



**OKLAHOMA
MATERNAL HEALTH,
MORBIDITY AND
MORTALITY**

**ANNUAL REPORT
2021**



OKLAHOMA
State Department of Health



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Introduction to Maternal Mortality

A Summary of National Data

A maternal death is defined by the World Health Organization (WHO) "as 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."¹ For stability of rates based on low numbers of maternal deaths in Oklahoma, a three-year rolling average is used for reporting purposes.

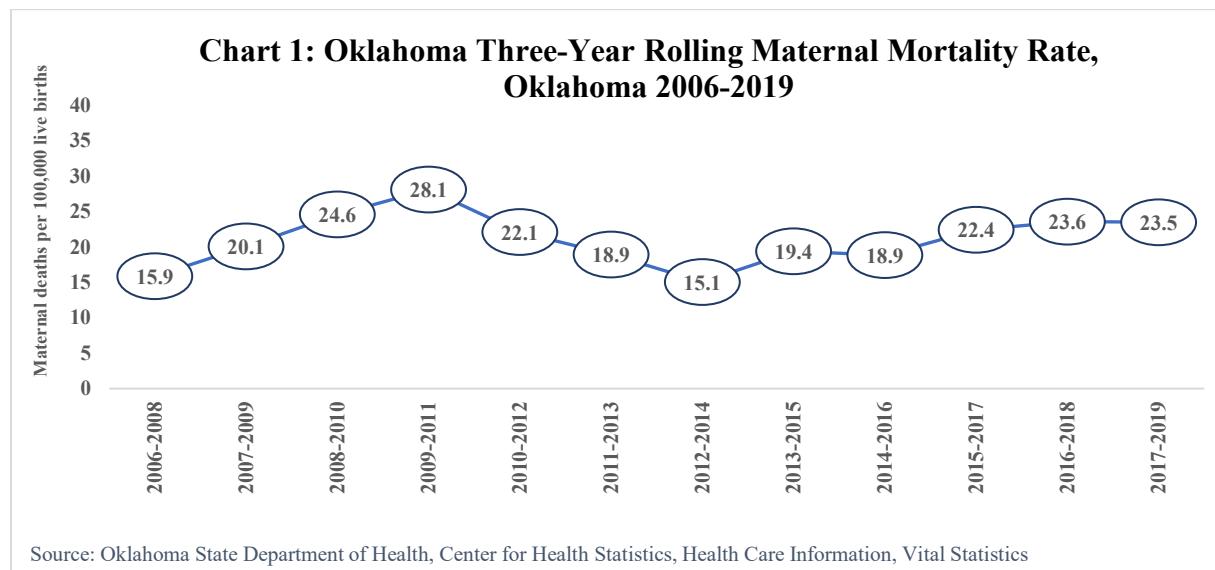
Maternal death rates are defined as the number of maternal deaths per 100,000 live births. The Centers for Disease Control and Prevention (CDC) estimates for 2019 show the U.S. had 20.1 maternal deaths per 100,000 live births, a significant increase from the 17.4 rate reported in 2018. The actual number of identified maternal deaths in 2019 was 754, compared to 658 in 2018.² In 2019 among race/ethnic categories, maternal mortality rates were: non-Hispanic White (17.9), non-Hispanic Black (44.0), and Hispanic (12.6). All groups experienced a rate increase in maternal mortality since 2018. The rate increases for non-Hispanic Black and Hispanic women were not considered statistically significant while the increased rate among non-Hispanic White women was statistically significant. In comparison to non-Hispanic White women, the disparity in maternal mortality rates for non-Hispanic Black women (2.5 times higher) and Hispanic women (3.5 times higher) continue to be of concern.²

Nationally, there was also a noticeable rate increase among women by age group. For instance, there was a statistically significant rate increase for women within age group 20-39 years, from 16.6 deaths per 100,000 live births in 2018 to 19.9 deaths per 100,000 live births in 2019. Among women aged less than 25 years, the maternal mortality rate in 2019 was 12.6, while the rate for women aged over 40 was 75.5.²



