

## **Maternal Mortality in Oklahoma, 2004-2018**

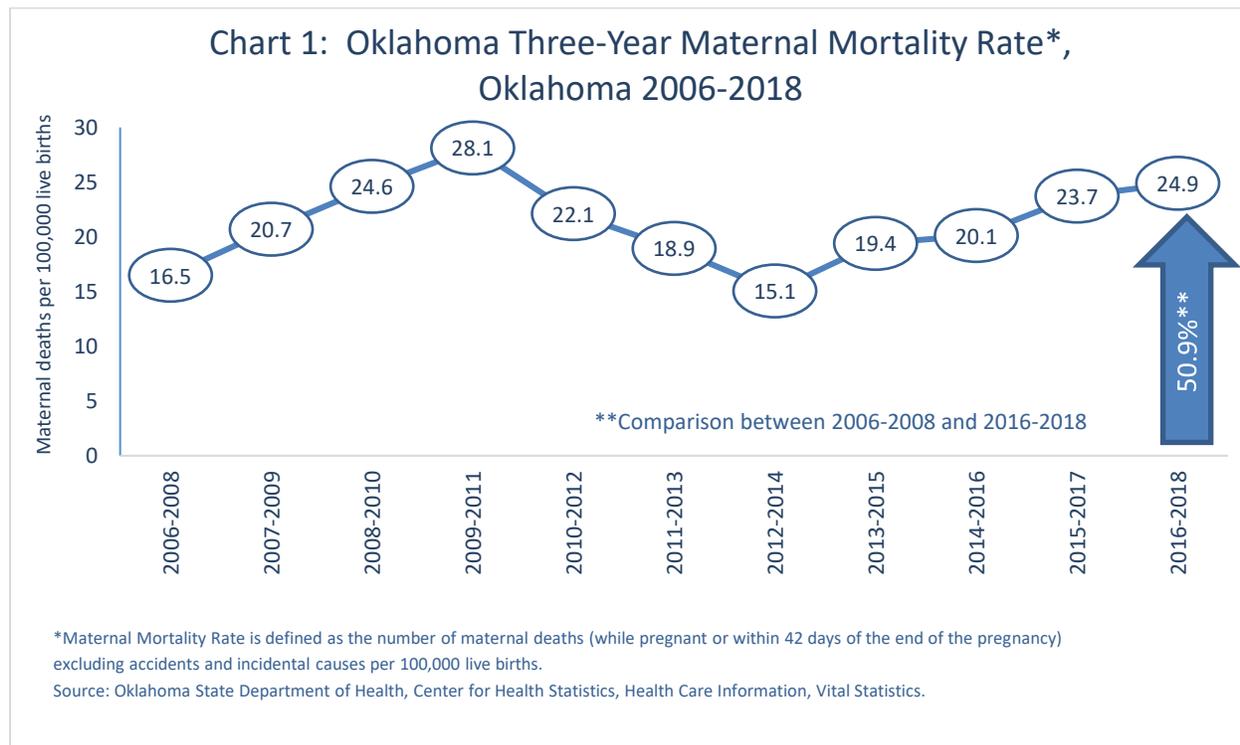
For the past 18 years in the state of Oklahoma, an average of 11 women died of complications related to pregnancy every year. Nationally, according to the Centers for Disease Control and Prevention (CDC), 700 women die every year related to a pregnancy or from delivery complications.<sup>1</sup> Since maternal mortality is viewed as an indicator of the overall effectiveness of obstetric practices and of health care systems, factors that contribute to its decline must be identified, reduced, or eliminated. Most maternal deaths happen before or soon after the mother has given birth, usually within a few weeks or months postpartum, not during the labor and delivery of the baby. In 2017 in the U.S., over 15% of all births were to older mothers. As a result of this delay in the age at which a woman decides to have a child, the potential for adverse health consequences also increase. Maternal deaths involve complex issues beyond the direct care a birthing facility provides. Issues that need attention include improving preconception health, early and continued prenatal care along with postpartum education. New mothers should be adequately educated regarding warning signs of possible health consequences that may constitute a medical emergency.

