Maternal health is defined as the health of women in the pregnancy and postpartum periods and can be influenced by pre-pregnancy health. The physical, emotional, and social changes that occur before, during, and well after the 40 weeks of gestation and the first year after childbirth can be exciting and joyful. But the physical demands of pregnancy are also intense, and complications during this period can reveal risk for the development of chronic disease in later life.1 For example, women with early-onset hypertensive disorders of pregnancy have more than twice the risk of developing incident cardiovascular disease and more than a fourfold risk of developing incident hypertension.2 During pregnancy and over the life course, the health of women can be understood using a multidimensional framework that incorporates the intersection of multiple biological factors (e.g., hormones and genetics) in the context of a woman’s life (e.g., environment and policies).3 This approach is critical to improving maternal health outcomes, such as maternal morbidity and mortality (MM&M), and addressing disparities.

Definitions

The Centers for Disease Control and Prevention (CDC) defines “pregnancy-associated death” as a death during or within one year of pregnancy, regardless of the cause. These deaths make up the universe of maternal mortality; within that universe are pregnancy-related deaths and pregnancy-associated, but not related deaths.4 The CDC’s Pregnancy Mortality Surveillance System uses the term “pregnancy-related death” and defines it as “the death of a woman while pregnant or within 1 year of the end of a pregnancy—regardless of the outcome, duration, or site of the pregnancy—from any cause related to or aggravated by the pregnancy or its management,” but not from an accidental or incidental cause.5 WHO defines maternal morbidity as “any health condition attributed to and/or aggravated by pregnancy and childbirth that has a negative impact on the woman’s wellbeing.”6 CDC defines severe maternal morbidity (SMM) as including “unexpected outcomes of labor and delivery that result in significant short- or long-term consequences to a woman’s health.”7

Severe Maternal Morbidity in the United States

SMM is an important risk factor for maternal death8. Indicators of SMM include acute myocardial infarction, adult respiratory distress syndrome, cardiac arrest, eclampsia, heart attack, acute renal failure, heart failure, sepsis, blood transfusion, and many more.7 Research shows that 73.5% of SMM cases occur in the first 2 weeks after discharge from the hospital.8 In 2014, SMM affected more than 50,000 women in the United States. In the past decade, rates of SMM have nearly doubled.7

Does SMM Affect Hospital Readmission?

Among women who gave birth in 2016–2017, women who experienced any indicator of SMM were 57% more likely to be readmitted within 7 days and 69% more likely to be readmitted 8 days to 42 days after delivery.8 For women with and without SMM, the most common reasons for readmission were obstetric complications and infections.

Who is Most Affected by SMM?

From 2012 to 2015, compared with White women, the incidence of SMM was:9

- 166% higher for Black women
- 148% higher for American Indian/Alaska Native women
- 122% higher for Hispanic women
- 117% higher for Asian/Pacific Islander women

Maternal Mortality in the United States

Maternal mortality in the United States is characterized by marked racial and ethnic disparities. In 2020, the maternal mortality rate for non-Hispanic Black women was 55.3 deaths per 100,000 live births, 2.9 times higher than the rate for non-Hispanic White women (19.1) and over three times higher than the rate for Hispanic women (18.2).8

Maternal Deaths, 2020 (deaths per 100,000 live births)

<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>Deaths per 100,000 live births</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>55.3</td>
</tr>
<tr>
<td>White</td>
<td>19.1</td>
</tr>
<tr>
<td>Hispanic</td>
<td>18.2</td>
</tr>
</tbody>
</table>

Source: Hoyert, 2023

In 2020, there were 861 maternal deaths in the United States, for an overall maternal mortality rate of 23.8 deaths per 100,000 live births, a significantly higher rate than in 2019.8 The U.S. maternal mortality rate is much higher than those of peer countries.4

What Factors Influence MMM?

Pre-pregnancy Health: The prevalence of pre-existing health conditions prior to pregnancy increased between 2015 and 2018, according to an analysis of data from commercially insured women ages 18–44. Increases occurred in the prevalence of depression (by 33%) and the incidences of hypertension and type 2 diabetes (by 31% and 28%, respectively). The rate of obesity doubled.12

Maternal Mental Health: Perinatal depression can affect women during pregnancy and after childbirth—with 1 in 8 women experiencing symptoms after delivery.11 It is treatable with talk therapy, medications, or a combination of the two.14

Opioid Use, Overdose, and Suicide: The number of mothers with opioid-related diagnoses documented at delivery increased by 131% between 2010 and 2017.12 Mental health conditions—including deaths by suicide, overdose, and unintentional injuries linked to these conditions—were the leading cause of pregnancy-related deaths among White women. About 15% of pregnancy-related deaths among White women were caused by mental health conditions.12

Prenatal Care: In 2019, 76.7% of pregnant women received early and adequate prenatal care.15 However, women who do not receive prenatal care are three to four times more likely to die from pregnancy-related complications.20

The Right Level of Care: Regionalized systems of care—including States, regional facilities, and providers—can reduce maternal morbidity and mortality.15

Are Pregnancy-Related Deaths Preventable?