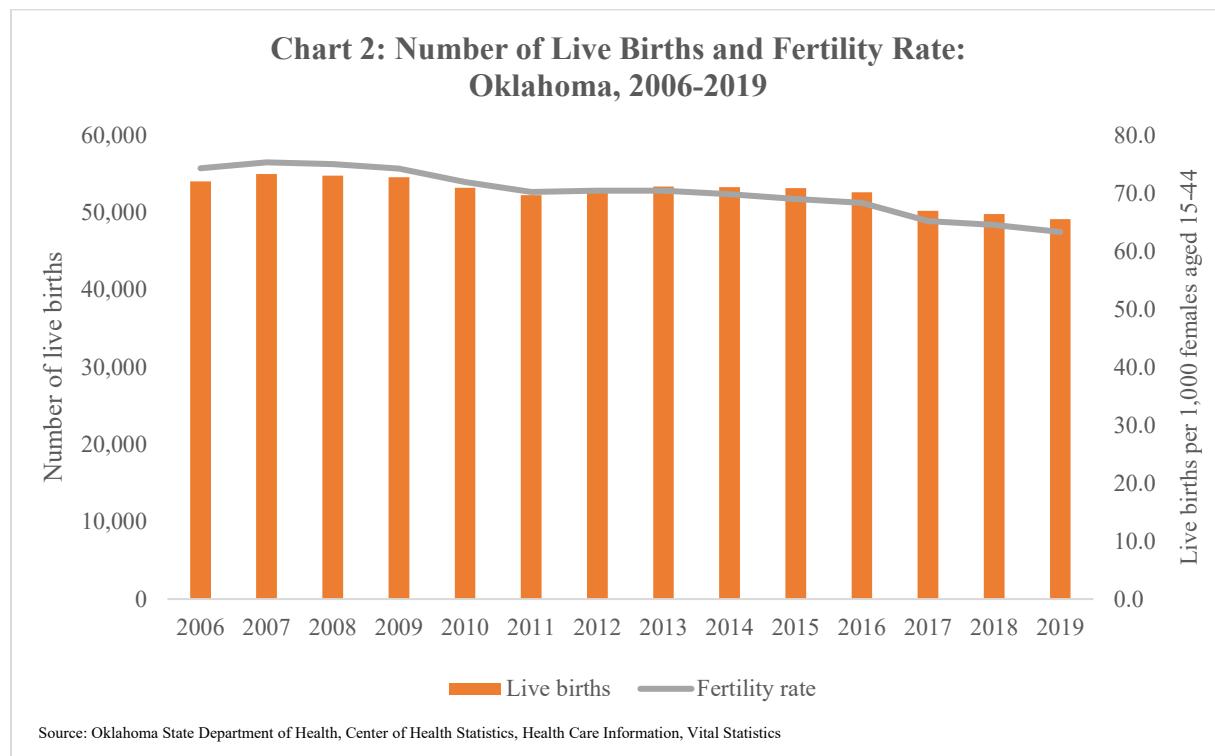
Oklahoma Data

Comparatively, during 2017-2019, Oklahoma had a maternal death rate of 23.5 maternal deaths per 100,000 live births. This rate has held steady from the period, 2016-2018, in which the rate was 23.6. It should be noted that periodically Oklahoma will review death records to update any past corrections or adjustments to death records that normally occur due to errors in coding, further investigation, changes in professional medical opinions, or judicial pronouncements. As such, any fluctuations, no matter how few, when reporting small numbers of events during a particular time frame will be reflected in what may appear to be large shifts in rates. Therefore, all rates mentioned in this report are accurate as to the date of this report (Chart 1).





While the Oklahoma maternal mortality rate has increased in recent years, the number of live births and the fertility rate for the state have been declining (Chart 2). On average since 2006, there are approximately 52,700 births per year in the state. However, each year from 2013 to 2019, the state has witnessed a decrease in the annual number of live births, declining by 8% over that study period. Likewise, the fertility rate has dropped by 10% from 70.5 births per 1,000 females aged 15-44 in 2013 to 63.3 in 2019. While maternal mortality has worsened in Oklahoma, it is doing so in a time where childbearing is falling among Oklahoma's women.



Fertility, of course, does vary by age. In 2019, the age-specific birth rate for females less than 25 years of age was 41.8 births per 1,000 population, down 37% since 2006 and representing approximately one third of all births in Oklahoma. The birth rate among women aged 25-39 was down as well, but the rate of change was more modest, only a 3% decline over the same period. Lastly, those women aged 40 or older experienced a rise in the rate of birth, climbing from 3.0 births per 1,000 population to 4.2 in 2019, a relative increase of 40%.

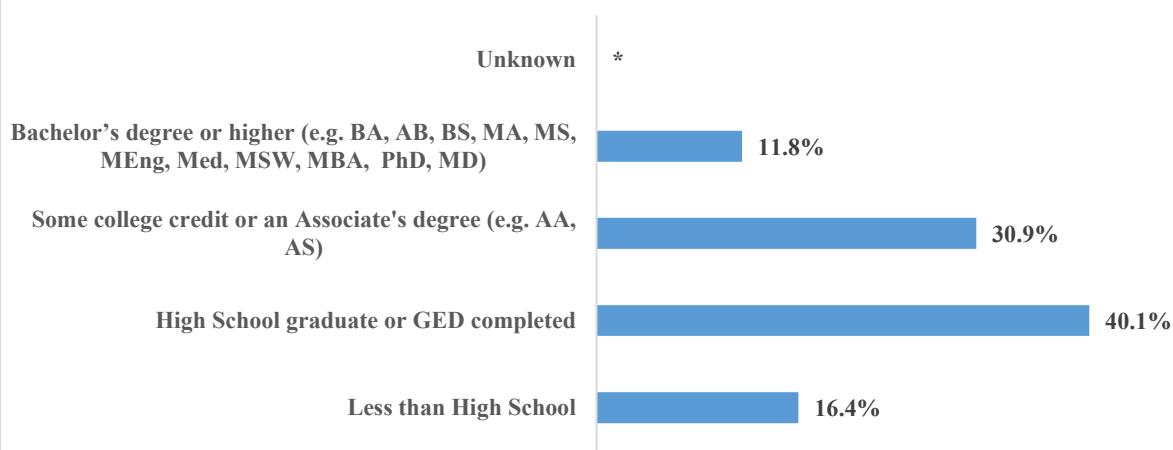


Education Level Attained

In 2019, of the 49,143 Oklahoma women who gave birth, 15.0% had less than a high school education, 31.4% earned a high school diploma or passed a General Educational Development Test (GED), 30.4% received some college credit or earned an Associate's degree, and 22.8% attained a Bachelor's degree or higher.

In Oklahoma for years 2006-2019, the majority of maternal deaths (40.1%) occurred among women who graduated from high school or had passed a GED. Women who received some college credit but did not obtain a degree or who had acquired an Associate's degree accounted for 30.9% of maternal deaths; 16.4% were among women who had less than a high school education. Those women who received a Bachelor's degree or higher accounted for 11.8% of maternal deaths (Chart 3).

Chart 3: Percentage of Maternal Deaths by Educational Level Attained, Oklahoma 2006-2019



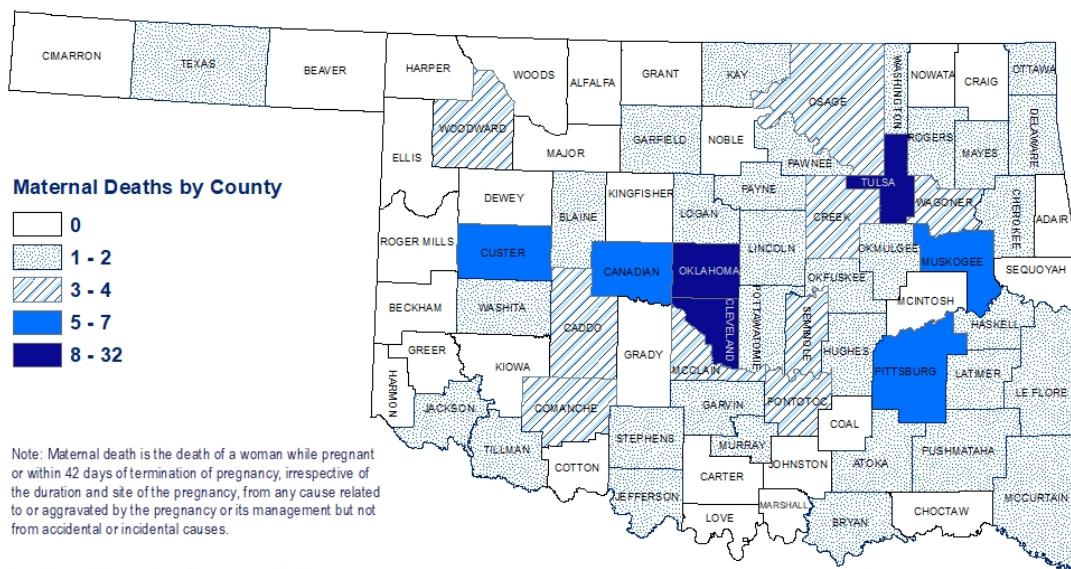
Source: Oklahoma State Department of Health, Center for Health Statistics, Health Care Information, Vital Statistics