In January 2020, the Centers for Diseases Control and Prevention (CDC) released a revised methodology for reporting maternal deaths. The new method is known as the 2018 Method and is intended to refine collection and reporting of maternal deaths by limiting coding inaccuracies associated with the pregnancy checkbox. The CDC's revised estimates for 2018 show the U.S. had 17.4 maternal deaths per 100,000 live births; the CDC lists Oklahoma's rate of maternal deaths as 30.1 maternal deaths per 100,000 live births for 2018. This new method places Oklahoma's ranking as the fourth worst rate in the U.S., which includes all states and the District of Columbia; however, 27 of the states' maternal death rates were suppressed due to fewer than 10 deaths, in order to protect confidentiality.<sup>2</sup>

Briefly, this new methodology reflects the death of a women 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. In order to classify a maternal death involving a woman over age 44 years, that 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.<sup>3</sup> The National Center for Health Statistics (NCHS) methodology states that maternal deaths due to an explicit obstetric condition will be counted regardless of age. In Oklahoma, according to vital records provided by Health Care Information (HCI) and reviewed by MCH for years 2016-2018, while utilizing the 2018 methodology, the reported 3-year rolling average during 2016-2018 for Oklahoma was 24.9 maternal deaths per 100,000 live births. For added stability in rate reporting involving low numbers, Oklahoma only releases three year rates.

A maternal death is defined by the World Health Organization (WHO) “as 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.”<sup>4</sup> In Oklahoma for years 2016-2018, the maternal mortality rate increased by 50.9% over the 2006-2008 maternal mortality rate of 16.5 (Chart 1).

