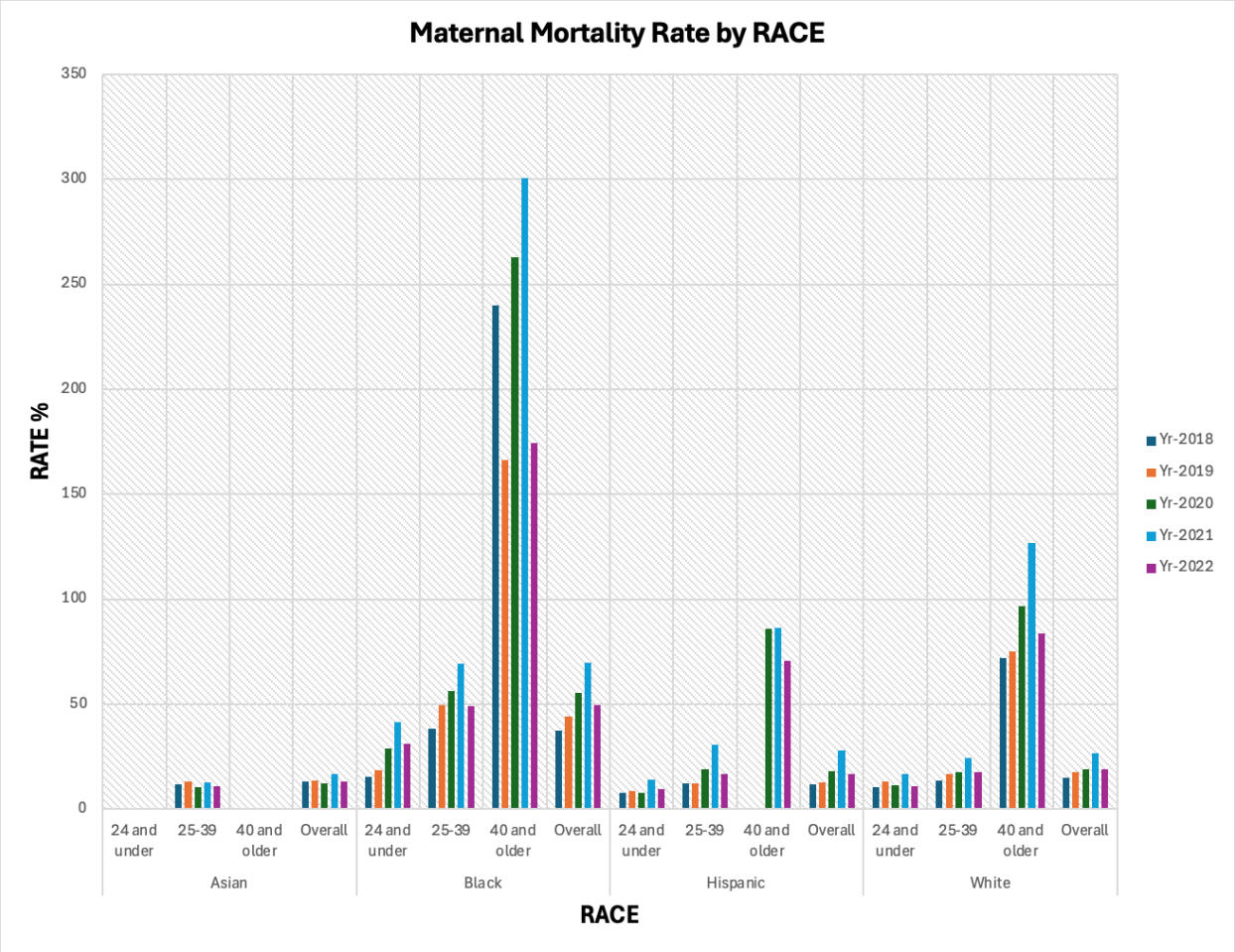
## Interpretation of Results in Relation to the Problem

The analysis reveals that the U.S. maternal mortality rate has never been below16% and has increased and decreased three times since the year 2000. The last increase started in 2017 and 2018 when the rate was 17.4 for both years then increased to 20.1 in 2019 then jumped to 23.8 in 2020.Due to Covid-19 the Maternal Mortality Rate reached 32.9 then decreased to 22.3 in 2022.