County of Residence

During 2006 to 2019 in Oklahoma, 29 of 77 counties did not experience a maternal death. Forty-two counties had less than five maternal deaths. Four counties reported between five and seven deaths. The following three counties are the most populous counties in Oklahoma and experienced the largest counts of maternal deaths: Cleveland County, which is located just south of Oklahoma County, had eight maternal deaths; Tulsa County had 20 maternal deaths; and Oklahoma County, 32. Oklahoma is considered a rural state in regards to land area and population density. The Census Bureau defines rural as land that is not part of an urban area. An urban area is an area where the population numbers at least 2,500 people of whom 1,500 are residents of non-institutional buildings. Populations of 50,000 or more are considered to be in an urbanized area; whereas populations of 2,500 to 50,000 are part of an urban cluster.³ Maternal deaths by county of residence occurred 53.3% of the time in urban areas of the state with 46.7% occurring in rural areas.

Maternal Deaths by County of Residence, Oklahoma 2006-2019



Data Source: Oklahoma State Department of Health,
Health Care Information, Vital Records

Created: 07.19.2021

Projection/Coordinate System: USGS Albers Equal Area Conic

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Disclaimer: This map is a compilation of records, information and data from various city, county and state offices and other sources, affecting the area shown, and is the best representation of the data available at the time. The map and data are to be used for reference purposes only. The user acknowledges and accepts all inherent limitations of the map, including the fact that the data are dynamic and in a constant state of maintenance.



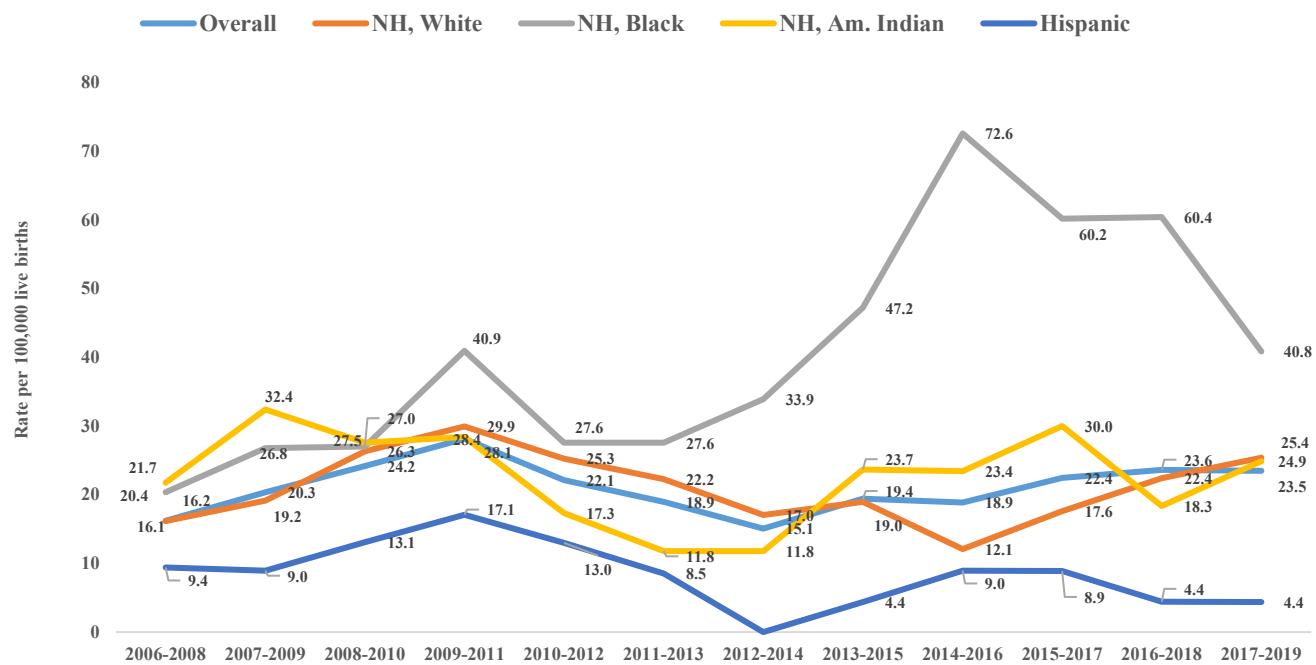
Maternal and Child Health Assessment Division
Maternal and Child Health Service
Family Health Services



Race/Ethnicity

Maternal deaths by race in Oklahoma for 2017-2019 showed that the maternal mortality rate among non-Hispanic White women was 25.4 maternal deaths per 100,000 live births, compared to the non-Hispanic African-American/Black women, whose rate was 1.6 times higher, recording 40.8 maternal deaths per 100,000 live births. The non-Hispanic African-American/Black rate dropped 32.5% from 2016-2018. The non-Hispanic American Indian rate for 2017-2019 (24.9) showed a 36.1% increase from the maternal mortality rate of 18.3 recorded in 2016-2018. The Hispanic rate of maternal deaths remained consistent at 4.4 for 2017-2019. Deaths among Native Hawaiian or Asian/Pacific Islanders has been suppressed due to the small number of cases (Chart 4).