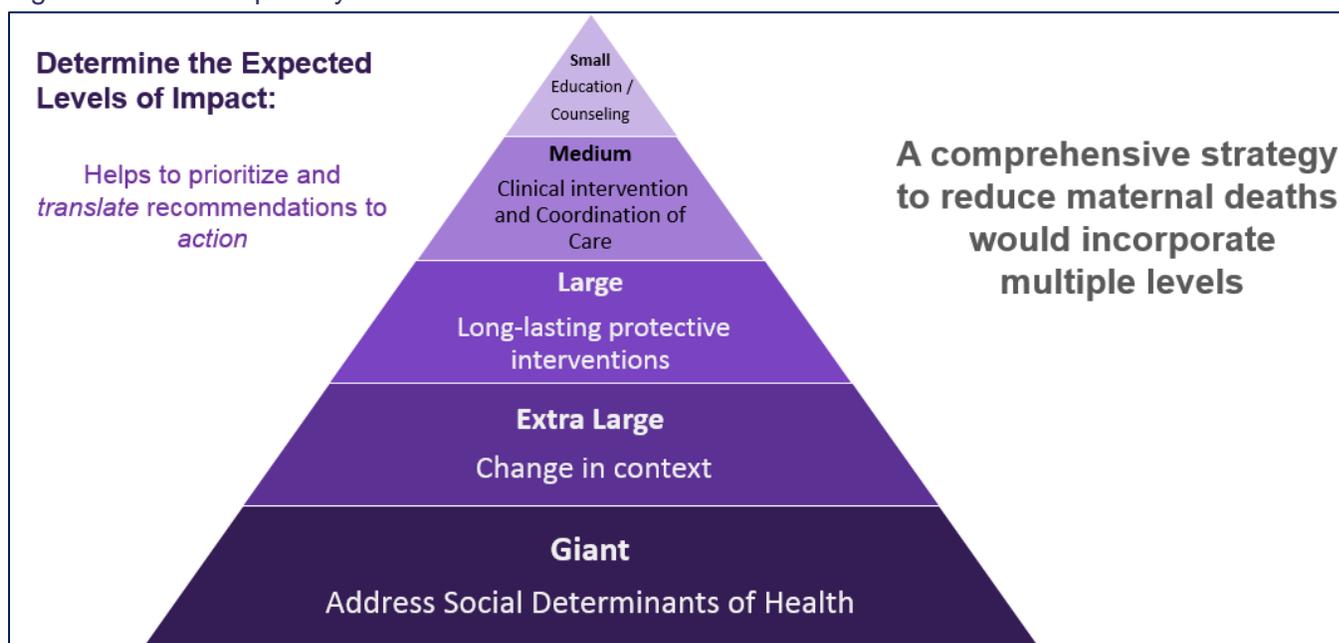


Oklahoma has a process to identify and explore the medical facts surrounding maternal deaths that has been designed to help improve health care for pregnant and postpartum women. The Maternal Mortality Review Committee (MMRC) is an essential statewide effort that has recently, through legislative action<sup>5</sup>, become a statutory committee with defined membership, responsibilities, and reporting criteria that will be used to explore opportunities to enhance and improve services to women, infants and their families. These qualitative, in-depth reviews investigate the causes of 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 a 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).<sup>6</sup>

Figure 1: Health Impact Pyramid

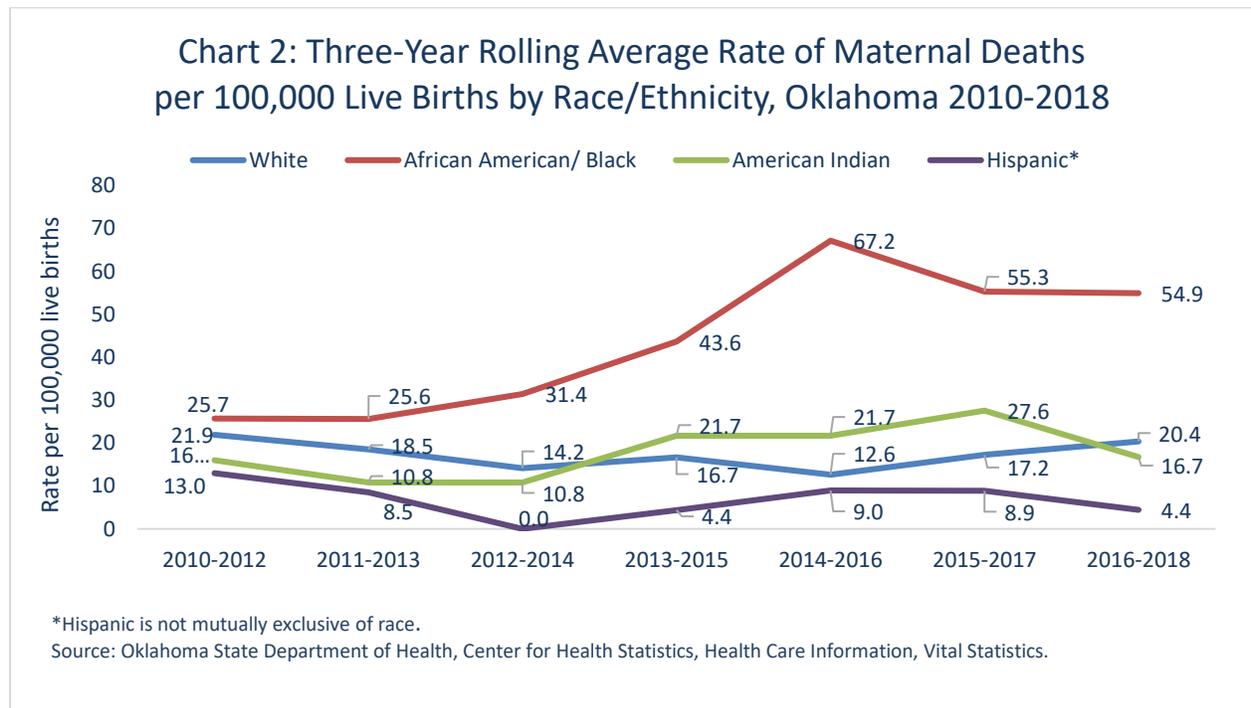


The MMRC efforts are designed to:

- 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.

