Michigan Maternal Mortality Surveillance (MMMS) Program

Maternal Deaths in Michigan, 2014-2018 Data Update

For more information about the MMMS Program, please contact Melissa Limon-Flegler, Program Coordinator, at limonfleglerm1@michigan.gov or Heidi Neumayer, Program Epidemiologist, at neumayerh@michigan.gov.

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Further information and data related to the MMMS Program can be found at Michigan.gov/MMMS.

Key Findings

- All maternal deaths, defined as those that occur during pregnancy or within one year of pregnancy, are reviewed by the Michigan Maternal Mortality Review Committee (MMRC).
- Deaths are categorized as either **pregnancy-related** (pages 2-3) or **pregnancy-associated, not related** (page 4).
- A total of **448 maternal deaths** were reported in Michigan during 2014-2018, of which **37 deaths** were verified as not being pregnant.
    - During 2014-2018, **61 deaths** were identified as pregnancy-related.
    - The most common causes of pregnancy-related death were hemorrhage, infection/sepsis, thrombotic pulmonary embolism and hypertensive disorders of pregnancy.
    - During 2014-2018, **332 deaths** were identified as pregnancy-associated, not related.
    - The most common cause of pregnancy-associated, not related death were accidental poisoning/drug overdose and medical causes not directly related to the pregnancy.
    - Pregnancy-relatedness was unable to be determined for an additional **18 deaths**.
    - Disparities exist by race, age, and education level for both pregnancy-related and pregnancy-associated, not related deaths.
    - Among the reviewed pregnancy-related deaths, 62.3 percent were determined to be preventable; among the reviewed pregnancy-associated, not related deaths, 61.0 percent were determined to be preventable.

Pregnancy-Related Mortality

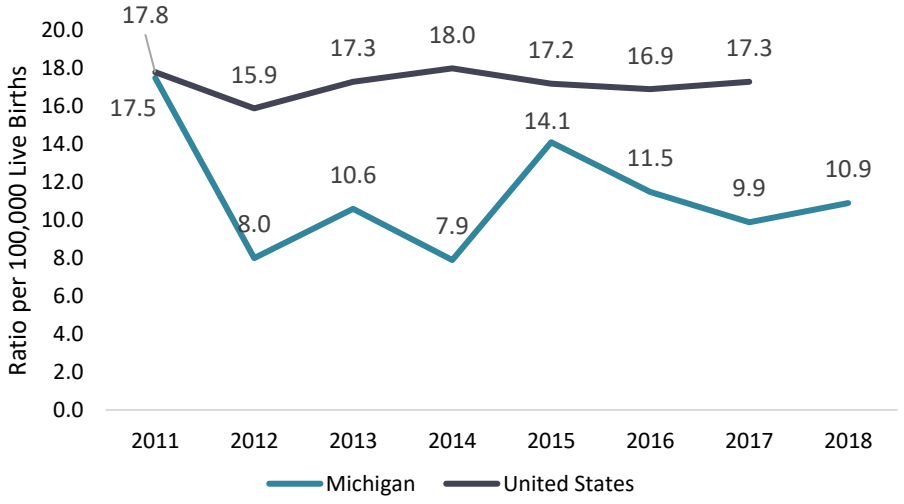
Pregnancy-related mortality is the death of a person while pregnant or within one year of the end of a pregnancy from any cause **related to or aggravated by** the pregnancy or its management. This does not include accidental or incidental causes.

From 2011-2018, 102 women died of pregnancy-related causes in Michigan, which is a ratio of 11.3 deaths per 100,000 live births.

Michigan experienced consistently lower ratios of pregnancy-related maternal mortality as compared to the United States, apart from 2011 when the ratios were comparable (Figure 1). Between 2011 and 2017[a], the national pregnancy-related mortality ratio remained relatively stable, while Michigan experienced between year fluctuations with an overall decrease between 2011 and 2018. Due to the relatively small numbers of cases in Michigan, a small change in deaths can lead to large changes in the mortality ratio.

It is important to note Michigan's pregnancy-related mortality ratios are based on a combination of vital records and MMRC determination. The national pregnancy-related mortality analyses do not include committee review.