Chart 4: Rate of Maternal Deaths per 100,000 Live Births by Race/Ethnicity, Oklahoma 2006-2019, Three-Year Rolling Rate



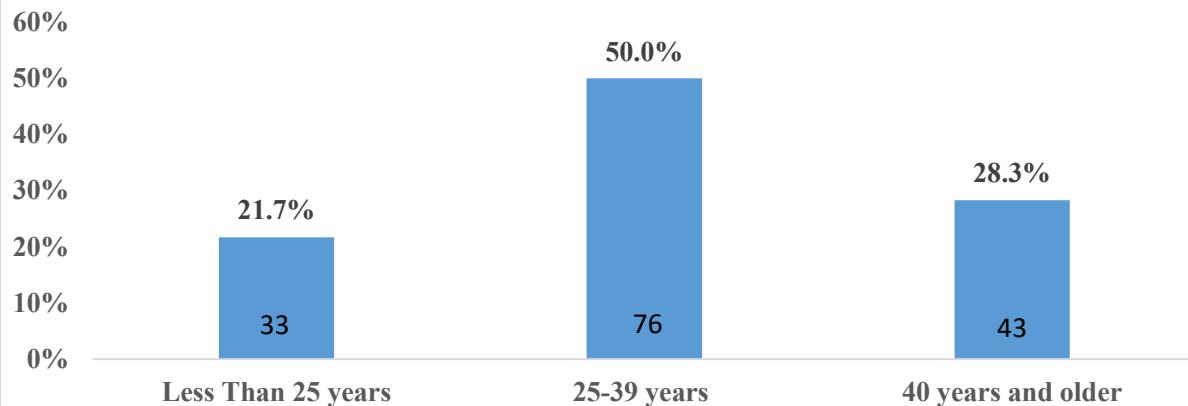
Source: Oklahoma State Department of Health, Center For Health Statistics, Health Care Information, Vital Statistics



Age at Time of Death

In Oklahoma, half of all mothers (50.0%) who died (76 deaths) within 42 days of a pregnancy termination were aged 25-39 years. Those aged 40 years and older (43 deaths) comprised 28.3% of maternal deaths. The fewest deaths occurred among mothers less than 25 years of age with 33 deaths, or 21.7% of all maternal deaths during 2006-2019 (Chart 5).

**Chart 5: Percentage of Maternal Deaths by Age at Time of Death,
Oklahoma 2006-2019**



Source: Oklahoma State Department of Health, Center for Health Statistics, Health Care Information, Vital Statistics



Top Causes of Maternal Mortality

As stated in the 2019 review of The American College of Obstetricians and Gynecologists (ACOG) Practice Bulletin⁴, cardiovascular disease is now considered the leading cause of death in pregnant and postpartum women in the United States.

In Oklahoma, the top five causes of maternal deaths for years 2006-2019 were:

- Cardiovascular conditions
- Infections
- Non-cardiovascular diseases
- Hemorrhage
- Cancer

The majority of maternal deaths result from cardiovascular conditions such as arrhythmia and pericardial tamponade. Tied for second are infections or sepsis, and non-cardiovascular disease is positioned third, which includes epilepsy, pulmonary issues, cirrhosis, asthma, pneumonia, and diabetes. Hemorrhage is the fourth leading cause of death, with cancer rounding out the top five causes of maternal deaths.

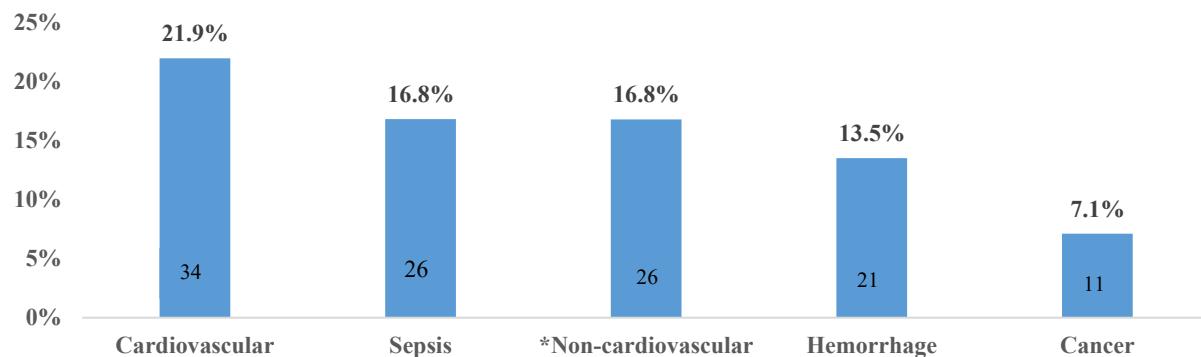
Other health issues contributing to the underlying causes of maternal death include thrombotic pulmonary embolism, amniotic fluid embolism, pulmonary embolism, hypertensive disorders associated with pregnancy, cerebrovascular difficulties, and cardiomyopathy.

Due to the fact that Oklahoma has adopted the Maternal Mortality Review Information Application (MMRIA) reporting guidelines, amniotic fluid embolism is separated from the death grouping of embolisms because of differences in etiology,⁵ thus causing the groupings for embolism type characteristics to drop from the top five causes of maternal death.

Oklahoma continues to rank among the worst states in the U.S. for several health indicators such as obesity, smoking, and poverty, which are contributing factors to an unhealthy pregnancy and adverse pregnancy outcomes (Chart 6 on next page).



Chart 6: Percentage of Maternal Deaths by Top Five Causes, Oklahoma 2006-2019





Women's Health Overview

Oklahoma has the second highest uninsured rate at 18.0% behind Texas at 21.4% for 2019 among the nonelderly population, compared to the national rate at 11.1%.⁶ In Oklahoma during 2019, according to the Behavioral Risk Factor Surveillance System (BRFSS), among women aged 18 to 44 years for 2019, 17.0% reported their health status as fair or poor and 24.3% felt that within the past year a doctor visit was too costly to be able to attend. Approximately 14.0% of women aged 18-44 reported having high blood pressure, 3.7% reported a diabetes diagnosis, and 3.4% reported gestational diabetes. In addition, 1.3% of women reported having been told by a doctor they suffered a stroke and 1.0% reported experiencing a heart attack. Among women of reproductive age, 67.6% were considered to be overweight or obese. Smoking also continues to be a public health concern. Among women in this age group, 18.4% reported being a current smoker, 13.3% reported smoking daily, while 16.1% reported being a former smoker.⁷





Postpartum Visits

According to the most recent Pregnancy Risk Assessment Monitoring System (PRAMS) data (2016-2019), 88.0% of new mothers in Oklahoma attended their postpartum visit. White mothers reported a higher postpartum visit rate (90.0%) than Black mothers at 85.2%, Native American mothers at 83.8% and mothers who reported their race as other at 84.3%.