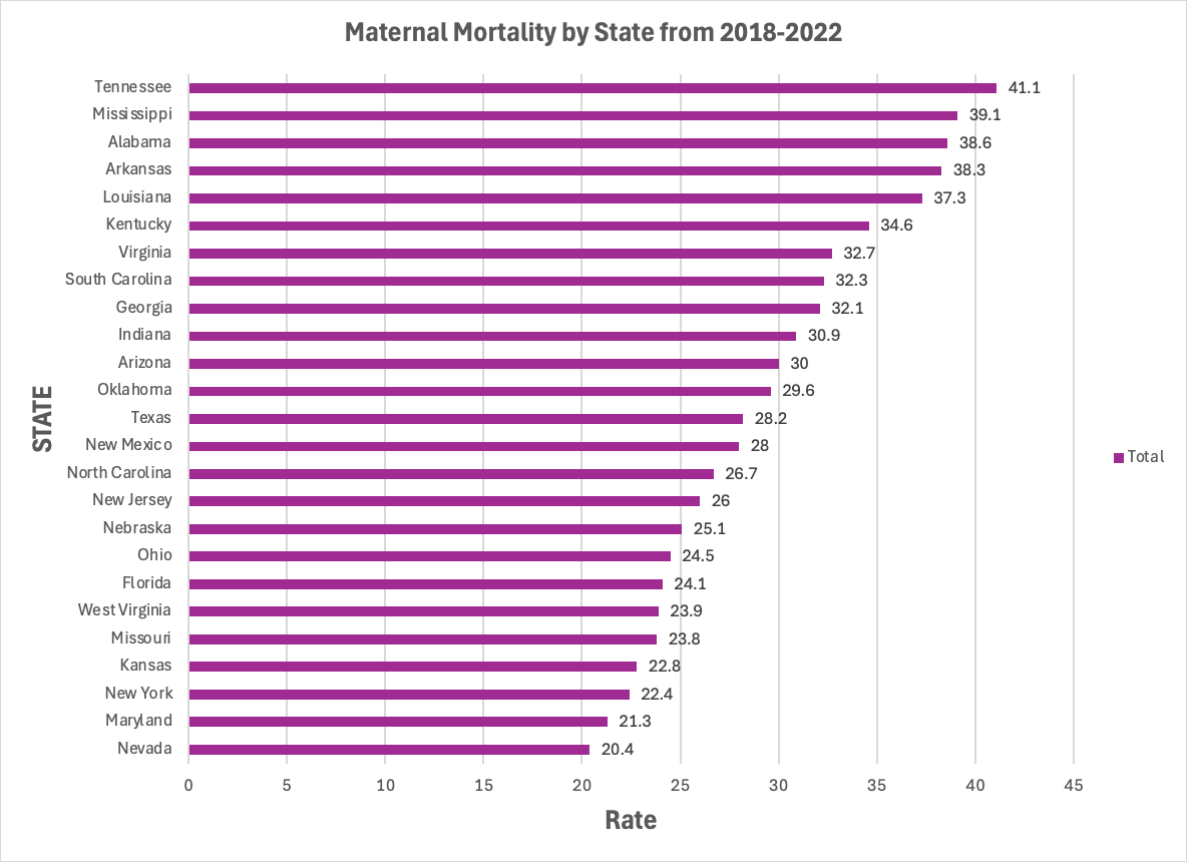

**Figure 1. Maternal mortality rate: United States, 2018–2022**

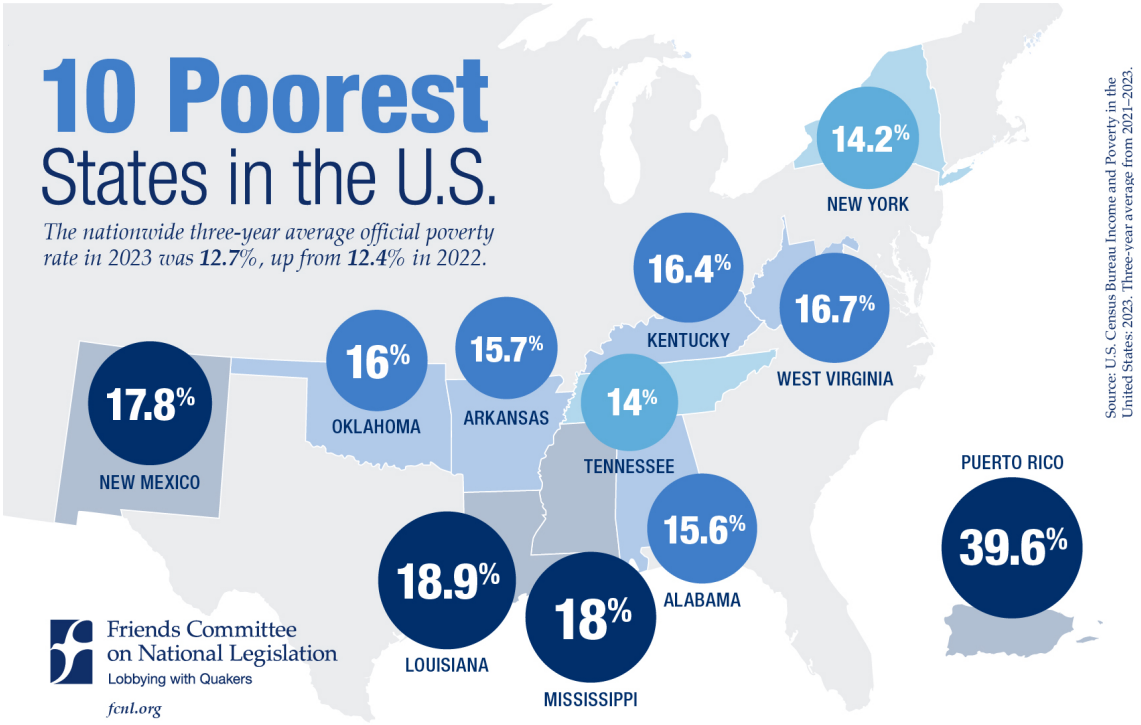


There are stark disparities among race and socioeconomic status. Black women face disproportionately high maternal mortality rates, which are more than double that of white women, reflecting systemic inequalities in healthcare access, quality, and socio-economic conditions.



States with higher poverty levels, high obesity rates, high diabetes rates and limited healthcare infrastructure have consistently reported higher maternal mortality rates. The results suggest that addressing these disparities, improving healthcare access, and targeting interventions for high-risk populations are essential to reducing maternal deaths in the U.S. Tennesse, Mississippi, Alabama, Louisana, and Arkansas all have high poverty, diabetes and obesity rates year over year. The US national MMR was 22.3% in 2022, all these states have rates higher than that figure. They all are in the top ten states with the highest Maternal Mortality.





