

**Oklahoma
Maternal Mortality
Review Committee**
Annual Report
2023



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INTRODUCTION

Maternal death continues to be an international standard to measure a nation's commitment to maternal health and access to quality health care. The Commonwealth Fund reported the maternal mortality rate for the U.S. was more than three times the rate for other developed countries.¹

Every maternal death is a tragedy. Historically, over 700 women died each year in the United States as a result of pregnancy or delivery complications. According to the National Center for Health Statistics, in 2021 this number rose to 1,205 deaths, raising the national maternal mortality rate from 23.8 deaths per 100,000 live births in 2020 to 32.9 in 2021.² Similarly, while the Oklahoma maternal mortality rate had been decreasing, the rate for 2019-2021 substantially increased from 25.2 in the previous reporting period (2018-2020) to 31.0 deaths per 100,000 live births. Despite national and local efforts to address maternal morbidity and mortality, disparities still exist in relation to race, age, and education level. Nationwide, Maternal Mortality Review Committees (MMRCs) have determined that the majority of pregnancy-related deaths are preventable, necessitating efforts to stop the current trajectory by improving education for providers and families and increasing access to quality health care before, during, and after pregnancy.³

A likely contributor to the increase in maternal mortality at both the national and state level is the emergence of COVID-19. Several groups were, and continue to be, at greater risk of severe illness due to COVID-19, including those who are immunocompromised, have certain disabilities, or have underlying health conditions, such as those who are pregnant or recently pregnant (within 42 days following the end of pregnancy).⁴ According to a report from the United States Government Accountability Office, about 25% of maternal deaths in 2020 and 2021 were related to COVID-19, with the greatest increase in maternal deaths occurring in the later months of 2021 (likely due to the predominance of the Delta variant starting in July 2021).⁵ Additionally, reduction in healthcare services, transportation and childcare challenges, and fear of contracting COVID-19 could have contributed to reduced access to healthcare, delayed or forgone pregnancy care, and worsened outcomes.

WOMEN'S HEALTH OVERVIEW: OKLAHOMA

As reported in the Census Bureau's Current Population Survey, Oklahoma had the third highest uninsured rate among the nonelderly population at 16.1% in 2021 (behind Texas at 19.1% and Alaska at 16.3%), compared to the national uninsured rate of 9.8%.⁶ Additionally, according to the Behavioral Risk Factor Surveillance System (BRFSS), among women aged 18 to 44 years in Oklahoma during 2021, 14.3% reported their health status as fair or poor, and 17.7% felt that within the past year, a doctor visit was too costly to be able to attend. Approximately 4.0% of women aged 18 to 44 reported ever receiving a diabetes diagnosis, and 3.2% reported gestational diabetes. In addition, 1.6% of women aged 18 to 44 reported having been told by a doctor they suffered a stroke and 1.2% reported experiencing a heart attack. Among women of reproductive age with known body mass index (BMI), 67.5% were overweight or obese. Smoking also continues to be a public health concern; among women in this age group, 15.5% reported being a current smoker, 11.2% reported smoking daily, and 17.7% reported being a former smoker.⁷

Postpartum Visits

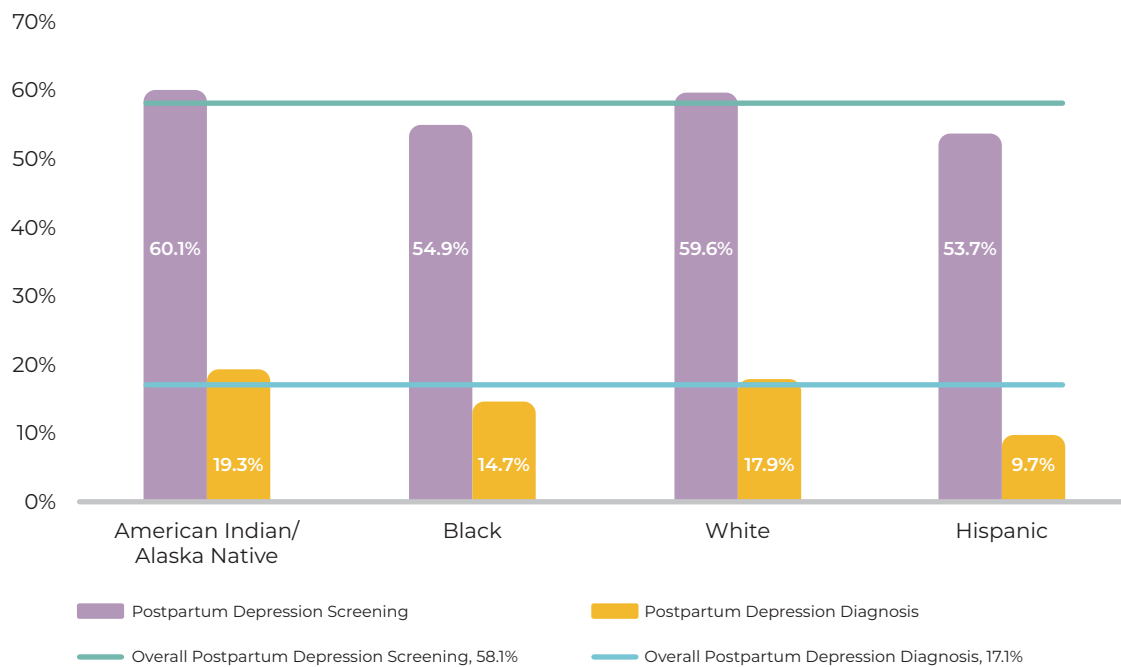
According to the most recent Pregnancy Risk Assessment Monitoring System (PRAMS) data (2021), 88.0% of new mothers in Oklahoma attended their postpartum visit. White mothers reported the highest postpartum visit rate at 90.9%, compared with 83.8% of Hispanic mothers, 82.9% of Black mothers, and 80.9% of American Indian/Alaska Native mothers.⁸ For this metric, Hispanic origin and race were not mutually exclusive.

Postpartum Depression

According to the Centers for Disease Control and Prevention (CDC), postpartum depression (PPD) occurs in an estimated 1 in 8 women that give birth every year.⁹ The onset of depressive, sad, or pessimistic feelings that may interfere with daily activities usually occurs during the six months after giving birth, but onset of symptoms can happen up to one year postpartum. Nationally, according to the CDC's PRAMS data in 2020, 13.4% of women experienced depressive symptoms or feelings of hopelessness following pregnancy and delivery.¹⁰ In Oklahoma, 16.1% of mothers reported PPD symptoms in 2021.⁸

According to the most recent data (2018-2021) from The Oklahoma Toddler Survey (TOTS), 58.1% of new mothers were screened for PPD and 17.1% of mothers were diagnosed with PPD (Chart 1). American Indian/Alaska Native mothers reported being screened for PPD most at 60.1%, followed by White mothers, Black mothers, and Hispanic mothers (Chart 1). American Indian/Alaska Native mothers also reported the highest numbers of PPD diagnosis at 19.3%, again followed by White mothers, Black mothers, and Hispanic mothers. For these metrics, Hispanic origin and race were not mutually exclusive.