Postpartum Depression

Postpartum depression (PPD) occurs in an estimated 1 in 8 women that give birth every year. The onset of depressive, sad, or pessimistic feelings that may interfere with daily activities usually occurs during the six months after giving birth but this onset of symptoms can happen up to one year postpartum. Nationally, according to the CDC's PRAMS data in 2019, 13.4% of women experienced depressive symptoms or feelings of hopelessness following pregnancy and delivery.⁹

Oklahoma PRAMS, for years 2016-2019, reported 16.1% of new mothers had experienced symptoms of postpartum depression. Almost 19% of Non-Hispanic Black mothers reported this issue compared to Non-Hispanic White mothers at 16.7%. Depressive symptoms among Non-Hispanic American Indian mothers were reported for 14.8%, while Hispanic mothers reported depression least often at 11.7% (Table 1).

According to data from the 2018-2019 The Oklahoma Toddler Survey (TOTS), 54.0% of new mothers were screened for postpartum depression. Non-Hispanic White and Non-Hispanic American Indian mothers reported having been screened 61.4% and 60.1%, respectively. Screenings occurred 58.8% of the time among Hispanic mothers. Non-Hispanic Black mothers reported the fewest screenings at 47.2%. Additionally, 14.1% of mothers with toddlers indicated they had been diagnosed with PPD sometime after their toddler was born. Numbers for women reporting being diagnosed with depression by race are not included due to low cell count numbers per category of less than 30 (Table 1). The Oklahoma TOTs is a two-year follow-up survey to the Oklahoma PRAMS survey which evaluates the health and well-being of Oklahoma's toddler population and their health experiences from birth to age two.



Table 1. Percent of women experiencing postpartum depression symptoms, who were screened for postpartum depression, and those with a postpartum depression diagnosis.

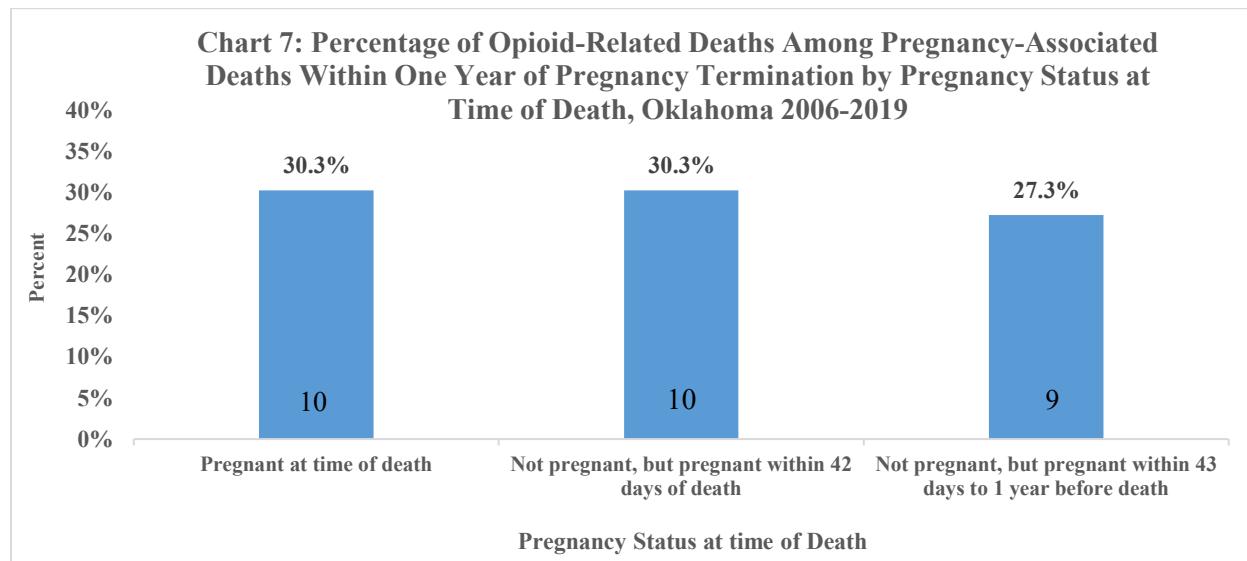
Postpartum Depression	Data Source	Prevalence (%)
Symptoms	PRAMS 2016 - 2019	16.1
NH White		16.7
NH Black		18.9
NH American Indian		14.8
NH Other		18.2
Hispanic		11.7
Screened	TOTS 2018 - 2019	54.0
NH White		61.4
NH Black		47.2
NH American Indian		60.1
NH Other		47.6
Hispanic		58.5
Diagnosed	TOTS 2018 - 2019	14.1
NH White		*
NH Black		*
NH American Indian		*
NH Other		*
Hispanic		*

Note - * indicates rate are not displayed because cell size is less than 30



Opioid Deaths

Opioid-related deaths made up 8.1% of Oklahoma's 356 pregnancy-associated deaths for 2006-2019. A pregnancy-associated death is defined as "the death of a woman while pregnant or within one 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".¹ For pregnancy-associated deaths from 2006 to 2019, opioid-related deaths occurred equally at 30.3% among mothers that were pregnant at the time of their death and those within 42 days postpartum. Twenty-seven percent of mothers died 43 days to one year postpartum (Chart 7).





Methodology

In 2019, Oklahoma adopted the CDC's methodology for reporting maternal deaths. The new method known as the 2018 Method, is intended to refine the collection and reporting of maternal deaths by limiting coding inaccuracies associated with the pregnancy checkbox.