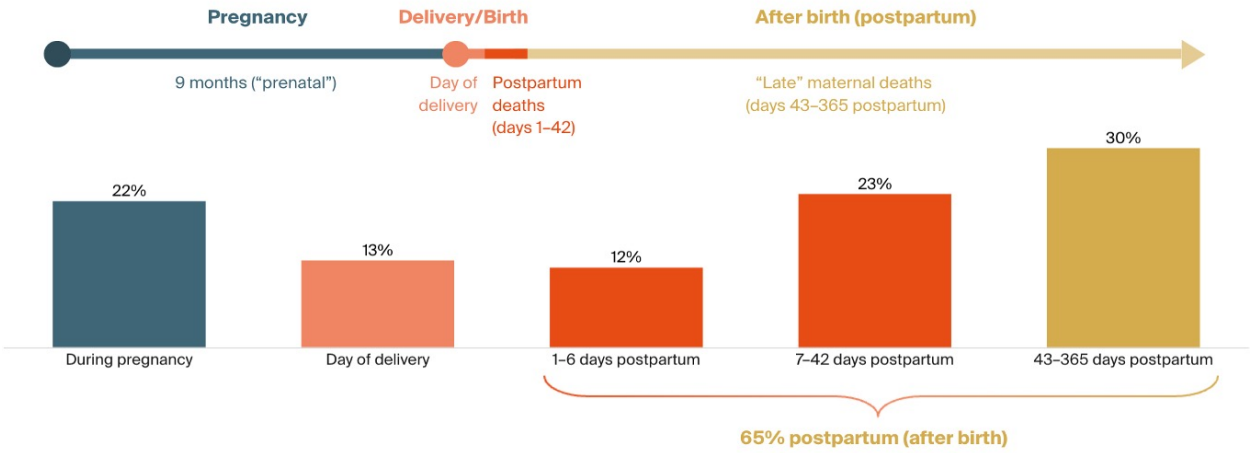

# Report Findings

The Maternal Mortality Rate (MMR) measures the number of women who die during pregnancy, childbirth, or within a specified period (often 42 days) postpartum due to pregnancy-related or pregnancy-aggravated causes. Alarmingly, the United States has the highest maternal mortality rate among high-income nations, exceeding others by at least 8%. Comparatively, countries such as Norway, Switzerland, Sweden, the Netherlands, Japan, Australia, Germany, the United Kingdom, France, Canada, South Korea, New Zealand, and Chile have significantly lower rates.

In 2022, the U.S. recorded 22 maternal deaths per 100,000 live births, with over 80% of these deaths being preventable. Notably, nearly two-thirds of maternal deaths in the U.S. occur during the postpartum period, ranging from one day to a full year after childbirth. During the first postpartum week, severe bleeding, high blood pressure, and infections are the leading contributors to maternal deaths, while cardiomyopathy is the primary cause of late postpartum fatalities.