Chart 1: Postpartum Depression Screening and Diagnosis by Race*, Oklahoma 2018-2021



*Hispanic origin and race not mutually exclusive

Source: Oklahoma State Department of Health, The Oklahoma Toddler Survey (TOTS) 2018-2021

SEVERE MATERNAL MORBIDITY (SMM)

The Alliance for Innovation on Maternal Health (AIM) provides support to states to improve work being done toward the goal of reducing SMM and maternal mortality. Both the CDC and Oklahoma utilize an SMM definition from AIM, characterized by identifying in-hospital deliveries where a mother develops severe complications during labor and delivery based on a list of 21 indicators that correspond to applicable ICD-10 codes (20 excluding blood transfusions).¹¹ Of note, the AIM definition has been updated, which may result in changes from prior reports. For reporting purposes, blood transfusion codes are included in this working definition of SMM. Rates for SMM are reported as per 10,000 deliveries.

SMM rates have continued to increase nationally, affecting approximately 27,000 women annually in the last decade and over 30,000 women in 2020.¹² According to the Healthcare Cost and Utilization Project (HCUP), SMM rates (excluding blood transfusion) increased by 26.4% from 69.8 per 10,000 in-hospital deliveries in 2011 to 88.2 in 2020, and by 10.7% from 2019 to 2020.

Of note, only state-licensed facilities contribute to the collection of SMM data in Oklahoma, therefore there are limitations to the process of analyzing hospital discharge data to capture all of Oklahoma’s potential SMM cases. Overall, rates of SMM in Oklahoma substantially increased from 2020 to 2021, by 12.2% excluding transfusions and by 35.2% including transfusions (Table 1).

Table 1: Number and Rate of Severe Maternal Morbidity (SMM) per 10,000 Deliveries Among Inpatient Hospital Discharges, Oklahoma 2016-2021

Year	Deliveries	SMM excluding transfusion	Rate of SMM excluding transfusion, per 10,000 deliveries	SMM including transfusion	Rate of SMM including transfusion, per 10,000 deliveries
2016	47,104	315	66.9	807	171.3
2017	45,020	348	77.3	856	190.1
2018	43,727	326	74.6	719	164.4
2019	43,793	297	67.8	646	147.5
2020	41,276	322	78.0	671	162.6
2021	42,967	376	87.5	945	219.9

NOTE: Oklahoma utilizes the [Alliance for Innovation on Maternal Health \(AIM\) definition of severe maternal morbidity](#).

Source: Oklahoma State Department of Health, Center for Health Information, Oklahoma Hospital Discharge Data, 2016-2021

Among SMM in 2021, adult respiratory distress syndrome (ARDS), acute renal failure, and disseminated intravascular coagulation (DIC) were the three leading SMM diagnoses, and blood transfusion, ventilation, and hysterectomy were the three leading SMM procedures (Table 2).

Table 2: Rates of Severe Maternal Morbidity (SMM) by Diagnosis-Based Indicators and Procedure-Based Indicators, Oklahoma 2021		Rate per 10,000 Deliveries
<i>Diagnosis-based Indicators</i>		
Adult respiratory distress syndrome		28.4
Acute renal failure		15.8
Disseminated intravascular coagulation		15.6
Sepsis		12.6
Pulmonary edema		10.5
Shock		6.1
Eclampsia		5.4
Thrombotic embolism		4.4
Puerperal cerebrovascular disorders		4.2
Cardiac arrest/ventricular fibrillation		1.9
Amniotic fluid embolism		1.2
Acute myocardial infarction		0.7
Aneurysm		0.5
Severe anesthesia complications		0.2
Heart failure during procedure or surgery		0.2
Sickle cell anemia with crisis		0.0
<i>Procedure-based Indicators</i>		
Blood transfusion		149.6
Ventilation		11.2
Hysterectomy		10.9
Conversion of cardiac rhythm		0.9
Temporary Tracheostomy		0.7
SMM Rate Overall		219.9
SMM Rate Overall (Excluding Transfusion)		87.5
> 60% increase from 2020		
NOTE: Oklahoma utilizes the Alliance for Innovation on Maternal Health (AIM) definition of severe maternal morbidity .		
Source: Oklahoma State Department of Health, Center for Health Information, Oklahoma Hospital Discharge Data, 2016-2021		

While the overall rate of SMM increased in 2021, some diagnoses and procedures disproportionately increased. Specifically, rates of adult respiratory distress syndrome (ARDS), thrombotic embolism, blood transfusion, and ventilation increased substantially from 2020 to 2021, each by over 60%. The sharp increases in the rates of respiratory complications, specifically ARDS and ventilation (which increased by 77.6% and 70.8%, respectively), are consistent with the effects of the COVID-19 pandemic. Even further, approximately 60% of ARDS and ventilation events co-occurred with a COVID-19 diagnosis code (ICD code U07.1).

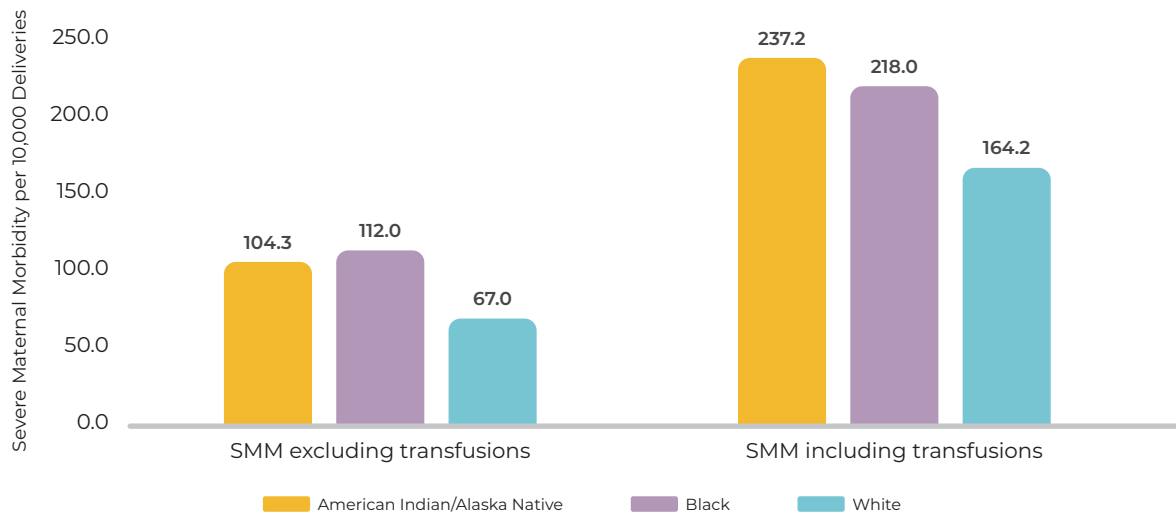
Conversely, the rate of eclampsia decreased by approximately 37% in 2021. This decrease could be in part due to recent recommendations and initiatives regarding interventions for patients at risk for preeclampsia. The American College of Obstetricians and Gynecologists (ACOG) published a practice bulletin in June of 2020 regarding gestational hypertension and preeclampsia, in which they made several recommendations, including low-dose aspirin therapy for preeclampsia prophylaxis, magnesium sulfate administration for seizure prevention, and use of nonsteroidal anti-inflammatory medications over opioid analgesics, among others.¹³ In late 2021, low-dose aspirin therapy was specifically further recommended by both the U.S. Preventive Services Task Force (USPSTF) and ACOG, and in 2023 the Low Dose Aspirin Preeclampsia Prevention Campaign was launched by the Oklahoma Perinatal Quality Improvement Collaborative (OPQIC), the Oklahoma Maternal Health Task Force (OMHTF), and the Oklahoma State Department of Health Maternal and Child Health Service.¹⁴⁻¹⁶ Additionally, as of February 1, 2023, Oklahoma SoonerCare added coverage for over-the-counter low-dose aspirin for pregnant members at high risk for preeclampsia, improving access to low-dose aspirin therapy for Oklahomans in need.¹⁷ The implementation of these measures is expected to reduce rates of preeclampsia diagnosis and further reduce rates of eclampsia in Oklahoma in coming years.