The methodology defines the death of a woman aged 10-44 years within 42 days of pregnancy termination with a positive pregnancy checkbox on the death certificate and an underlying cause of death related to a maternal code. All death certificates among maternal deaths aged 10-44 years that only had a positive pregnancy checkbox will be selected for further investigation; however, these deaths will be included in maternal death counts where pregnancy termination occurs at more than 42 days up to one year by assigning them a late maternal code or until otherwise determined not to be valid and thereby excluded.

The checkbox will not be the only source of confirmation to women over the age of 44 years. To classify a maternal death involving a woman over age 44 years, a death must contain a maternal-related condition as an underlying cause of death, a condition that can be found in ICD-10-CM 2019: The Complete Official Codebook.¹⁰ The National Center for Health Statistics (NCHS) methodology states that maternal deaths due to an explicit obstetric condition will be counted regardless of age. Also, it should be noted that the reporting of small numbered events, even across several years to help with stability, may continue to be volatile.¹¹



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.

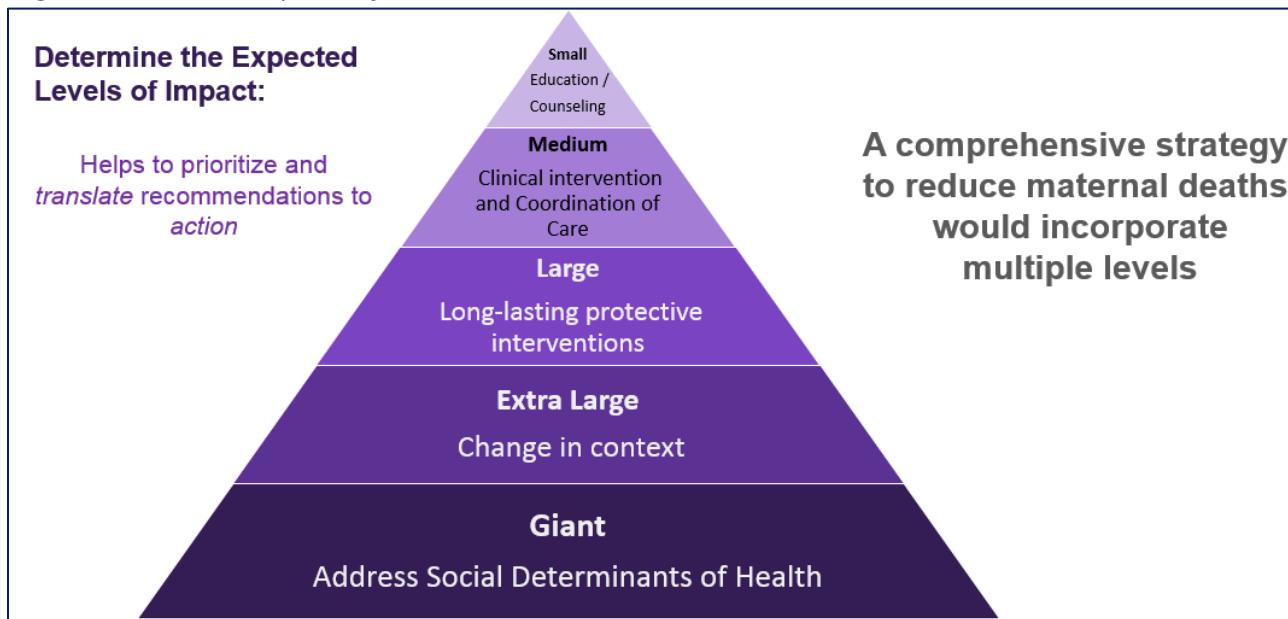
The Oklahoma MMRC operates under the auspices of the Oklahoma State Department of Health. Through uniform procedures, defined processes, and assigned responsibilities, the OSDH initiates the MMRC process by identifying pregnancy-related cases. Deaths of women of childbearing age are reviewed to determine if the death is to be classified as a pregnancy-related death 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. Another aspect of the death review is to conclude what level of impact a committee recommendation or prevention strategy would have to the population at large during the primary, secondary, or tertiary stage.

The impact levels are defined as small (individual behavioral changes), medium, large, extra-large, and giant (population level changes) which are based on the Health Impact Pyramid (Figure 1 next page).⁵



Figure 1: Health Impact Pyramid



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 in order 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 provide overwhelming health-related benefits for all Oklahomans. Health benefits could include reduced rates of obesity, smoking during pregnancy, increased access to prenatal and well-woman care, and education for health care providers on postpartum warning signs.

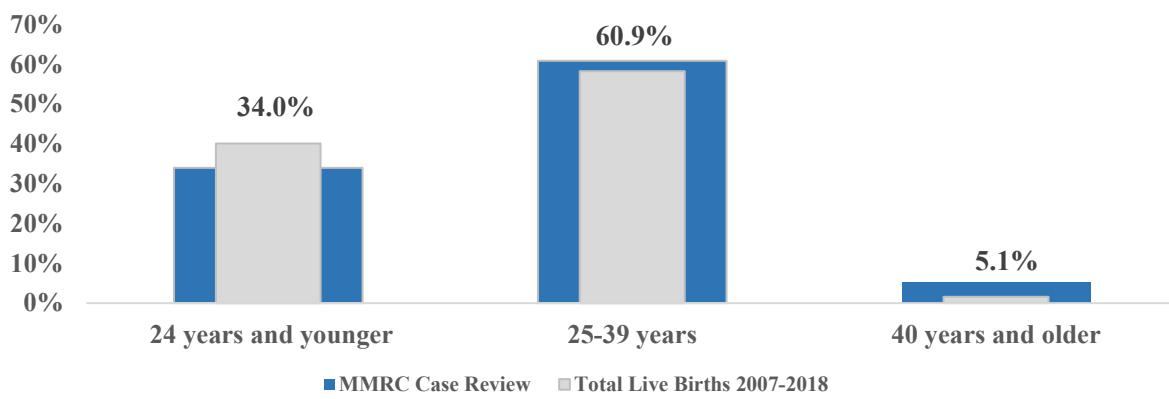


The Oklahoma MMRC reviews all potential maternal deaths where on the official death certificate a pregnancy checkbox indicates that the death of the women aged 10-44 years occurred during pregnancy or within one year of pregnancy termination and an underlying cause of death is related to a maternal code.