Figure 1. Pregnancy-Related Mortality in Michigan, 2011-2018



Date Sources: Centers for Disease Control and Prevention, Pregnancy Mortality Surveillance System, 2011-2017[a]; Michigan Department of Health and Human Services, Michigan Maternal Mortality Surveillance Program, 2011-2018; Michigan Department of Health and Human Services, Division for Vital Records and Health Statistics, Resident Death Files, 2011-2018

[a]2018 national data not yet available for comparison at time of report.

All data in this report except trend data (Figure 1 and Figure 4) reflect 2014-2018 aggregated.

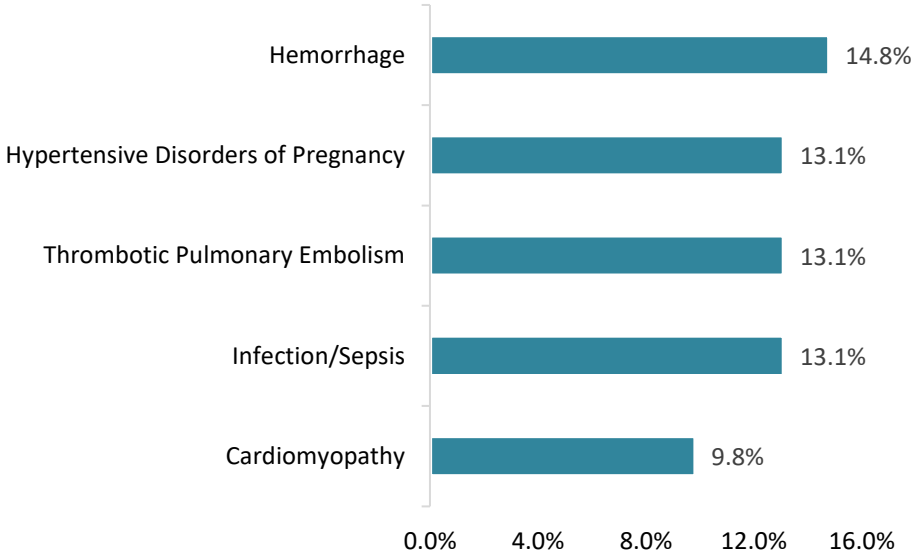
Pregnancy-Related Mortality

Causes of Pregnancy-Related Deaths

The most common causes of pregnancy-related death in Michigan is hemorrhage (14.8%), followed by infection/sepsis, thrombotic pulmonary embolism, and hypertensive disorders of pregnancy (13.1%) (Figure 2). Cardiomyopathy is a less common, but significant cause of pregnancy-related maternal death.

Due to the small sample size for pregnancy-related deaths, multiple cause of death groupings were suppressed. The following categories had between 1 and 5 pregnancy-related maternal deaths:
Amniotic fluid embolism, cerebrovascular conditions, cardiovascular conditions, mental health conditions, gestational trophoblastic disease, substance use disorder, homicide and other medical non-cardiovascular conditions.

Figure 2. Causes of Pregnancy-Related Deaths in Michigan, 2014-2018

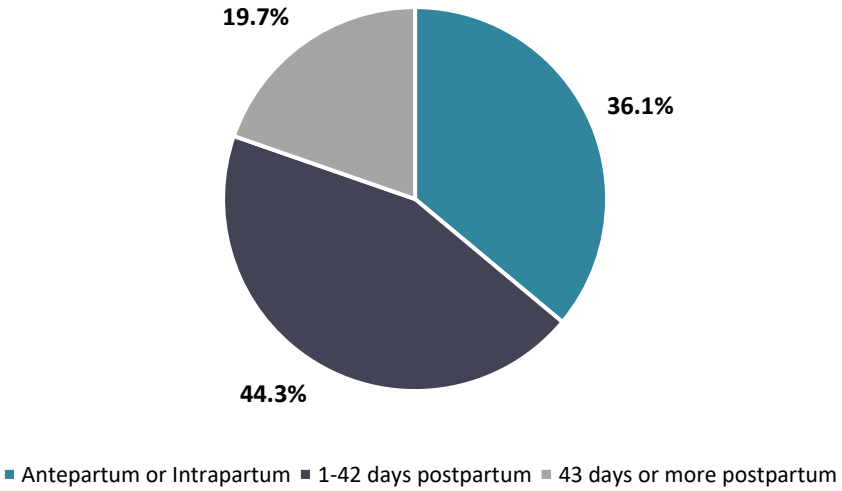


Note: Cause of death categories with <6 maternal deaths were suppressed.