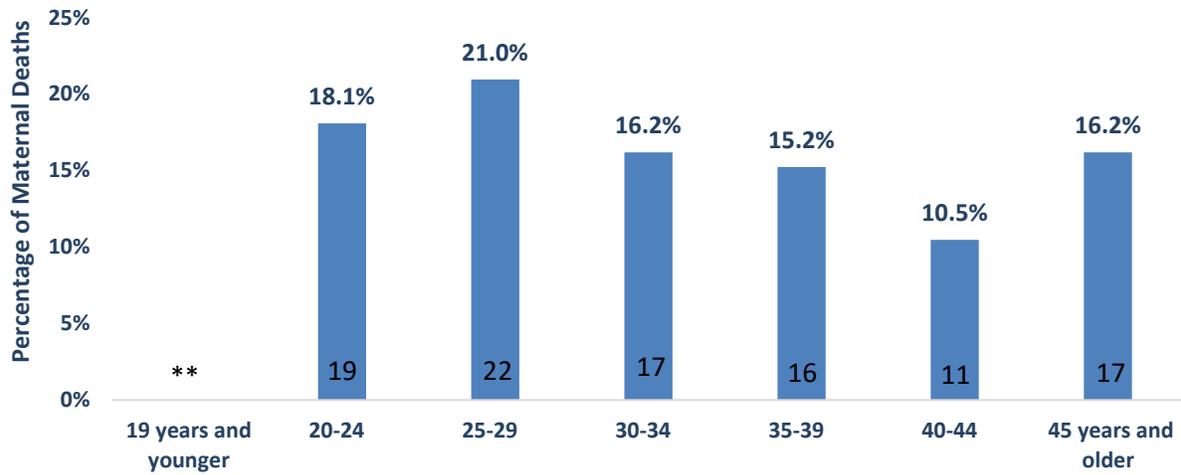
Interventions, strategies, and the development of systems that increase knowledge and decrease pregnancy-related mortality will serve not only to improve the health of women and children, but will provide overwhelming health-related benefits for all Oklahomans. Health benefits could include reduced rates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

Among the identified maternal deaths in Oklahoma for years 2004-2018, the Hispanic population had the fewest deaths. For 2016-2018, the Hispanic rate was 4.4 maternal deaths per 100,000 live births. A significant pattern among the African American/Black population continues to represent an alarming disparity of more than 2.5 times the rate of deaths compared to the white population. Native American women have experienced up to 1.5 times the rate of deaths when compared to white women over the years; however, the current 2016-2018 rate shows an 18.1% decline in its rate of maternal deaths compared to white women (Chart 2).



For years 2010-2018 in Oklahoma, the largest percentage of mothers (21.0%) that died in Oklahoma within 42 days of a pregnancy termination were aged 20-29 years (22 deaths). Those aged 45 years and older make up 16.2% of maternal deaths (17 deaths). The fewest deaths occurred among mothers aged 19 years and younger (Chart 3).

**Chart 3: Percentage of Maternal Deaths\* by Age at Time of Death, Oklahoma 2010-2018**



\*Maternal Death is defined as the number of maternal deaths(while pregnant or within 42 days of pregnancy termination) excluding accidents and incidental causes.

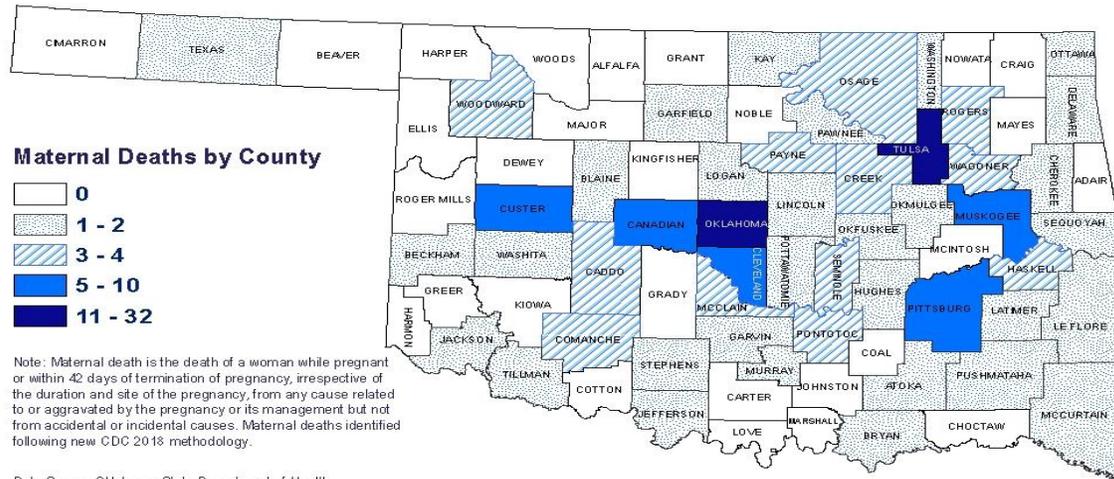
\*\*Suppressed due to small cell size.