Race

Additionally, severe maternal morbidity varied by race in Oklahoma from 2019-2021 (Chart 2). White women had the lowest rates of SMM, both excluding and including transfusions. The rate of SMM for this time period, including transfusion, was 164.2 per 10,000 deliveries for White women. Comparatively, American Indian/Alaska Native women had a rate of SMM 1.4 times higher than White women at 237.2 per 10,000 deliveries, with Black women 1.3 times higher at 218.0 per 10,000 deliveries. Hispanic origin was not available in the data source for SMM.

Considering SMM excluding transfusions, the rate of SMM was 67.0 per 10,000 deliveries for White women. Comparatively, Black women had a rate 1.7 times higher at 112.0 per 10,000 deliveries, with American Indian/Alaska Native women 1.6 times higher at 104.3 per 10,000 deliveries.

Chart 2: Rate of Severe Maternal Morbidity per 10,000 Deliveries by Race*, Oklahoma 2019-2021



*Hispanic origin information not available

NOTE: Oklahoma utilizes the [Alliance for Innovation on Maternal Health \(AIM\) definition of severe maternal morbidity](#).

Source: Oklahoma State Department of Health, Health Care Information, Oklahoma Hospital Discharge Data, 2019-2021

The leading causes of SMM also varied by race (Table 3). ARDS was the leading cause of SMM overall and for all race groups except for Black/African American women, for whom acute renal failure was the top cause of SMM. ARDS, acute renal failure, and DIC were in the top five causes for all racial subgroups, and additionally sepsis and hysterectomy were in the top five for two of the three racial subgroups. For American Indian/Alaska Native women, eclampsia and ventilation tied for the third highest rate of SMM, and DIC and hysterectomy tied for the fifth highest rate of SMM.

Table 3: Top 5 Causes of Severe Maternal Morbidity by Race, Oklahoma 2019-2021

	American Indian / Alaska Native	Black / African American	White	Overall (Includes Other Race)
1	Adult Respiratory Distress Syndrome	Acute Renal Failure	Adult Respiratory Distress Syndrome	Adult Respiratory Distress Syndrome
2	Acute Renal Failure	Adult Respiratory Distress Syndrome	Disseminated Intravascular Coagulation	Disseminated Intravascular Coagulation
3	Eclampsia	Disseminated Intravascular Coagulation	Hysterectomy	Acute Renal Failure
4	Ventilation	Pulmonary Edema / Acute Heart Failure	Acute Renal Failure	Sepsis
5	Disseminated Intravascular Coagulation	Sepsis	Sepsis	Hysterectomy
	Hysterectomy			

NOTE: Oklahoma utilizes the [Alliance for Innovation on Maternal Health \(AIM\) definition of severe maternal morbidity](#).
Source: Oklahoma State Department of Health, Health Care Information, Oklahoma Hospital Discharge Data, 2019-2021

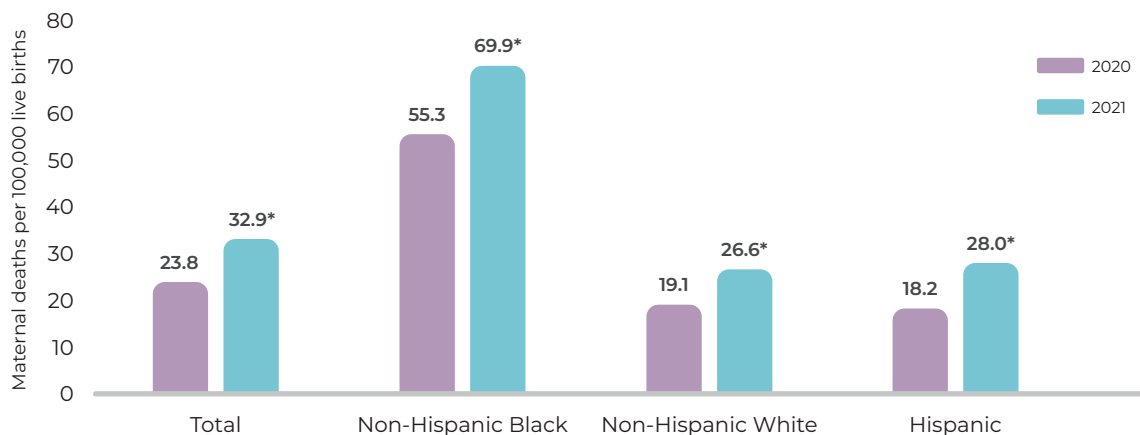
MATERNAL MORTALITY

Summary of National Data

A maternal death is defined by the World Health Organization (WHO) as the death of a woman “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 termination of pregnancy, irrespective of the duration and site of the pregnancy”.¹⁸

Maternal mortality rates are defined as the number of maternal deaths per 100,000 live births. The CDC estimates for 2021 show that the U.S. had a statistically significant increase in maternal mortality with 32.9 maternal deaths per 100,000 live births, compared with 23.8 reported in 2020 (Chart 3, adapted from *Maternal Mortality Rates in the United States, 2021*).² In 2021 among race/ethnic categories, maternal mortality rates were: Non-Hispanic White (26.6), Non-Hispanic Black (69.9), and Hispanic (28.0). All groups experienced a statistically significant rate increase in maternal mortality since 2020. Health equity continues to be of concern, with a widening disparity of maternal mortality rates between race/ethnicity groups. In 2021, Non-Hispanic Black women had a significantly higher maternal mortality rate (by about 2.6 times) than both Non-Hispanic White women and Hispanic women. National maternal mortality rates for Non-Hispanic American Indian/Alaska Native women and other races were not available for 2021.