Women over age 44 years are included in MMRC reviews if their death certificate specifies a maternal-related condition as an underlying cause of death. Oklahoma has reviewed 138 cases through April 2021, whose ages range from less than 19 years to 45 years and older. The 138 cases involved maternal deaths during years 2007-2018.

The majority of the MMRC reviewed cases (60.9%) fall into the age ranges 25-39 years compared to 58.3% of live births that occurred among women of this age range. Live births during 2007-2018 occurred to 40.1% of birthing women and 34.0% of maternal deaths reviewed happened to women aged 24 years and younger. The rate of maternal deaths among the reviewed cases involved women aged less than 24 years at 11.1 per 100,000 live births, women aged 25-39 years at 19.4, and 388.9 for women aged 40 years and older. Those mothers considered to be of an advanced maternal age, older than 35 years, comprised 20.3% of the reviewed cases. The fewest reviewed cases (5.1%) were for mothers 40 years and older whereas 1.6% of all live births were to women aged 40 and older (Chart 8).

Chart 8: Percentage of Oklahoma Maternal Mortality Committee Case Reviews of Maternal Deaths* by Age at Time of Death Compared to Percentage of Live Births by Age at Birth for Years 2007-2018



*Maternal Mortality Review Committee cases include all maternal deaths up to one year of termination of pregnancy that occurred from 2007-2018.

Source: Oklahoma State Maternal Mortality Review Committee and the Oklahoma State Department of Health, Center for Health Care Information, Vital Statistics.



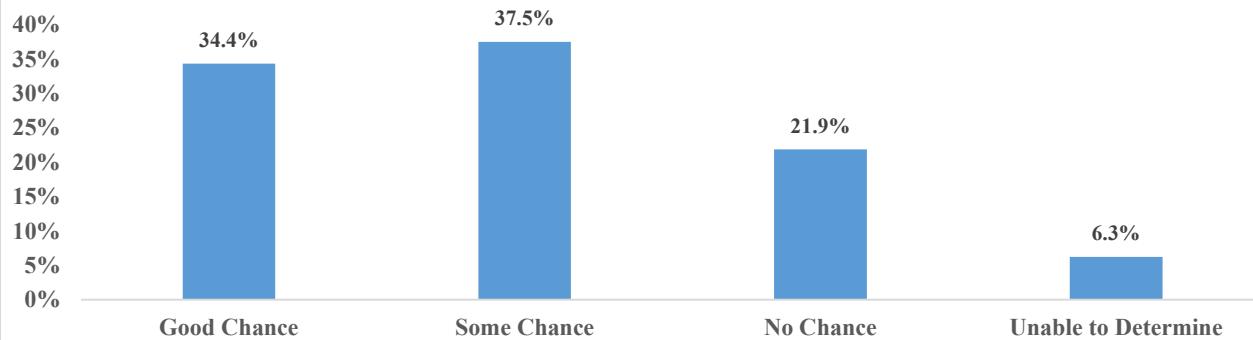
Among the 138 cases reviewed by the Oklahoma MMRC, the deaths occurred most among mothers not pregnant, but pregnant within 42 days of pregnancy termination (46.4%), followed by deaths of women who were pregnant at the time of death (24.6%). The remaining deaths (16.7%) were to mothers that died between 43 days and one year of pregnancy termination, with this data point missing for 12.3% of the cases.

The MMRC determined that 44.2% of the 138 cases reviewed were actually pregnancy-related, while 24.6% were possibly pregnancy-related. Pregnancy-associated but not related deaths were attributed to 25.4% of the cases with 5.8% unable to be determined.

The MMRC, through April 2021, has utilized the MMRIA Decision Form for 34 of the most recent case reviews. Of those cases, the committee determined that 70.6% of the deaths could have been preventable. In addition, it was determined that among the 34 cases, 37.5% and 34.4%, respectively, had some or a good chance to alter their outcome, and 21.9% had no chance to alter their outcome.

For 6.3% of the cases reviewed, the committee was unable to determine chances to change the outcome given the data available at the time of review (Chart 9).

Chart 9: Maternal Mortality Review Information Application Decision Form Used to Determine the Chance to Alter Outcome Among Oklahoma Maternal Death Cases Reviewed for Years 2016-2018



Source: Oklahoma Maternity Mortality Review Committee case reviews



Severe Maternal Morbidity (SMM)

Oklahoma is one of nine states that received the State Maternal Health Innovation Program (SMHIP) Grant to increase access to health care, improve health education, and address social determinants of health for pregnant and postpartum women and their families. This program is designed to improve disparities in maternal health outcomes and focuses on reducing both maternal mortality and severe maternal morbidity.¹²

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. The SMM definition is 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.¹³ For reporting purposes, blood transfusion codes will be included in this working definition of SMM. Rates for SMM are reported as per 10,000 deliveries.

Nationally, in 2014 (the most recent data available) SMM rates have been continually increasing, affecting more than 50,000 women annually.¹⁴ The CDC reports that from 1993 to 2014 SMM rates increased 200% from 24.5 per 10,000 in-hospital deliveries to 144.0 in 2014. Most of these complications did involve blood transfusions. Hysterectomy and ventilation or temporary tracheostomy were the next most frequent complications experienced.

In Oklahoma, only state licensed facilities contribute to the collection of SMM data and thus there are limitations to the process involved with analyzing hospital discharge data in measuring all of Oklahoma's potential SMM cases. Most recently in Oklahoma for years 2016-2019 in-hospital deliveries, as well as the number of live births have been declining.

In 2019, Oklahoma witnessed a 6.6% overall decline in live births, recording 49,143 live births compared to 2016 with 52,607 live births. The decline in live births occurred among all races; however, the rate of Hispanic births saw an increase of 2.4%. The rates of SMM involving blood transfusions are beginning to show a decline from 169.8 in 2016 to 140.2 in 2019 per 10,000 deliveries. Hypertension numbers for years 2016-2019 have increased 26.0% from 1,447 to 1,823 cases. SMM identified complication rates that include hypertension as well as transfusions remain around 22.0 with the exception of 2017, where the rate showed a high of 26.9 (Table 2).