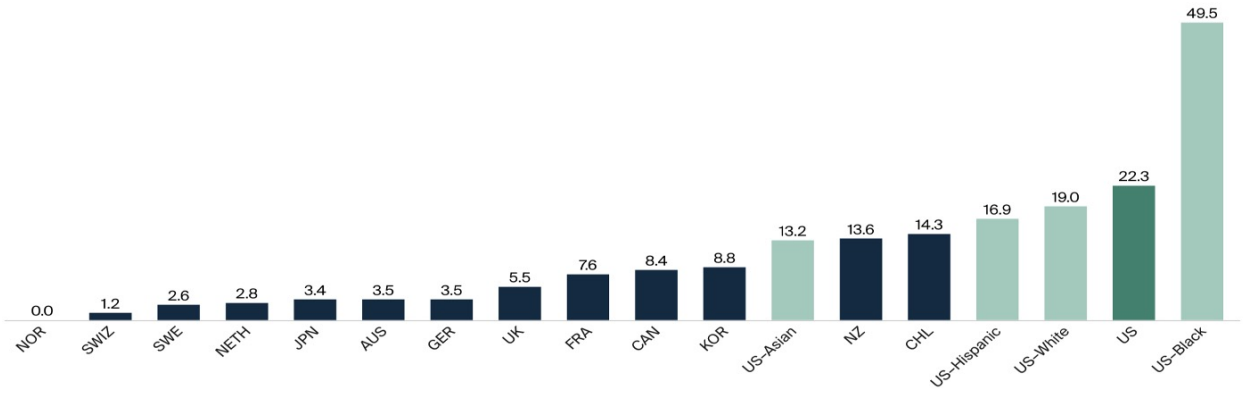
## Two-thirds of U.S. pregnancy-related deaths occur during the postpartum period.

*Distribution of pregnancy-related deaths by timing of death in relation to pregnancy, 2017–2019*




## The United States continues to have the highest maternal death rate, with the rate for Black women by far the highest of any group.

*Maternal deaths per 100,000 live births*



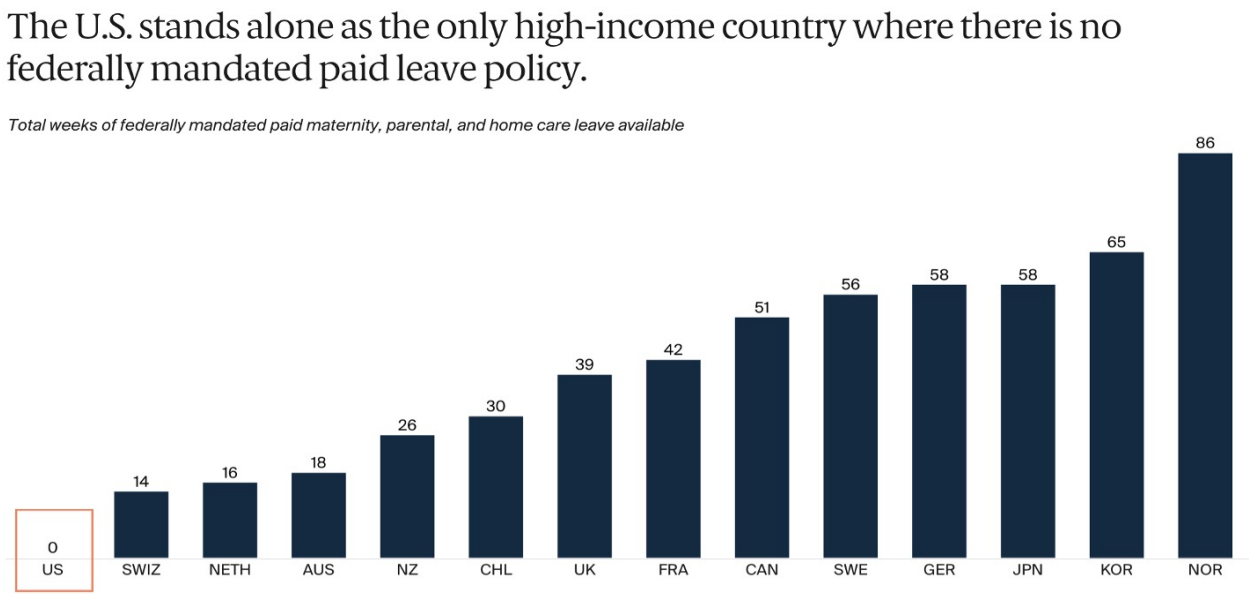

**Gaps in U.S. Maternal Care and Support**

The U.S. lags behind other high-income countries in providing essential maternal support:

- Postpartum Home Visits: All high-income nations except the U.S. guarantee at least one home visit within the first week postpartum. These visits help address maternal and mental health concerns, assess social support systems, and identify needs such as housing, food, and protection from domestic violence.
- Paid Maternity Leave: The U.S. is the only high-income country without federally mandated paid leave. Other nations mandate at least 14 weeks of paid leave: Switzerland provides 14

weeks, the Netherlands 16 weeks, Chile 30 weeks, and Norway an impressive 86 weeks. Paid leave enables mothers to manage the physical and emotional demands of motherhood, supports financial stability, reduces postpartum depression rates, and lowers infant mortality.