Chart 3: Maternal Mortality Rates by Race and Hispanic Origin, United States 2020-2021

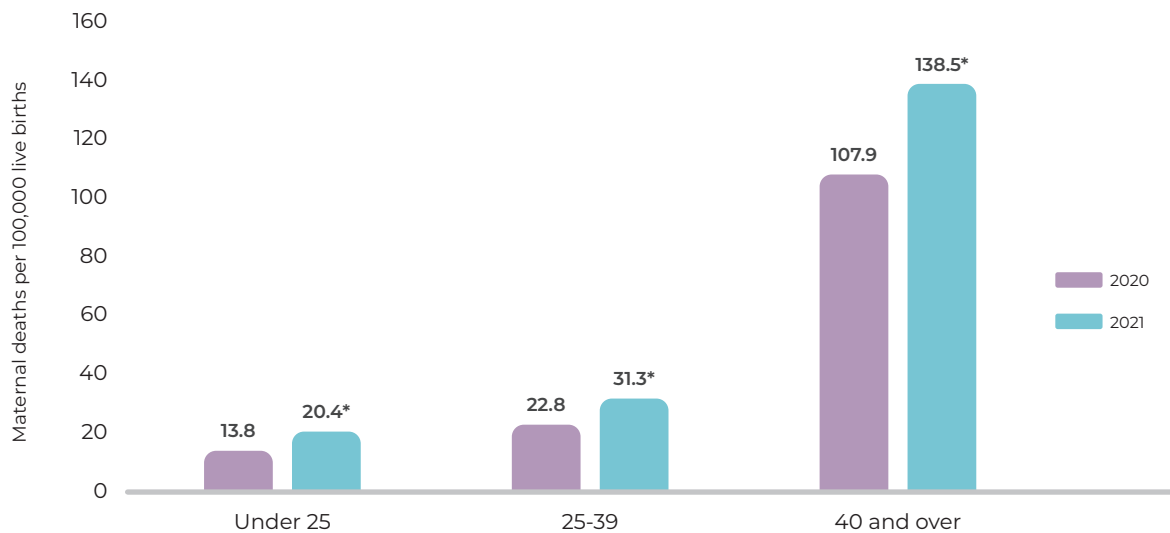


*Statistically significant increase from 2020 ($p < 0.05$)

Source: *Maternal Mortality Rates in the United States, 2021*, National Center for Health Statistics

From 2020 to 2021 maternal mortality rates increased significantly in every age group (Chart 4, adapted from *Maternal Mortality Rates in the United States, 2021*). For women between 25 and 39 years of age there was an increase from 22.8 deaths per 100,000 live births in 2020 to 31.3 in 2021. Among women under 25 years of age the maternal mortality rate increased by nearly 50% from 13.8 to 20.4. Women 40 years of age and older again had the highest maternal mortality rate, which increased from 107.9 in 2020 to 138.5 deaths per 100,000 live births in 2021. The 2021 maternal mortality rate for women 40 years of age or older was significantly higher than women under 25 (by 6.8 times) and women 25-39 (by 4.4 times).

Chart 4: Maternal Mortality Rates by Age Group, United States 2020-2021



*Statistically significant increase from 2020 ($p < 0.05$)

Source: *Maternal Mortality Rates in the United States, 2021*, National Center for Health Statistics

Oklahoma Maternal Mortality

Definitions and Methodology

The Oklahoma definitions for maternal death and maternal-related conditions are adapted from the definitions of the WHO and the National Center for Health Statistics (NCHS) within the CDC. Both organizations define a maternal death as “the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and the site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes”.^{2,18} To compute national estimates of maternal deaths, the NCHS uses data from the National Vital Statistics System (NVSS) and “does not include all deaths occurring to pregnant or recently pregnant women, but only those deaths with the underlying cause of death assigned to International Statistical Classification of Diseases (ICD), 10th Revision code numbers A34, O00–O95, and O98–O99”.² Oklahoma’s definition of a maternal-related condition is consistent with these ICD codes.

- **Maternal Death:** The death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes.
- **COVID-Related Maternal Death:** A maternal death where any multiple cause of death field included ICD code U07.1 (COVID-19).
- **Maternal Mortality Ratio (MMR):** The number of maternal deaths per 100,000 live births. Also referred to as maternal mortality rate.
- **Maternal-Related Condition:** A condition assigned to code numbers A34, O00–O95, and O98–O99 of the International Classification of Diseases, 10th Revision.

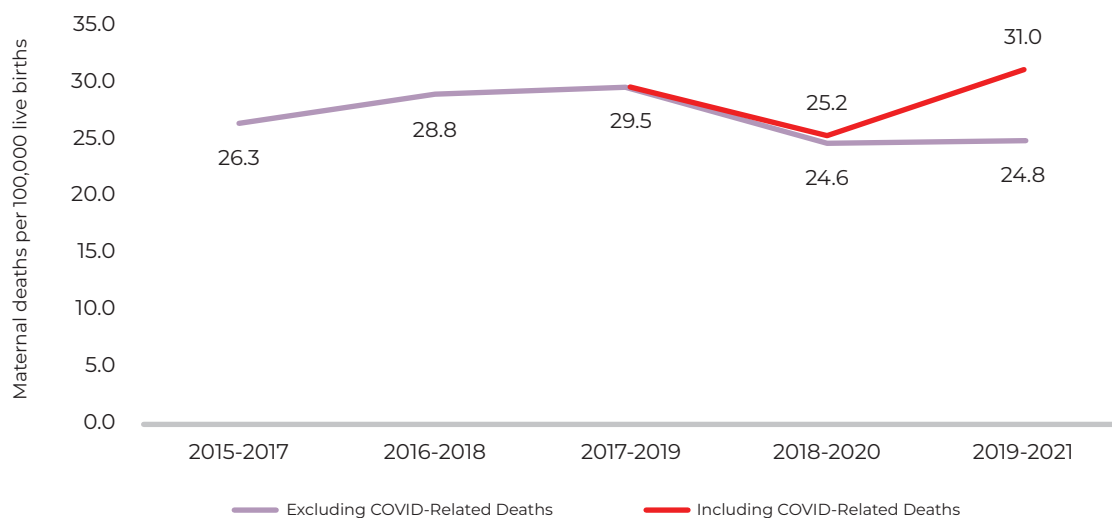
For consistency with the national maternal mortality estimates from NCHS, Oklahoma computes maternal mortality estimates from vital statistics. To identify maternal deaths for reporting a statewide maternal mortality rate, Oklahoma selects all death certificates of individuals where:

- The state of maternal residence is Oklahoma *and*
- Age at time of death is between 10 and 59 *and*
- The underlying cause of death contains a maternal-related condition *and*
- The pregnancy checkbox indicates that the death occurred while pregnant, within 42 days of pregnancy termination, or pregnancy status is unknown *and*
- The manner of death was not determined to be an accident, suicide, or homicide.

Maternal Mortality Rate

From 2019 to 2021, Oklahoma had an MMR of 31.0 maternal deaths per 100,000 live births (Chart 5). For rate stability, a three-year average is used for reporting maternal mortality in Oklahoma, based on low numbers of maternal deaths each year. The MMR increased substantially from 25.2 in the 2018-2020 time period to 31.0 in the 2019-2021 time period, a 23.0% increase. This increase follows a similar trend to the national MMR, likely in part due to the effects of the COVID-19 pandemic. From 2019-2021, deaths related to COVID-19 comprised 20% of maternal deaths in Oklahoma.