Pregnancy Period

Pregnancy-related mortality can occur at any time during the pregnancy or the one-year period following the pregnancy. Between 2014 and 2018, most pregnancy-related maternal deaths occurred 1-42 days postpartum (44.3%) or during the antepartum or intrapartum pregnancy interval (36.1%). Antepartum refers to deaths that occur before childbirth and intrapartum refers to deaths that occur during labor or delivery.

Figure 3. Pregnancy-Related Maternal Mortality by Pregnancy Period, 2014-2018



Date Sources: Michigan Department of Health and Human Services, Michigan Maternal Mortality Surveillance Program, 2014-2018; Michigan Department of Health and Human Services, Division for Vital Records and Health Statistics, Resident Death Files and Live Birth Files, 2014-2018.

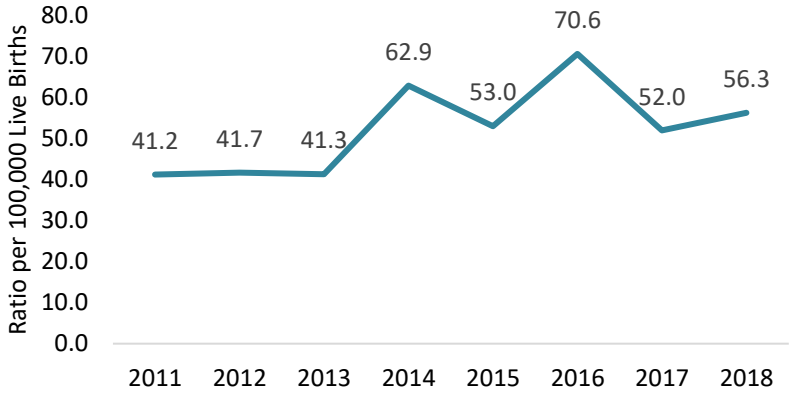
Pregnancy-Associated, Not Related Mortality

Pregnancy-associated, not related mortality is the death of a person while pregnant or within one year of the end of a pregnancy due to a cause **unrelated to** pregnancy.

From 2011-2018, 472 women in Michigan died from pregnancy-associated, not related causes for a ratio of 52.3 per 100,000 live births. This includes both accidental and medical causes of death which were determined to be unrelated to pregnancy.

The pregnancy-associated maternal mortality ratio in Michigan remained stable between 2011 and 2013 (approximately 41 pregnancy associated maternal deaths per 100,000 live births). The pregnancy-associated maternal mortality ratio fluctuated over the next five years with a high of 70.6 per 100,000 live births in 2016 to a low of 52.0 per 100,000 live births in 2017.

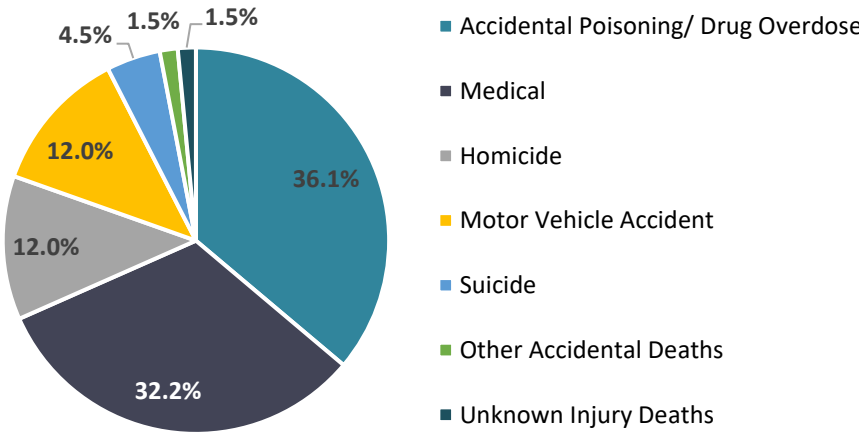
Figure 4. Pregnancy-Associated, Not Related Mortality in Michigan, 2011-2018



Causes of Pregnancy-Associated, Not Related Deaths

The most common causes of pregnancy-associated, not related death are substance use deaths (36.1%), followed by medical causes not directly related to the pregnancy (32.2%)(Figure 5). Other common causes of death include motor vehicle accidents (12.0%), homicide (12.0%), and suicide (4.5%). Other accidental deaths and unknown causes of death make up the remaining pregnancy-associated, not related deaths.