**Shortages in Maternal Health Providers**
The U.S. faces a significant shortage of maternal healthcare providers:
- Midwifery Services: Midwives, who could provide 80% of essential maternal care worldwide, remain underutilized in the U.S. Integrated midwifery care could prevent 41% of maternal deaths, 39% of neonatal deaths, and 26% of stillbirths globally. Yet, midwives are outnumbered by OB-GYNs, and their services are not uniformly covered by private insurance. While Medicaid covers midwifery care under the Affordable Care Act (ACA), low reimbursement rates and insufficient midwifery supply limit access for many.
- Maternity Care Deserts: Nearly 7 million U.S. women live in counties without hospitals, birth centers, or obstetric providers, and this shortage is expected to worsen.




**The Impact of Universal Healthcare**
Universal healthcare is a standard in all high-income countries except the U.S., where nearly 8 million reproductive-age women remain uninsured. The ACA's Medicaid expansion has improved maternal health outcomes, particularly for Black and Latina mothers, but coverage gaps persist. Universal, comprehensive maternity care with cost-sharing exemptions could significantly reduce maternal mortality.

**Postpartum Care Deficiencies**
The World Health Organization recommends at least four health checkups within the first six weeks postpartum, but two in five U.S. women—particularly younger, low-income, and uninsured women—miss even a single checkup. In contrast, countries like Chile incentivize postpartum care through conditional cash-transfer programs, offering home visits and financial benefits. **Conditional Cash Transfer (CCT) programs** are social assistance initiatives that

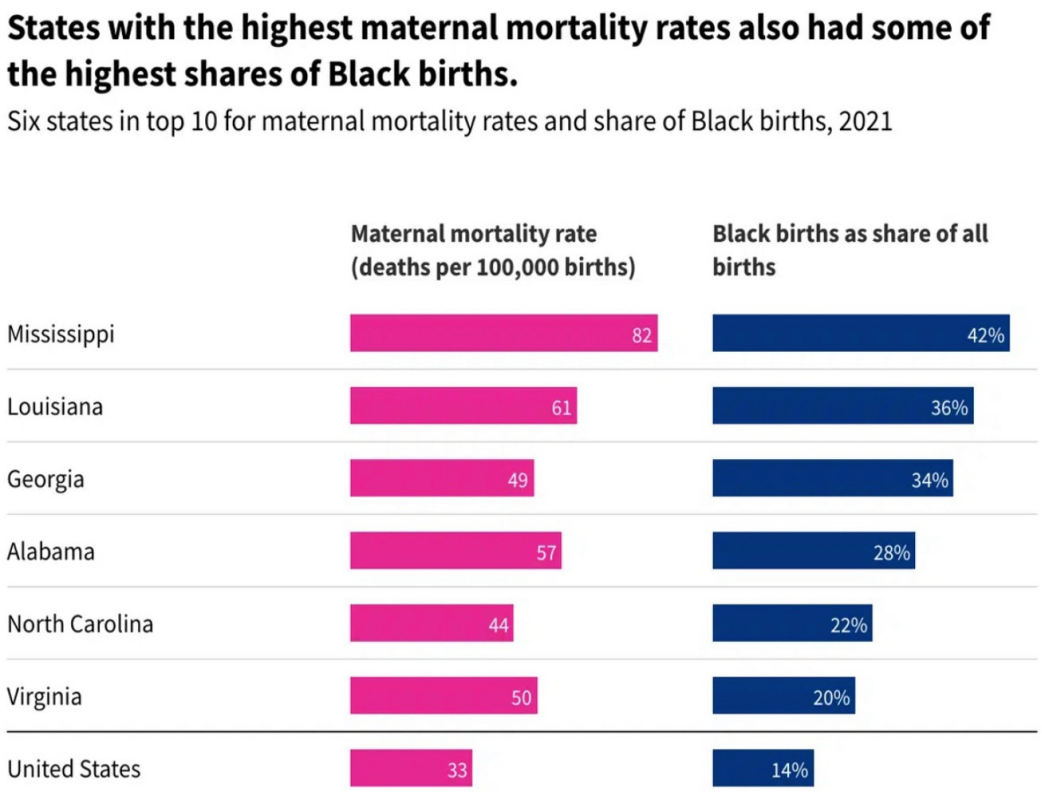
provide financial incentives to individuals or families, typically in low- or middle-income countries, in exchange for meeting specific conditions related to education, health, or other social outcomes.