Chart 5: 3-Year Rolling Maternal Mortality Rate Excluding and Including COVID-Related Deaths*, Oklahoma 2015-2021



*Deaths were considered COVID-related if any multiple cause of death included ICD code U07.1

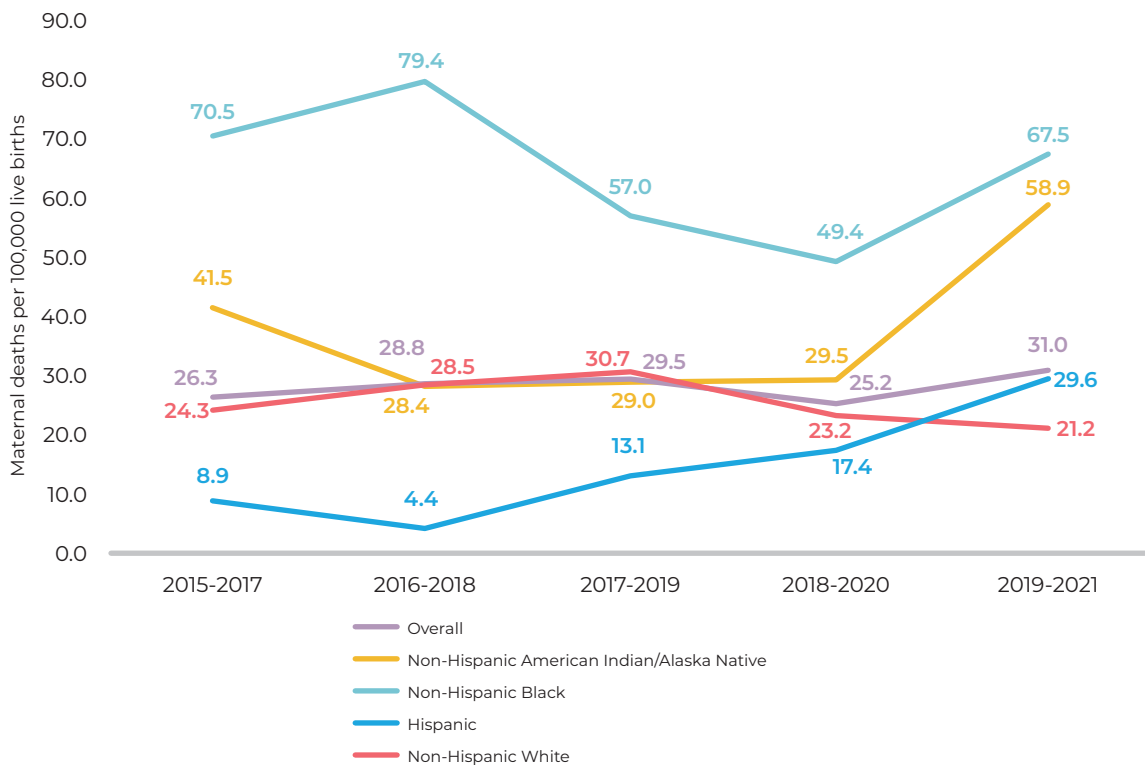
Source: Oklahoma Vital Statistics, 2015-2021

Demographic Characteristics

Race/Ethnicity

The MMR increased in every race/ethnicity group in 2019-2021, apart from Non-Hispanic White women, for which the rate decreased by 8.6% (Chart 6). Non-Hispanic White women continue to have the lowest MMR, at 21.2 deaths per 100,000 live births in 2019-2021. MMRs among Non-Hispanic Black, Hispanic, and Non-Hispanic American Indian/Alaska Native women all increased substantially, by 36.6%, 70.1%, and 99.7%, respectively. Disparities in maternal mortality continue to persist for Non-Hispanic Black women and are emerging for Non-Hispanic American Indian/Alaska Native women. Compared to Non-Hispanic White women from 2019-2021, the MMR for Non-Hispanic Black women was 3.2 times higher and the MMR for Non-Hispanic American Indian/Alaska Native women was 2.8 times higher.

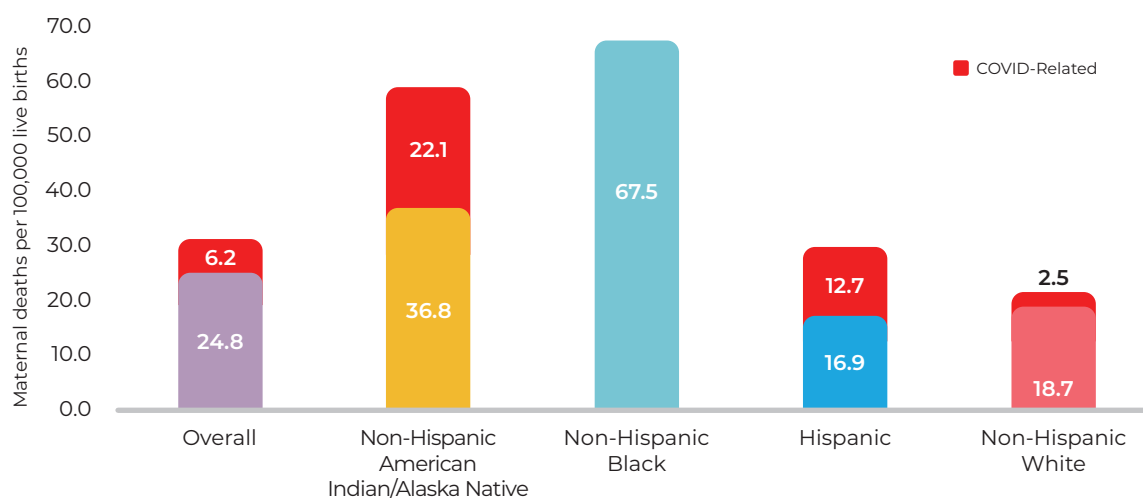
Chart 6: 3-Year Rolling Maternal Mortality Rate by Race/Ethnicity, Oklahoma 2015-2021



Source: Oklahoma Vital Statistics, 2015-2021

Certain groups also appear to have been disproportionately impacted by COVID-19 regarding maternal mortality. Non-Hispanic American Indian/Alaska Native and Hispanic women had a larger proportion of maternal deaths related to COVID-19, comprising 37.5% and 42.9% of maternal deaths in those groups, respectively (Chart 7).

Chart 7: 3-Year Maternal Mortality Rate by Race/Ethnicity and COVID-19 Relatedness*, Oklahoma 2019-2021



*Deaths were considered COVID-related if any multiple cause of death included ICD code U07.1