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

### County of Residence:

During 2004 to 2018 in Oklahoma, 28 of 77 counties did not experience a maternal death. Forty-two counties had less than five maternal deaths. Five counties had between five and 10 deaths. Cleveland County which is located just south of Oklahoma County had eight maternal deaths. Tulsa County had 20 maternal deaths, and Oklahoma County had the most maternal deaths with 32.

## Maternal Deaths by County, Oklahoma 2004-2018



Created: 07.10.2020

Projection/Coordinate System: USGS Albers Equal Area Conic



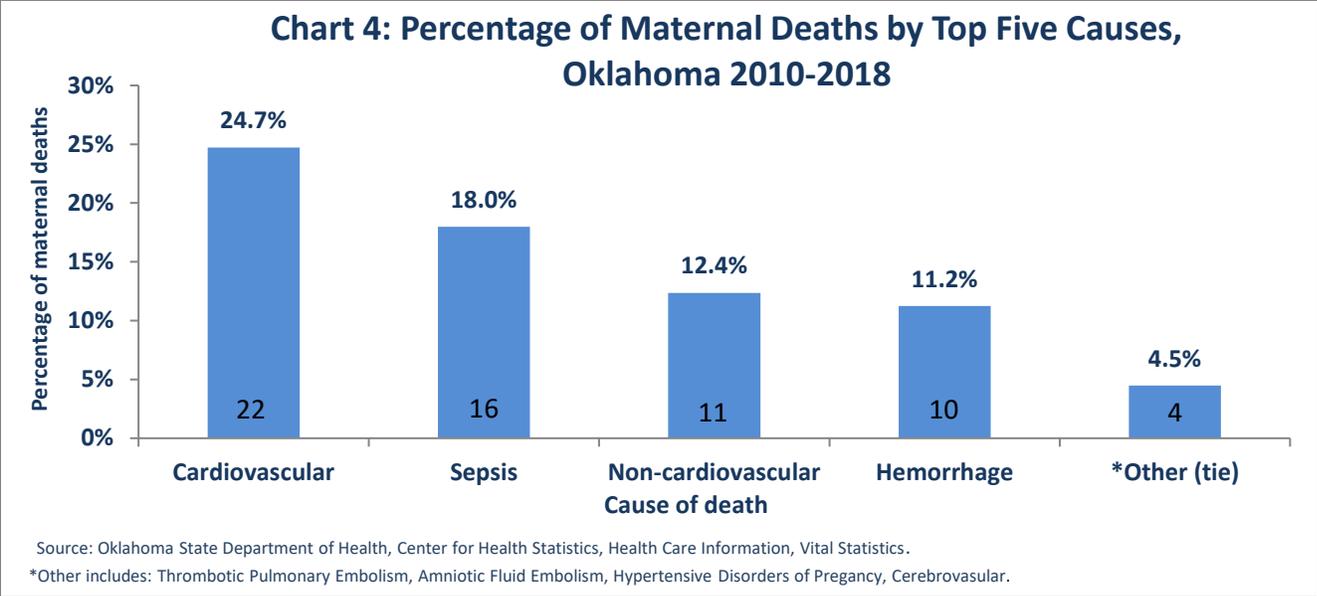
Disclaimer: This map is a compilation of records, information and data from various city, county and state offices and other sources, reflecting the area shown, and is the best representation of the data available at the time. The map and data are to be used for reference purposes only. The user acknowledges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