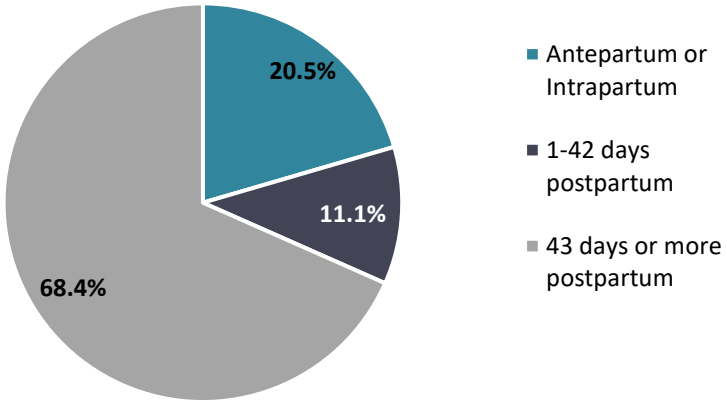
Figure 5. Causes of Pregnancy-Associated, Not Related Deaths in Michigan, 2014-2018



Pregnancy Period

Pregnancy-associated, not related mortality can occur any time during the pregnancy or the one-year period following the pregnancy. Between 2014 and 2018, most pregnancy-related maternal deaths occurred 43 or more days postpartum (68.4%), followed by the antepartum or intrapartum pregnancy interval 20.5%).

Figure 6. Pregnancy-Associated, not Related Maternal Mortality by Pregnancy Period, 2014-2018

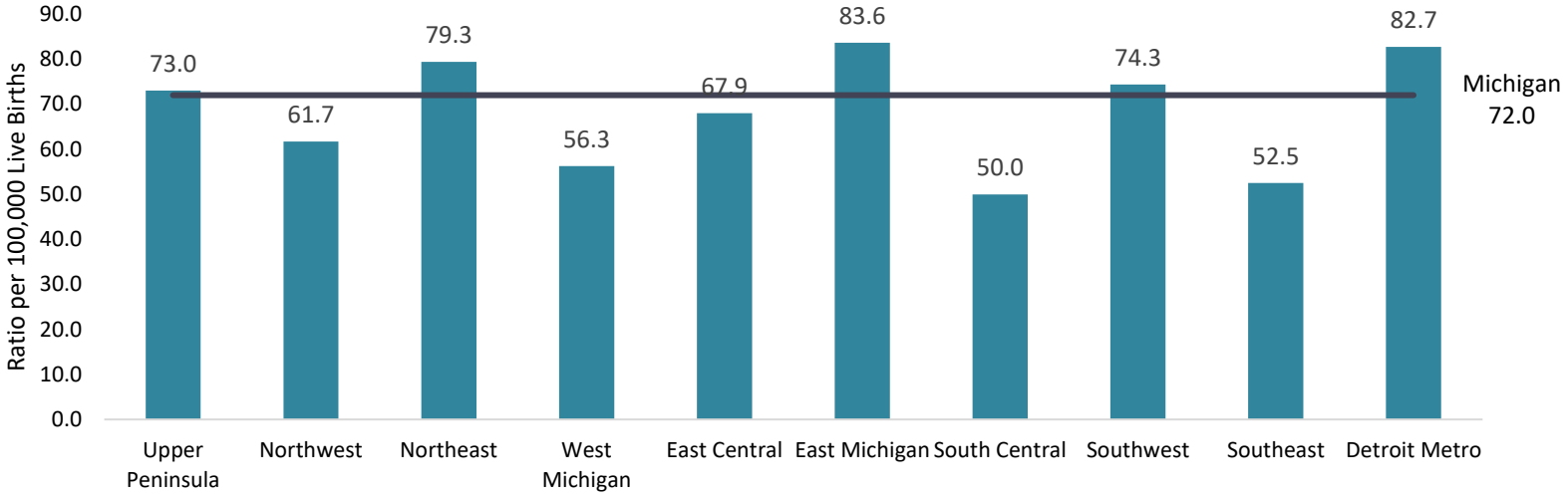


Date Sources: Michigan Department of Health and Human Services, Michigan Maternal Mortality Surveillance Program, 2014-2018; Michigan Department of Health and Human Services, Division for Vital Records and Health Statistics, Resident Death Files, 2014-2018.