Source: Oklahoma Vital Statistics, 2019-2021

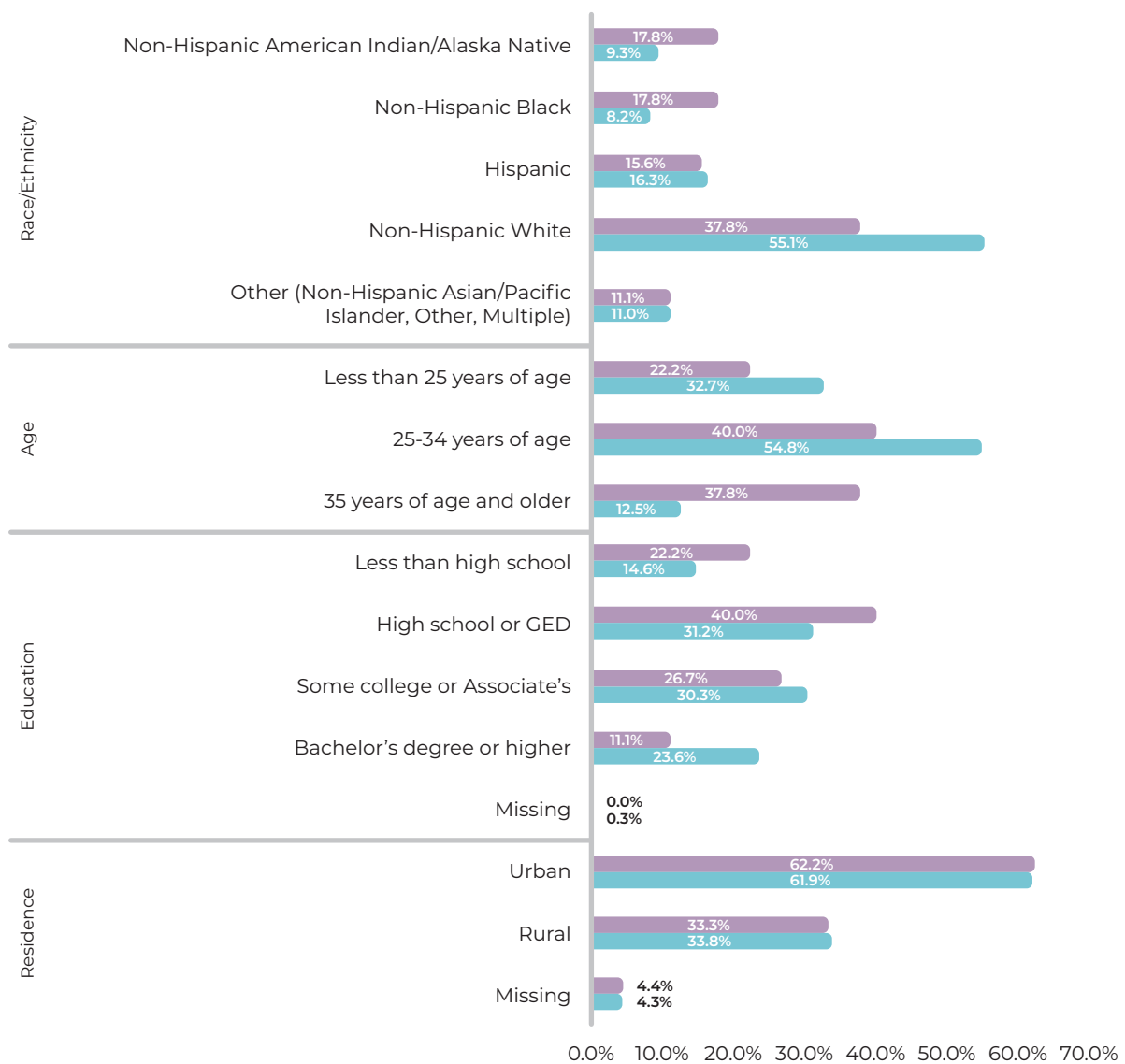
According to the Oklahoma State Department of Infectious Disease Prevention and Response, American Indian or Alaska Native persons had the highest cumulative COVID-19 mortality rate from 2020-2021, followed by White persons and Black or African American persons.¹⁹ From the same report, American Indian persons also had the lowest percentage of people being fully vaccinated at 30.6%, compared with 44.8% of White persons and 36.2% of Black persons.

Each death certificate contains a singular underlying cause of death, with the option to report multiple causes of death, which may include several conditions that contributed to the death. Since the maternal death definition requires the underlying cause of death be a maternal condition, the estimated burden of COVID-19 on maternal mortality was measured by the presence of the COVID-19 ICD code in the multiple cause of death fields on the death certificate. Therefore, it is possible that there are additional COVID-related deaths among pregnant and postpartum women that are not included in this metric, where COVID-19 was the underlying cause of death.

Race/Ethnicity, Age, Educational Attainment, and Residence

Compared with live births, maternal mortality disproportionately affected Non-Hispanic Black mothers, Non-Hispanic American Indian/Alaska Native mothers, mothers 35 years of age or older, and mothers who received a high school education or less (Chart 8). No disproportionate effects were observed for rurality of maternal residence.

Chart 8: Demographic Characteristics of Maternal Deaths and Live Births, Oklahoma 2019-2021



Source: Oklahoma Vital Statistics, 2019-2021

Maternal Deaths Live Births

MATERNAL MORTALITY REVIEW COMMITTEE

Oklahoma has a process to identify and explore the medical facts surrounding maternal deaths that has been designed to help improve health care for pregnant and postpartum women.

The Maternal Mortality Review Committee (MMRC) is an essential statewide effort that has been established through legislative action. The MMRC is a statutory committee with defined membership, responsibilities, and reporting criteria utilized to explore opportunities to enhance and improve services to women, infants, and their families. These qualitative, in-depth reviews investigate the causes and circumstances surrounding a maternal death.

Through communication and collaboration, the MMRC serves as a continuous quality improvement system that will result in a more complete understanding of maternal issues and identify challenges surrounding maternal health care services. The overall goal of the MMRC is prevention through understanding of causes and risk factors.

The Oklahoma MMRC operates under the auspices of the Oklahoma State Department of Health (OSDH). Through uniform procedures and defined processes, the OSDH initiates the MMRC process by identifying all pregnancy-associated cases. Deaths of women of childbearing age are reviewed to determine if the death is to be classified as pregnancy-related and whether the death could have been prevented.

The MMRC also makes a determination as to what extent the impact of timely and appropriate intervention could have had on the outcome of a particular case. The MMRC efforts are designed to:

- Improve and enhance public health efforts to reduce and prevent maternal death in Oklahoma.
- Improve identification of maternal deaths to interpret trends, identify high-risk groups, and develop effective interventions.
- Utilize review information to identify health care system issues and gaps in service delivery and care.
- Develop action plans and preventive strategies to implement recommendations in communities and provider networks.

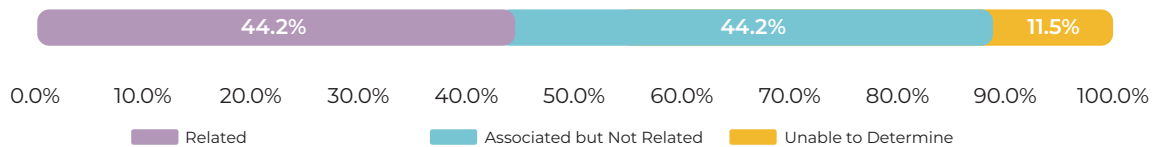
Interventions, strategies, and the development of systems that increase knowledge and decrease pregnancy-related mortality will serve not only to improve the health of women and children but will also provide overwhelming health-related benefits for all Oklahomans. Health benefits could include reduced rates of obesity and smoking during pregnancy, increased access to prenatal and well-woman care, and education for health care providers on postpartum warning signs and evidence-based quality improvement strategies.

The Oklahoma MMRC reviews all potential maternal deaths where the official death certificate pregnancy checkbox indicates that the death of a woman aged 10-44 years occurred during pregnancy or within one year of pregnancy termination and the underlying cause of death is related to a maternal code. Women over 44 years of age are included in MMRC reviews if their death certificate specifies a maternal-related condition as an underlying cause of death.