**Addressing Disparities**
A federally mandated paid leave policy would be especially impactful for Black and low-income women, who face higher risks of maternal mortality. Expanding midwifery services, improving access to postpartum care, and addressing systemic inequalities are critical steps toward reducing maternal deaths and improving maternal health outcomes in the U.S.

The urgency to adopt these measures cannot be overstated, as the majority of maternal deaths in the U.S. are not only preventable but represent a profound inequity in healthcare delivery.

## Black Maternal Health

In 2021, six of the top ten states with the highest maternal mortality rates also ranked among the top ten for the largest percentages of Black births. Leading the list was Mississippi, with a maternal mortality rate of 42% among Black women, followed by Louisiana (36%), Georgia (34%), Alabama (28%), North Carolina (22%), and Virginia (20%). Black women have consistently experienced the highest maternal mortality rates of any racial or ethnic group since at least 2014. For non-Hispanic Black women, cardiac-related conditions were the leading cause of these deaths.



In 2022, the Black maternal mortality rate (MMR) was 49.5, a staggering 36.3% higher than the Asian MMR, 30.5% higher than the White MMR, and 32.6% higher than the Hispanic MMR. **Addressing Black maternal health requires urgent and focused attention at the national, state, and local levels**.

From reviewing the US Maternal Hospitals dataset in MySQL. I retrieved the following information:

Facility ID,
Facility Name,
Address,
City/Town,
State,
ZIP Code,
County/Parish,
Telephone Number,
Measure ID,
Measure Name,
Score,
Sample,

In the 'Measure ID' and 'Measure Name' fields it displayed the following codes - PC_01 / **Elective Delivery**, PC_05 / **Exclusive Breast Milk Feeding** and SM_7 / **Maternal Morbidity Structural Measure**. We will focus on the Maternal Morbidity. From reviewing the data there were 2,225 hospitals that had a structural morbidity measure score of 'Yes'. In the same field other hospitals had a range of score from 0 to 95. Around 161 hospitals had a score of 'No'. The score of the Maternal Morbidity Structural Measure indicates whether a hospital is actively participating in a structured state or national Perinatal Quality Improvement(QI) Collaborative and implementing patient safety or bundles related to maternal morbidity as part of those initiatives; essentially, it reflects a hospital's commitment to improving maternal health through quality improvement programs and related safety practices.

**Key Points About the Maternal Morbidity Structural Measure:**

- **Focus on QI Collaboratives:** This measure checks if a hospital is part of a recognized perinatal quality improvement (QI) program.
- **Safety Practices:** It also evaluates if the hospital is implementing specific safety practices or bundles for maternal health as part of the program.

**Why This Measure Matters:**

- **Reducing Maternal Complications:** Encourages hospitals to actively work on lowering severe maternal health issues through QI programs.
- **Transparency for Patients:** Provides patients with data to identify hospitals committed to improving maternal health.

The measure is intended to determine the number of hospitals currently participating in a state or national perinatal quality collaboratives (PQCs) and whether hospitals are implementing the safety practices or bundles included as part of these initiatives.

## ***Overview of Maternal Health Measures***

### Maternal Morbidity Structural Measure:

Hospitals participating in the Inpatient Quality Reporting (IQR) Program must answer:

- Does the hospital participate in state or national perinatal quality improvement programs to improve maternal outcomes during labor, delivery, and postpartum care?
- Has the hospital implemented safety practices to address complications like hemorrhage, severe hypertension, or sepsis?

Hospitals respond with: Yes, No, or Not applicable (if they don't provide labor/delivery care).

### Elective Delivery Measure:

Tracks the percentage of early scheduled deliveries (1-2 weeks before the due date) that weren't medically necessary.

- Why it matters:

  Delivering after 39 weeks is ideal for fetal brain and lung development.
  Medically unnecessary early deliveries increase risks for both mother and baby.

- Best practices:

  Hospitals should avoid early deliveries unless they are medically necessary.

Lower percentages indicate better adherence to safe practices.

### Cesarean Birth Measure:

Reports the percentage of first-time mothers (with a single baby in the head-down position at term) who deliver by C-section.

- Why it matters:

  While C-sections can save lives when necessary, they are often overused, leading to increased risks without better outcomes.