### Top Causes:

The top five causes of maternal deaths for years 2010-2018, include the following listed health issues. The majority of maternal deaths involve cardiovascular conditions such as arrhythmia and pericardial tamponade. Infections or sepsis is the second leading cause of maternal death in Oklahoma, followed by non-cardiovascular disease that includes epilepsy, cirrhosis, asthma, and pneumonia. Hemorrhage continues to be a major issue leading to death. There are equal numbers of death that formulate the top five underlying causes of maternal death that include thrombotic pulmonary embolism, amniotic fluid embolism, hypertensive disorders associated with pregnancy and cerebrovascular difficulties. 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 in an unhealthy pregnancy and adverse pregnancy outcomes.

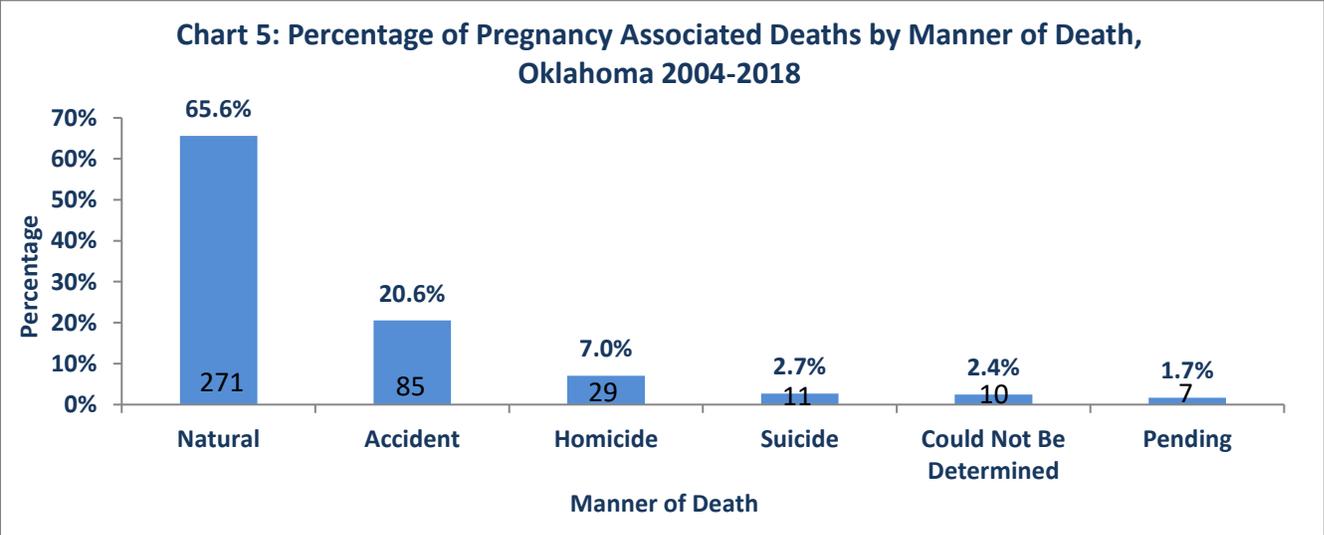
Nationally, for years 2011-2015 (most current data available), the top leading causes of maternal deaths result from cardiovascular disease followed by non-cardiovascular disease, infection or sepsis, hemorrhage, and cardiomyopathy.<sup>7</sup>