Table 2: Oklahoma Hospital Discharge Data, 2016-2019

Discharge Year	Deliveries							Per 10,000 deliveries			
		SMM including transfusion	SMM excluding transfusion	Hypertension (HTN)	SMM including transfusion + HTN	SMM excluding transfusion + HTN	SMM including transfusion	SMM excluding transfusion	SMM including transfusion + HTN	SMM excluding transfusion + HTN	
2016	47,106	800	305	1,447	141	103	169.8	64.7	29.9	21.9	
2017	45,058	843	337	1,700	167	121	187.1	74.8	37.1	26.9	
2018	43,730	682	282	1,711	127	96	156.0	64.5	29.0	22.0	
2019	43,795	614	263	1,823	137	95	140.2	60.1	31.3	21.7	

Source: Oklahoma State Department of Health, Center for Health Information.





Conclusions and Recommendations

Through comprehensive case reviews, the MMRC generated recommendations identified to help improve access to quality pregnancy-related health care that will contribute to a reduction in the number of maternal deaths in Oklahoma.

Due to COVID-19 restrictions, the MMRC had limited opportunities to review cases and act on recommendations during 2020. Consequently, some of the following recommendations are being carried over from the prior report.

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.

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 postpartum warning signs and how to seek care.
- **Recommendation:** Educate healthcare providers, pregnant women, and their families about pregnancy warning signs and how to seek care
- **Recommendation:** Promote the use of the AIM maternal safety bundles in all Oklahoma birthing hospitals.

Conclusion: Awareness and personal responsibility are also important factors in the occurrence of a maternal death.

- **Recommendation:** Increasing awareness of possible pregnancy and post-delivery complications and educating pregnant women and their families to seek medical care sooner, thereby limiting the risks for



maternal mortality and morbidity and increasing time for medical intervention.

- **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 compliance with follow-up care and postpartum visits.
- **Recommendation:** Promote the Oklahoma Perinatal Quality Improvement Collaborative (OPQIC) Empowering Pregnant and Postpartum Patients Toolkit
- **Recommendation:** Encourage providers and hospitals to adopt the TeamBirth initiative.¹⁵

Conclusion: Potentially relevant information is still missing from case review data when an autopsy is not performed for a maternal death.

- **Recommendation:** Require an autopsy for any death of a women while pregnant or within 365 days of pregnancy termination.

Conclusion: Lack of societal and familial support found in case reviews contributes to maternal mortality and morbidity.

- **Recommendation:** Watch for opportunities to address the social determinants of health including improved access to care, access to affordable insurance, access to reliable transportation, and expansion/extension of Medicaid coverage especially for those women experiencing pregnancy complications that require continued medical follow-up post-delivery.
- **Recommendation:** Support the Oklahoma Health Care Authority with efforts to expand Medicaid. Healthcare providers can educate families on eligibility requirements, assist with Medicaid enrollment, and refer to primary care for chronic health issues or OB/GYN for prenatal care when indicated.
- **Recommendation:** Encourage emergency rooms and labor and delivery triage units to make a follow-up phone call for pregnant and postpartum women within 24 hours of discharge.
- **Recommendation:** Support OSDH and OPQIC in facilitating TeamBirth across the state.



Conclusion: Lack of education and/or lack of simulation exercises for postpartum hemorrhage and hypertension/preeclampsia may contribute to maternal morbidity and mortality

- **Recommendation:** Continue to encourage all birthing hospitals and prenatal care providers to implement AIM maternal safety bundles, hold emergency simulation drills with staff, and ensure the presence and utilization of chain of command procedures in emergencies.

Conclusion: Healthcare providers responding to crisis situations often do not have access to all relevant health care information.

- **Recommendation:** Improve coordinated efforts among medical providers to increase access to medical history through inter-compatibility of electronic medical records.

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.



Report Summary

According to the CDC, Oklahoma persistently ranks among the states with the worst rates (40th) of maternal deaths in the U.S.¹⁶ The national maternal mortality rate increased 15.5% from 17.4 maternal deaths per 100,000 live births in 2018 to 20.1 during 2019. Oklahoma's reported three-year maternal mortality rate for 2017-2019 was 23.5 maternal deaths per 100,000 live births.

Oklahoma's 2006-2019 top five causes of maternal deaths are similar to what has been reported nationally, except for Oklahoma's incidence of cancer deaths, which rounded out the state's top five.

Maternal deaths during 2006-2019 in Oklahoma most often occurred among women who had completed high school and either received a diploma or a GED, followed by women who received some college credit but did not obtain a degree.

Opioid deaths comprised 8.1% of pregnancy-associated deaths and occurred equally among mothers that died while pregnant and to mothers who died within 42 days from termination of pregnancy.

Severe maternal morbidity is a challenge for women's health care not only in Oklahoma but nationally. Most cases involve blood transfusions. In Oklahoma, many hospitals have adopted the use of AIM maternal safety bundles to address issues of delivery complications and thus declines have been observed in the rates of SMM related to blood transfusions. There is an increased incidence noted in those women with transfusions and hypertension for 2019.

Women's health in Oklahoma is a challenge with the second highest uninsured rates in the U.S. at 18.0%. Both the U.S. and Oklahoma maternal mortality rates show similar disparities by race and ethnicity. High adult smoking rates in Oklahoma contribute to adverse birth outcomes. Obesity rates along with other chronic health issues continue to burden the health status of women in Oklahoma. Women aged 35 and over tend to experience more difficult pregnancies along with adverse birth outcomes.

In Oklahoma during years 2017-2019, 20.3% of maternal deaths reviewed by the Oklahoma MMRC occurred among women of an advanced age (≥ 35 years). An encouraging improvement is the increase in the number of birthing hospitals adopting the AIM maternal safety bundles and the increase to 88.0% of new mothers attending their postpartum visit.



Maternal morbidity and mortality related to labor and delivery is increasing among women that present with poor health or chronic health-related conditions prior to becoming pregnant. Chronic health conditions most often cited among maternal deaths include hypertension, cardiovascular disease, and obesity.

The MMRC decisions indicated that most women who died within one year of a pregnancy ending could possibly have had a better outcome had particular health related issues been better managed prior to, during, or after the pregnancy. Such health-related issues include receiving preconception health screenings, increased access to appropriate prenatal care, increased awareness of possible complications post-delivery and seeking medical intervention as soon as warning signs are identified.



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