  Lower percentages indicate safer practices and reduced unnecessary C-sections.

### Exclusive Breast Milk Feeding Measure:

Measures the percentage of newborns exclusively fed breast milk during their hospital stay.

- Why it matters:

Exclusive breastfeeding for the first six months is linked to significant health benefits for both mother and baby.

Higher percentages reflect better support for breastfeeding practices.

These measures aim to drive improvements in maternal health by promoting best practices that enhance healthcare quality, safety, and equity. By adhering to these practices, hospitals and doctors can increase the likelihood of safe deliveries and healthy outcomes for both mothers and babies.

# Conclusion

States with the highest maternal mortality rates (MMRs) often have high rates of diabetes, preterm births, and obesity. Many of these high-MMR states have Black populations comprising at least 13% of their total population. In contrast, states with lower MMRs typically have Black populations accounting for less than 9% of their total population. Data analysis suggests that the number of hospitals meeting structural morbidity measures in a state does not have a significant direct impact on MMRs. However, these measures provide critical insights and serve as a foundation for identifying areas that require further exploration and targeted interventions.

Key states to investigate for strategies to reduce maternal mortality and morbidity include California, Delaware, Connecticut, and Pennsylvania.

- Delaware, with a Black population of 22%, has a lower MMR than California, despite its smaller size and population.

- California, one of the largest states in the U.S., has successfully maintained a low MMR and fewer maternal deaths, demonstrating that large populations can achieve positive outcomes with effective policies and practices.

- Connecticut, where the Black population is 13.1%, offers an interesting comparison. Its Black population percentage is higher than that of Kentucky (9%), Indiana (10%), and Ohio (13%)—all states ranking among the top 10 or 20 for highest MMRs. Connecticut's Black population is also comparable to New Jersey (15%) and Arkansas (15%), both of which are in the top 10 states with the highest MMRs.

- Pennsylvania has a Black population of 12% and boasts a lower MMR than many high-MMR states. Notably, Pennsylvania has more annual births than states such as Virginia, North Carolina, Tennessee, Alabama, Mississippi, Louisiana, Arkansas, and New Jersey. Despite this, it has fewer maternal deaths than states like Virginia, North Carolina, Tennessee, Ohio, and Georgia.

These states provide valuable case studies for examining the factors that contribute to lower maternal mortality rates, even in the context of diverse populations and varying healthcare

challenges. By analyzing their policies, healthcare systems, and social determinants of health, we can identify effective strategies to reduce maternal mortality and morbidity nationwide.

| | MMR | Obesity % | Per-Term % | Diabetes %/ Diabetes Mortality Rate |
|---|---|---|---|---|
| California | 10.5 | 28.1 | 9.2 | 7.9 / 25 |
| Delaware | * | 37.9 | 10.4 | 11.6 / 25.1 |
| Connecticut | 15.6 | 30.6 | 9.3 | 8.3 / 15.2 |
| Pennsylvania | 17.5 | 33.4 | 9.7 | 9.3. / 22.6 |

* Rate very low

US Pre-Term births > 10.4
US. Obesity rate 2021 - 2023 > 40.3
US Diabetes rate 2021 > 11.6
US MMR 2022 > 22.3

## ***Recommendations to Lower the U.S. Maternal Mortality Rate***

1. Expand Publicly Funded Paid Maternity Leave Nationwide

Implement publicly funded paid maternity leave in all states. This program, funded by taxpayers, supports new mothers by providing paid time off after childbirth, reducing stress and improving health outcomes. States like California, Connecticut, Delaware, and Maine, which have lower MMRs, maternal deaths, and preterm birth rates, provide examples of the benefits. Currently, 13 states and the District of Columbia have passed legislation creating paid family and medical leave programs. Expanding this nationwide could improve maternal outcomes.

2. Culturally Appropriate Programs to Reduce Obesity and Diabetes

Develop culturally tailored programs to address obesity and diabetes, which are major risk factors for maternal mortality. Targeted initiatives like Black Maternal Health Programs can help address historical inequities and improve maternal health outcomes for Black women, who face disproportionate risks.

3. Expand Midwife-Supported Birth Programs

Establish state or federal programs to support midwife-led births and care in all states. Currently, only Maine, Rhode Island, Maryland, and Virginia have such programs. Notably, Maine and Rhode Island have low Maternal Vulnerability Indexes, MMRs, and maternal deaths. Expanding midwife care could improve access to quality maternal health services.

4. Medicaid Expansion and Extension

Ensure Medicaid expansion and postpartum coverage extensions in all states. Currently, only 37 states have adopted this policy. States like Tennessee, Alabama, Arkansas, and Mississippi, which lack this program, has high maternal mortality rates. Medicaid expansion could provide critical access to care for underserved populations.