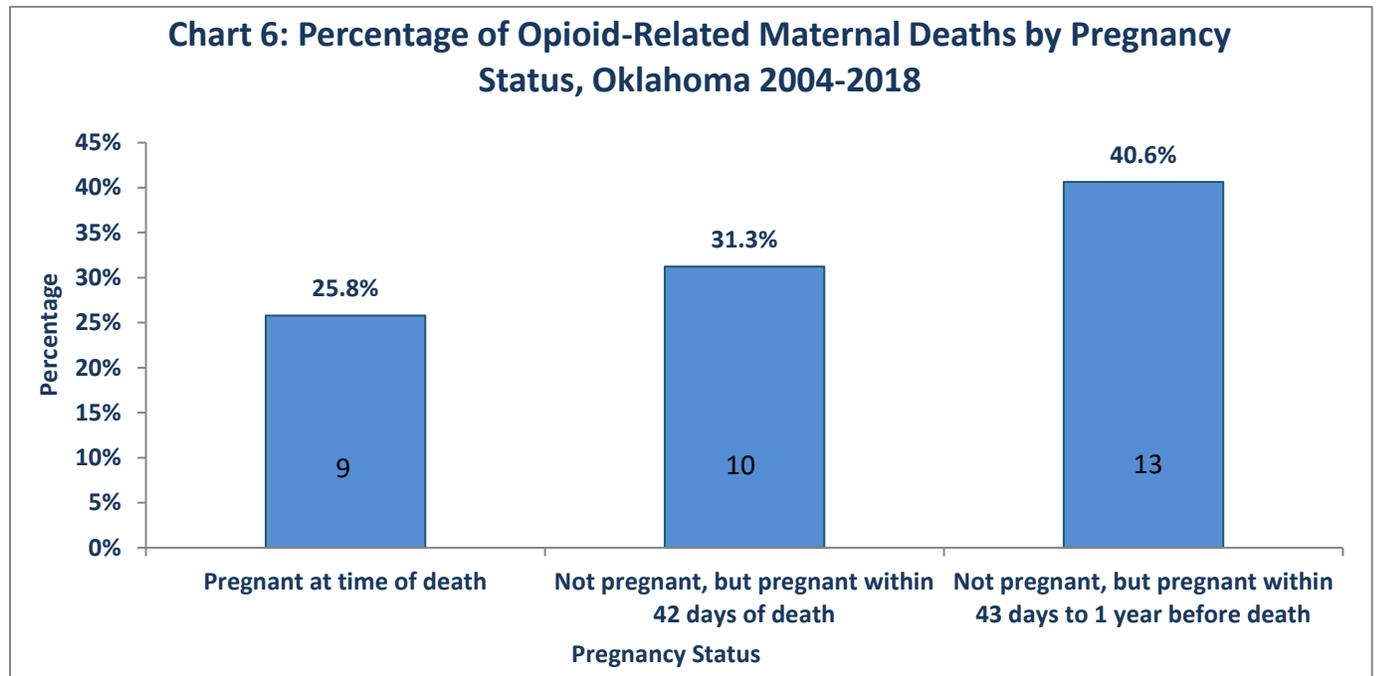
**Pregnancy Associated Deaths:**

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, but not from accidental or incidental causes.<sup>7</sup>

Of the 413 pregnancy-associated deaths in Oklahoma during 2004-2018, the majority (65.6%) were determined to be from natural causes. Natural causes are defined as a death due to the unique process of disease or aging. Twenty percent were attributed to accidents; the remaining deaths were recorded as homicide (7.0%); suicide (2.7%); and either pending (1.7%) or could not be determined 2.4% (Chart 5).



Opioid-related maternal deaths up to one year of the termination of a pregnancy during years 2004 to 2018 were often found among mothers that were 43 days to one year postpartum (40.6%). Thirty-one percent were determined to be among mothers within 42 days postpartum, and the remaining 25.8% were to women that were pregnant at the time of their death (Chart 6).



**Preventability:**

The CDC, in conjunction with the Association of Maternal & Child Health Programs (AMCHP), created a national initiative known as the Maternal Mortality Review Information Application (MMRIA). MMRIA was designed to assist states with standardizing the collection and reporting of maternal death data. Oklahoma recently adopted the use of MMRIA forms for capturing MMRC conclusions regarding preventability of death and the impact any positive actions would likely have had to alter the outcome. The MMRC has reviewed eight cases since utilizing the new forms, concluding that all but one case had some chance, even if small, of being preventable. The committee agrees that timelier interventions could have resulted in more positive outcomes for mother and infant.