MMRC Case Reviews

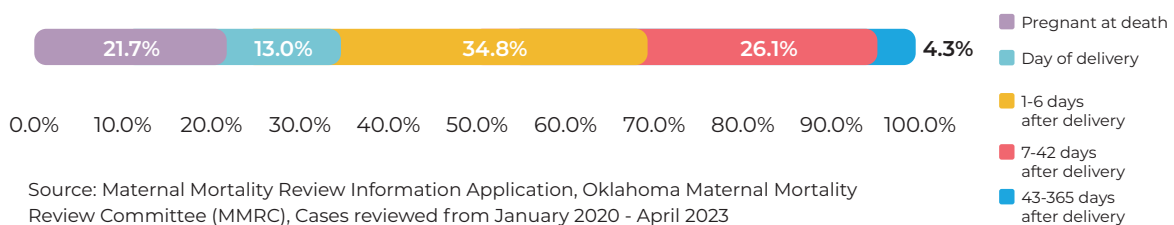
From January 2020 to April 2023, the MMRC reviewed 52 cases, with dates of death between 2017 and 2021. Of these deaths, 44.2% were determined to be pregnancy-related (Chart 9). Approximately 65% of pregnancy-related deaths occurred in the postpartum period (Chart 10) and nearly 80% were determined to have been preventable. A death is considered pregnancy-related if the death occurred during or within one year of pregnancy, from a pregnancy complication, a chain of events initiated by pregnancy, or the aggravation of an unrelated condition by the physiologic effects of pregnancy. A death is considered preventable if there was at least some chance of the death being prevented by one or more reasonable changes to patient, family, provider, facility, system, and/or community factors. Of note, the number of pregnancy-related deaths for this time period is small, therefore these data should be interpreted with caution.

Chart 9: Pregnancy-Relatedness of MMRC-Reviewed Deaths, Oklahoma MMRC Reviews January 2020 - April 2023



Source: Maternal Mortality Review Information Application, Oklahoma Maternal Mortality Review Committee (MMRC), Cases reviewed from January 2020 - April 2023

Chart 10: Timing of Death for Pregnancy-Related Deaths, Oklahoma MMRC Reviews January 2020 - April 2023

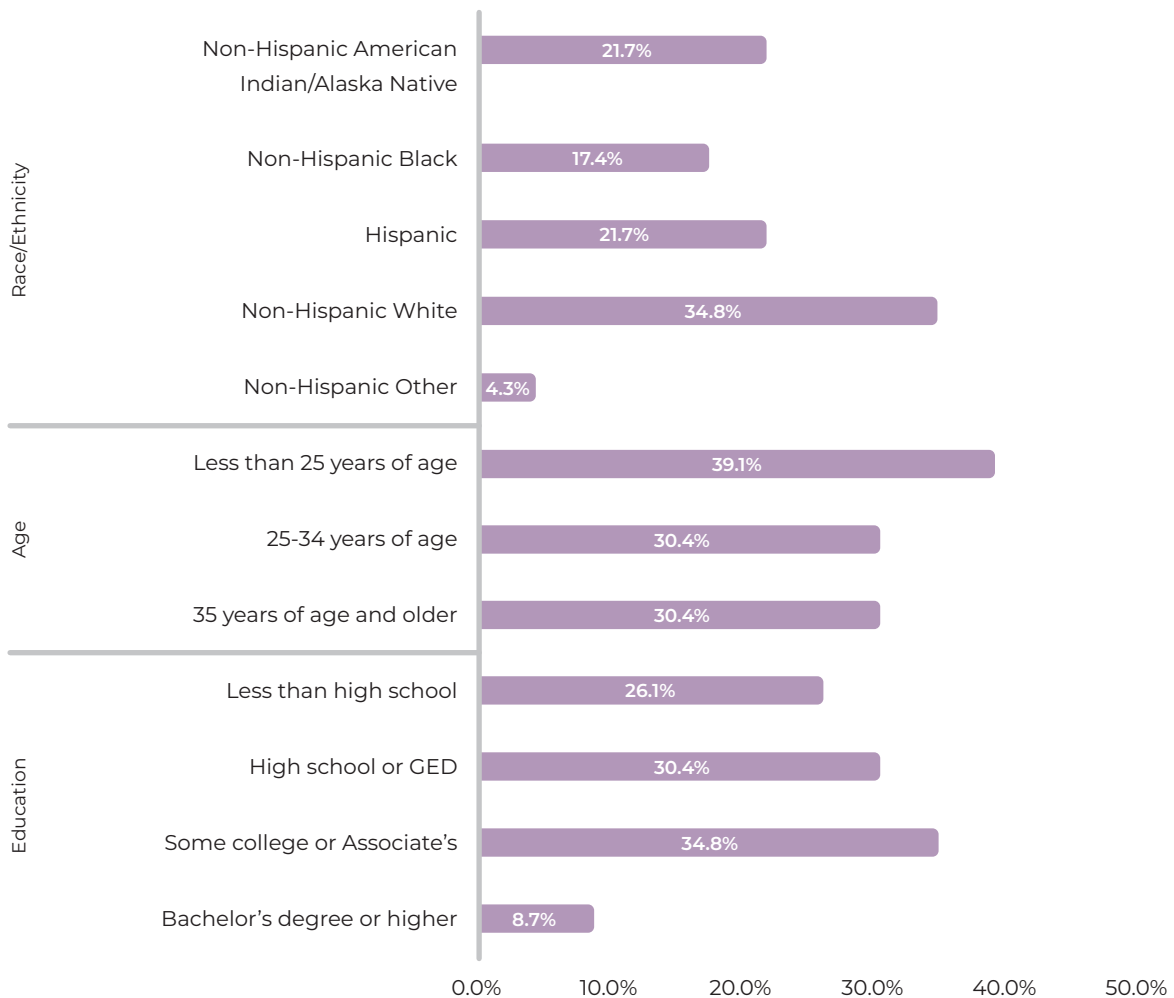


Source: Maternal Mortality Review Information Application, Oklahoma Maternal Mortality Review Committee (MMRC), Cases reviewed from January 2020 - April 2023

Demographic Characteristics

For deaths reviewed from January 2020 to April 2023, Non-Hispanic White women, women under the age of 25, and women with some college credit or an Associate's degree made up the largest proportions of pregnancy-related deaths (Chart 11).

Chart 11: Demographic Characteristics of Pregnancy-Related Deaths, Oklahoma MMRC Reviews January 2020 - April 2023