Pregnancy-Associated (Total) Mortality

Pregnancy-associated (total) mortality is the death of a person while pregnant or within one year of the end of a pregnancy. This includes pregnancy-related, pregnancy-associated, not related and deaths where pregnancy-relatedness was unable to be determined.

Figure 7. Pregnancy Associated Maternal Mortality Ratio by Prosperity Region, 2014-2018



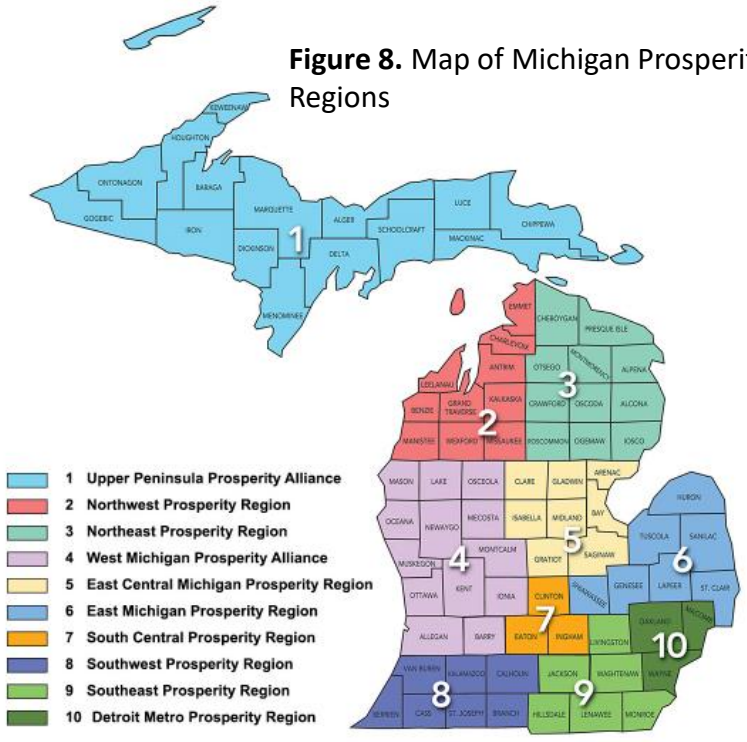
Prosperity Region

Between 2014 and 2018, Prosperity Regions 3, 6, 8 and 10 experienced higher pregnancy-associated maternal mortality ratios when compared to Michigan as a whole.

Prosperity Regions 1 experienced a similar pregnancy-associated mortality ratio when compared to Michigan overall.

Prosperity Regions 2, 4, 5, 7, and 9 experienced lower pregnancy-associated mortality ratios when compared to Michigan overall.

Figure 8. Map of Michigan Prosperity Regions



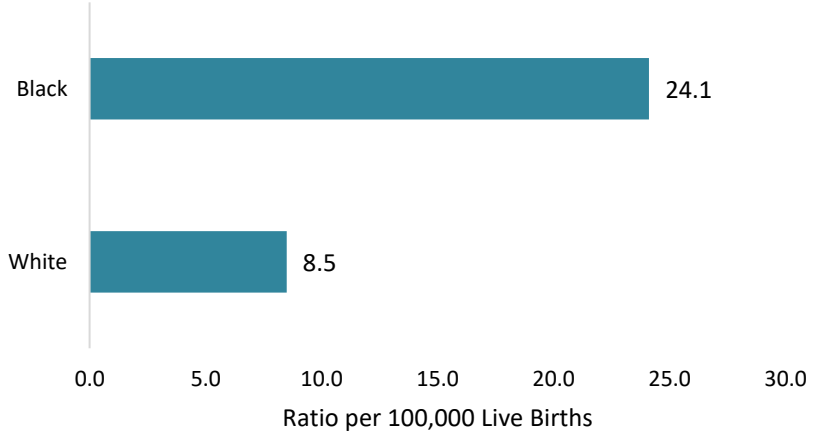
Date Sources: Michigan Department of Health and Human Services, Michigan Maternal Mortality Surveillance Program, 2014-2018; Michigan Department of Health and Human Services, Division for Vital Records and Health Statistics, Resident Death Files, 2014-2018

Disparities

Pregnancy-Related Mortality

Nationwide, Black women die from pregnancy-related causes at a much higher ratio than white women. From 2014-2018, Black women were **2.8 times** more likely to die from pregnancy-related causes in Michigan (24.1 and 8.5 per 100,000 live births, respectively) (Figure 9). However, this is an improvement from 2007-2010, when Black women died from pregnancy complications five times more often than white women. This may be due to a larger decrease in the *average* number of pregnancy-related deaths in Black women compared to white women.