5. Doula Reimbursement Policy

Encourage Medicaid reimbursement for doula services to support the sustainability of the doula workforce. Doulas provide vital emotional and physical support during pregnancy and delivery. Currently, only 16 states have such policies, including California, Rhode Island, and Massachusetts, which have better maternal health outcomes.

6. Establish National or State-Level Maternal Review Boards

Create maternal review boards across all states to investigate the causes and circumstances of fetal, infant, and maternal deaths. These boards should use a standardized process to improve healthcare quality and address systemic issues contributing to maternal mortality.

7. Declare Maternal Mortality a National Health Crisis

The U.S. should formally declare maternal mortality and morbidity a health crisis, reallocating federal funds to combat this issue effectively. Prioritizing maternal health would enable states to adopt targeted measures to reduce mortality rates.

8. Implement Stricter C-Section Guidelines

Encourage healthcare providers to follow stricter guidelines for cesarean sections and promote less invasive delivery methods whenever possible. Overuse of C-sections increases risks of complications and maternal deaths.

9. Mandatory Postpartum Mental Health Checkups

Require postpartum mental health screenings for all mothers. Establishing a standardized system to track maternal health outcomes would provide essential data to improve care and prevent complications.

10. Cash Transfer Programs for Low-Income Mothers

Offer cash transfer programs to uninsured or low-income mothers who attend regular checkups and engage in exercise during pregnancy. This could incentivize early detection and timely interventions, reducing risks during and after childbirth.

11. Chronic Condition Management During Pregnancy

Develop a system to manage and track chronic conditions like diabetes and heart disease in pregnant mothers. Better management could reduce complications such as hypertension and gestational diabetes, which are significant contributors to maternal deaths.

12. Maternal Support Groups in Hospitals

Hospitals should offer maternal support groups to provide mothers with economic and emotional support. These groups could assist with basic needs like diapers, baby clothes, and childcare services, allowing mothers time for rest or self-care. Building a community support network can help alleviate stress and improve maternal well-being.

13. Educate Parents

Share maternal data with expecting parents in an simple and entertaining short videos. Educate them on the methods or steps they can do for a successful pregnancy before and after. Cover topics such as prenatal health tips, birth plans and support, postpartum health, child birth recovery and emergency awareness. This information should be accessible by online, healthcare facilities and community outreach.

14. Address Racism and to lower Black Maternal Mortality Rates

**Culturally Competent Care**:
Healthcare providers who share cultural backgrounds with their patients are often better equipped to understand their unique needs and address health concerns with sensitivity. Black midwives, doulas, and OB-GYNs can play a critical role in providing culturally appropriate care, fostering trust, and reducing barriers to accessing quality healthcare

**Addressing Implicit Bias**:
Implicit bias among healthcare providers has been identified as a significant contributor to disparities in maternal health outcomes. Increasing the representation of Black healthcare professionals can help mitigate the effects of these biases and ensure that Black women's concerns are taken seriously during pregnancy and childbirth.

**Community Engagement**:
Locating Black healthcare providers in Black communities ensures that care is accessible and that providers are embedded in the populations they serve, strengthening community relationships and trust in the healthcare system.

To curb these disparities, programs could include the following elements:

1. **Training and Recruitment**:
    - Provide scholarships, mentorship, and career development programs to encourage Black individuals to pursue careers as midwives, doulas, and OB-GYNs.
    - Partner with historically Black colleges and universities (HBCUs) to establish pipelines for healthcare careers.

2. **Placement and Accessibility**:
    - Offer financial incentives or loan forgiveness for Black healthcare providers to practice in underserved Black communities.
    - Establish birthing centers and maternal health clinics in areas with high populations of Black residents.
3. **Community-Centric Care Models**:
    - Develop healthcare delivery models that incorporate Black midwives, doulas, and OB-GYNs into care teams, focusing on a holistic and culturally sensitive approach.
    - Create programs that provide prenatal, delivery, and postpartum support tailored to Black mothers' needs.
4. **Policy Advocacy and Funding**:
    - Advocate for federal and state policies that prioritize funding for culturally appropriate maternal care programs.
    - Ensure Medicaid and private insurers cover doula and midwifery services.
5. **Community Outreach and Education**:
    - Educate communities on the availability of these services and their benefits.
    - Promote awareness of the role of doulas and midwives in improving birth outcomes.
6. **Accountability and Research**:
    - Establish systems to collect and analyze data on maternal health disparities, focusing on racial equity.
    - Use this data to measure the impact of initiatives and refine approaches.