**Conclusions/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.

MMRC staff routinely encounters difficulty in obtaining complete records, therefore, creating gaps in the information available to the review committee. As a result, the Oklahoma State Department of Health proposed legislation to strengthen the MMRC and expand legal access to all relevant information necessary to make informed recommendations to improve the quality of

care. The aforementioned legislation was passed in May 2019, signed into law by the Governor, and became effective in November 2019. This new state statute will allow MMRC members to access any death related reports from other state agencies/entities, such as police investigations, and reinforce the legal authority of the MMRC to conduct family interviews.

- Conclusion: Many women enter pregnancy with health issues that impact pregnancy outcomes.
  - Recommendation: Increase awareness in both public and private healthcare providers 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 the postpartum period contributing to mortality.
  - Recommendation: Educate healthcare providers, pregnant women, and their families about postpartum warning signs.
- Conclusion: Personal responsibility is also an important factor in the occurrence of a maternal death.
  - Recommendation: Increasing awareness of possible 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. In addition, health care providers should improve efforts to encourage compliance with follow-up care and postpartum visits.
- 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.
- 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.

## Summary:

Oklahoma has one of the worst rates of maternal deaths in the U.S. According to the CDC, utilizing the new 2018 methodology for defining a maternal death, Oklahoma ranks number four behind Alabama, Kentucky and Arkansas as having the most maternal deaths per 100,000 live births.<sup>1,2</sup> Both the U.S. and Oklahoma maternal mortality rates show similar disparities by race and ethnicity. Maternal morbidity and mortality related to labor and delivery is increasing among women that show symptoms of poor health or chronic health-related conditions prior to becoming pregnant. The U.S. has seen the numbers of women who delay having babies until a more advanced age, considered to be 35 years or older, steadily increase since the 1970's, while first time births to women over the age of 40 didn't begin to show an increase until the 1980's.<sup>8</sup> Older women tend to experience more difficult pregnancies and adverse birth outcomes. In Oklahoma during years 2010-2018, 41.9% of maternal deaths occurred among women of an advanced age.

Chronic health conditions most often cited among maternal deaths include hypertension, cardiovascular disease, and obesity. The MMRC decisions indicated that most women that 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, appropriate prenatal care, and better awareness of possible complications post-delivery and seeking medical intervention sooner.

## References:

1. Center for Disease Control and Prevention (CDC), Division of Reproductive Health, National Center for Chronic Disease Prevention and Health Promotion, accessed July 7, 2020, <https://www.cdc.gov/reproductivehealth/maternalinfanthealth/pregnancy-relatedmortality.htm>
2. Maternal Mortality in the United States: Changes in Coding, Publication, and Data Release, 2018 by Donna L. Hoyert, Ph.D., and Arialdi M. Miniño, M.P.H., Division of Vital Statistics National Vital Statistics Reports, Vol. 69, No. 2, January 30, 2020
3. ICD-10-CM 2019: The Complete Official Codebook, American Medical Association
4. World Health Organization, Health statistics and information systems, accessed July 7, 2020, <http://www.who.int/healthinfo/statistics/indmaternalmortality/en/>
5. Oklahoma Enrolled House Bill No. 2334, Maternal Mortality Review Act, by Roberts, Sean, Stark and Caldwell of the House and Quinn and Young of the Senate (2019). Retrieved July, 30, 2019 from <http://www.oklegislature.gov/index.aspx>.
6. Building U.S. Capacity to Review and Prevent Maternal Deaths. (2018). Report from nine maternal mortality review committees. Retrieved Nov 7, 2018 from [http://reviewtoaction.org/Report\\_from\\_Nine\\_MMRCs](http://reviewtoaction.org/Report_from_Nine_MMRCs)
7. Pregnancy Mortality Surveillance System, Division of Reproductive Health, National Center for Chronic Disease Prevention and Health Promotion, accessed Nov 7,

2018, <https://www.cdc.gov/reproductivehealth/maternalinfanthealth/pregnancy-mortality-surveillance-system.htm>

8. First Births to Older Women Continue to Rise, T.J. Mathews, M.S.; and Brady E. Hamilton, Ph.D., NCHS Data Brief No. 152, May 2014. Accessed Sept. 05, 2019, from, <https://www.cdc.gov/nchs/products/databriefs/db152.htm>.