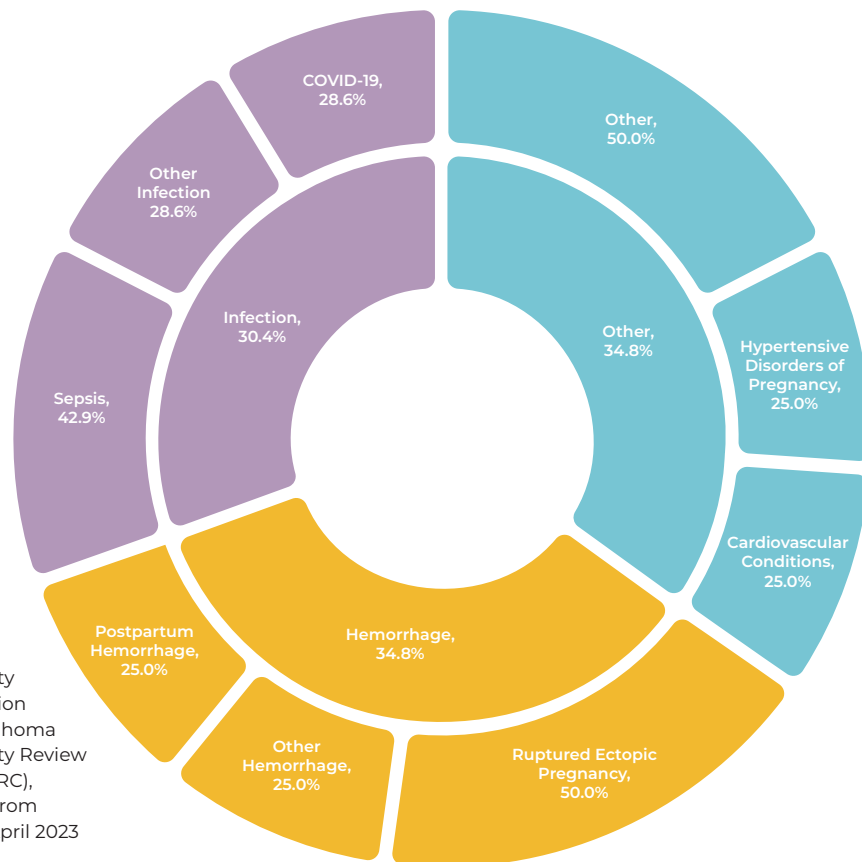


Source: Maternal Mortality Review Information Application, Oklahoma Maternal Mortality Review Committee (MMRC), Cases reviewed from January 2020 – April 2023

Top Causes of Pregnancy-Related Deaths

The top causes of pregnancy-related deaths reviewed were hemorrhage and infection, comprising about two-thirds (Chart 12) of the deaths. Half of the deaths due to hemorrhage were caused by a ruptured ectopic pregnancy, and a quarter were caused by postpartum hemorrhage. Among deaths due to infection, 42.9% were caused by sepsis and 28.6% were caused by COVID-19. About a third of pregnancy-related deaths were due to other causes, such as amniotic fluid embolism, cardiomyopathy, and hypertensive disorders related to pregnancy.

Chart 12: Causes of Pregnancy-Related Deaths, Oklahoma MMRC Reviews January 2020 - April 2023



Source: Maternal Mortality Review Information Application, Oklahoma Maternal Mortality Review Committee (MMRC), Cases reviewed from January 2020 – April 2023

Comparatively, the leading cause of pregnancy-related death in the United States from 2017 to 2019 was other cardiovascular conditions, followed by infection or sepsis, cardiomyopathy, hemorrhage, and thrombotic pulmonary or other embolism.²⁰

Contributing Factors and Recommendations

To generate actionable recommendations to reduce pregnancy-related mortality, the MMRC reviewed the factors which contributed to each pregnancy-related and preventable death. For deaths reviewed from January 2020 to April 2023, contributing factors at the patient or family, provider, and facility levels continued to be the most prevalent factors.

Common themes among contributing factors at the patient or family level included delay in seeking and receiving care, adherence to recommendations, substance use disorders, and chronic conditions (e.g., obesity, tobacco use). Delays in seeking care were attributed to lack of access or financial resources, stigma, cultural or religious factors, and knowledge of when to seek care. Lack of adherence to recommendations at the patient level were noted, such as lack of or limited prenatal care and being unvaccinated for COVID-19 and influenza, specifically for deaths caused by infections.

Common themes among provider and facility factors included mismanagement of care, delay of treatment, lack of or inadequate assessment, and poor continuity of care. For several deaths, noted lower quality of care was due to the standard of care not being followed, particularly for deaths related to hemorrhage and infection.

The MMRC generated recommendations identified to help improve access to quality pregnancy-related health care that will contribute to a reduction in the incidence of maternal morbidity cases and the number of maternal deaths in Oklahoma:

Conclusion: Many women enter pregnancy with health issues that impact pregnancy outcomes.

- **Recommendation:** Increase awareness in both public and private healthcare providers and reproductive age individuals about the importance of preconception health regardless of pregnancy intention since approximately half of all pregnancies are not intended at the time they occur.
- **Recommendation:** Continue to expand access to quality prenatal care through county health departments and mobile clinics across the state.
- **Recommendation:** MMRC and OMHTF members will promote and advocate for access to health care and preventative services that support lifestyle modification across the continuum of childbearing years.

Conclusion: Current ACOG/CDC recommendations are available but not widely adopted that could improve the quality of prenatal care.

- **Recommendation:** Educate healthcare providers on current recommendations for provision of postpartum care to include a two-week and six-week postpartum visit. The Oklahoma Healthcare Authority expanded postpartum coverage to 12 months in January 2023 which will assist in providing access to this care.
- **Recommendation:** Ensure prenatal care providers are aware ACOG supports COVID-19 vaccination for most pregnant women.

Conclusion: Gaps exist in health care provider knowledge.

- **Recommendation:** OMHTF members and partners will continue to emphasize the importance of developing policies and procedures for management of postpartum hemorrhages and holding simulation exercises for staff.
- **Recommendation:** Increase utilization of SBIRT (Screening, Brief Intervention, Referral to Treatment) to improve identification of individuals in need of referral for substance use intervention and treatment.

Conclusion: Delays in medical intervention occurred when complications developed during pregnancy and the postpartum period, contributing to mortality.

- **Recommendation:** Expand education to healthcare providers, pregnant women, and their families about pregnancy and postpartum warning signs and how to seek care.

Conclusion: Opportunities exist to improve the quality of prenatal/intrapartum/postpartum care through communication.

- **Recommendation:** Increase awareness of possible complications by educating pregnant women and their families on pregnancy and post-birth warning signs.
- **Recommendation:** Promote the CDC “Hear Her” Campaign to encourage pregnant women and their families to speak up and to encourage healthcare providers to listen and respond.
- **Recommendation:** Encourage providers and hospitals to adopt the TeamBirth initiative to ensure transparent communication and shared decision making occur with the patient and among the clinical team.²¹
- **Recommendation:** OSDH, OMHTF, and OPQIC will share this annual report with additional partners including the Oklahoma Hospital Association, Oklahoma Healthcare Authority, hospital system administration, and healthcare providers.

Conclusion: Opportunities exist to improve the safety of prenatal/intrapartum/postpartum care.

- **Recommendation:** OPQIC will continue to promote implementation of AIM OB Hemorrhage/Hypertension Patient Safety Bundles in all Oklahoma birthing hospitals.
- **Recommendation:** Promote Emergency Obstetric Simulation Training for emergency room providers and rural hospitals without delivery services.

Conclusion: Opportunities exist for collaboration in support of legislation to improve the quality of care and prevent maternal deaths.

- **Recommendation:** Continue to collaborate with community partners to pass legislation requiring all maternal deaths be referred to the Medical Examiner's office (any death of a woman while pregnant or within 365 days of pregnancy termination) for consideration of a potential autopsy. Potentially relevant information is still missing from case review data when an autopsy is not performed for a maternal death.
- **Recommendation:** ACOG and the Oklahoma Chapter of the American College of Nurse Midwives will advocate for legislation requiring licensure for all midwives practicing in the state.

Conclusion: Health inequity can contribute to poor maternal outcomes.

- **Recommendation:** Promote enrollment and completion in the Speak Up training for health care professionals providing obstetrical care.
- **Recommendation:** Promote acceptance and utilization of midwifery and doula care.

The impact of implementing recommendations made by the MMRC should help to reduce maternal mortality in Oklahoma. The MMRC agrees that the increase in shared knowledge and education among professionals and non-professionals will encourage more women and their families to seek health care prior to any pregnancy, during pregnancy, and after pregnancy to improve birth outcomes.

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