An estimated 60% of maternal deaths are preventable.21 Understanding the complex social and economic determinants of health that contribute to maternal death is key in reducing poor maternal health outcomes.25
NIH’s Investment in Maternal Health

NIH is investing resources in maternal health research and initiatives across its Institutes and Centers (ICs) and the Office of the Director (OD) to study different aspects of MMM, with many projects leveraging the expertise of NIH research networks. NIH-wide maternal health activities focus on identifying causes of maternal mortality in the U.S. (e.g., cardiovascular disease, infection, and immunity), contributing health conditions and social factors, and pregnancy-related complications. For example, projects are determining how maternal glucose levels throughout pregnancy affect risk for gestational diabetes mellitus and infant outcomes, evaluating strategies for treating hypertension during pregnancy, identifying the mechanisms underlying adverse outcomes (e.g., preterm birth, preeclampsia, fetal growth restriction, and stillbirth), and assessing disparities in maternity care and characteristics associated with high and low rates of MMM. These are a few examples of NIH investments in comprehensive and interdisciplinary research efforts and its commitment to reducing poor maternal health outcomes for underserved and underfunded areas.

NIH Maternal Morbidity and Mortality Research by Topic, FY 2020

In FY 2020, NIH invested $223,522,448 in support of MMM research. Using the NIH Research, Condition, and Disease Categorization (RCDC) data system and its Portfolio Visualization (PVIZ) module reveals a wide array of topic areas pursued in research projects focused on MMM. This figure includes NIH-funded MMM awards and classifies the projects into various primary clusters by topics. These topics are not mutually exclusive, and individual research projects can fit into multiple areas. The majority of the MMM awards addressed research related to maternal mortality, maternal health, premature birth, gestational diabetes, pregnancy complications, and postpartum conditions. These scientific inquiries included basic science research, disease assessments, mental health studies, and behavioral and social determinants of health. Cross-cutting themes in the individual projects—such as the effects of SARS-CoV-2 on pregnancy, minority health, health disparities, and maternal care equity—contributed valuable insights into ways to reduce MMM.

For additional information on the primary cluster and sub-cluster categorization, please visit here.

Ongoing NIH Maternal Health Programs

Addressing Racial Disparities in Maternal Mortality and Morbidity
Administrative Supplements for Research on Women's Health in the IDeA States
Advancing Clinical Trials in Neonatal Opioid Withdrawal Syndrome (ACT NOW)
Advancing Integrated Models (AIM) of Care to Improve Maternal Health Outcomes among Women Who Experience Persistent Disabilities
Chronic Hypertension and Pregnancy (CHAP)
Project
Early Intervention to Promote Cardiovascular Health of Mothers and Children (ENRICH)
Glycemic Observation and Metabolic Outcomes in Mothers and Offspring (GO MOMs)
Human Placenta Project
Implementing a Maternal health and Pregnancy Outcomes Vision for Everyone (IMPROVE)
International Maternal, Pediatric, Adolescent AIDS Clinical Trials (IMPAACT) Network
Maternal And Developmental Risks from Environmental and Social Stressors (MADRES)
Maternal and Infant Environmental Health Riskscape (MIEHR) Research Center
Maternal and Pediatric Precision in Therapeutics (MPPRINT) Hub
Maternal-Fetal Medicine Units (MFMU) Network
Medication Treatment for Opioid Use Disorder in Expectant Mothers (MOMs)
Mobile Health: Technology and Outcomes in Expectant Mothers (MOMs)
MOMI-VAX
Notice of Special Interest (NOSI): Small Business Initiatives for Innovative Diagnostic Technology
for Improving Outcomes for Maternal Health Nulliparous Pregnancy Outcomes Study: Monitoring Mothers-to-Be (nMoM2b) Heart Health Study
Pregnancy as a Vulnerable Time Period for Women’s Health
PreSource
Reproductive Endocrine Related Mood Disorders Differential Sensitivity (Postpartum Depression)
Research on the Health of Women of Understudied, Underrepresented and Underreported (U3) Populations
Study of Pregnancy and Neonatal Health (SPAN)
Surveillance Monitoring for ART Toxidities (SMARTT)
Task Force on Research Specific to Pregnant Women and Lactating Women (PRGLAC)
Women’s Health Centers of Biomedical Research Excellence (COBRE)

References
17. Centers for Disease Control and Prevention, 2021. Severe Maternal Mortality in the United States
18. Tolkovski et al., 2018. Maternal mortality and nativity among new-borns in the United States compared to 15 other developed countries.
24. NIH Research, Condition, and Disease Categorization (RCDC) Database, Portfolio Visualization (PVIZ) Module.