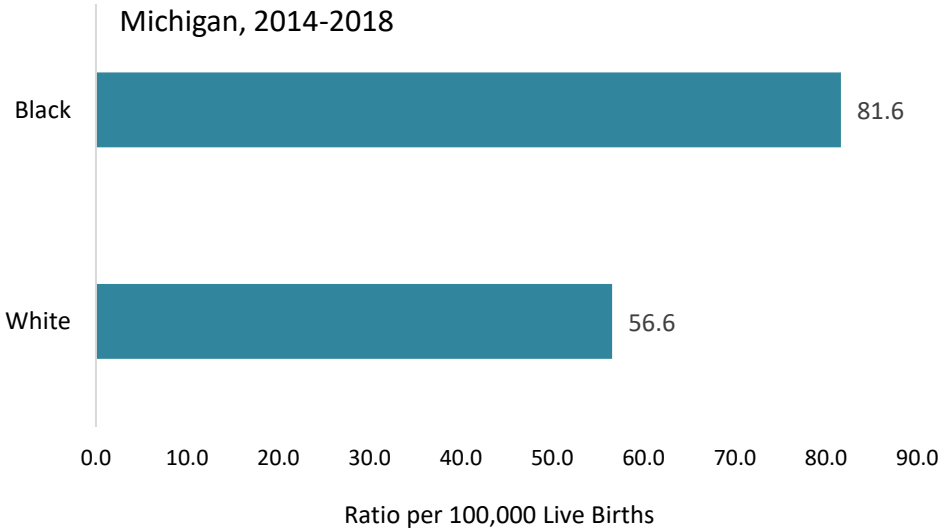
Figure 9. Pregnancy-Related Mortality Ratio (per 100,000 Live Births) by Maternal Race, Michigan, 2014-2018



Pregnancy-Associated, Not Related Mortality

Disparities also exist among pregnancy-associated, not related deaths in Michigan. From 2014-2018, Black women were **1.4 times** as likely to die from pregnancy-associated, not related causes than white women in Michigan (81.6 and 56.6 per 100,000 live births, respectively) (Figure 10).

Figure 10. Pregnancy-Associated, Not Related Mortality Ratio (per 100,000 Live Births) by Maternal Race, Michigan, 2014-2018



Date Sources: Michigan Department of Health and Human Services, Michigan Maternal Mortality Surveillance Program, 2014-2018; Michigan Department of Health and Human Services, Division for Vital Records and Health Statistics, Resident Death Files, 2014-2018.

Preventability

The Maternal Mortality Review Committee (MMRC) considers whether an intervention at the provider, patient, facility, system, community or policy domain could have potentially averted the death. A death is considered **preventable** if the committee determines there was at least some chance of the death being averted by one or more reasonable changes in any domain at any level. Preventability is unknown if there is insufficient information available to determine if a death was preventable.

Figure 11. Preventability for Pregnancy-Related Deaths, MI 2014-2018

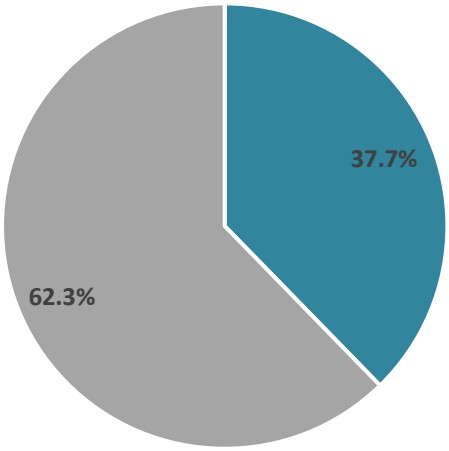
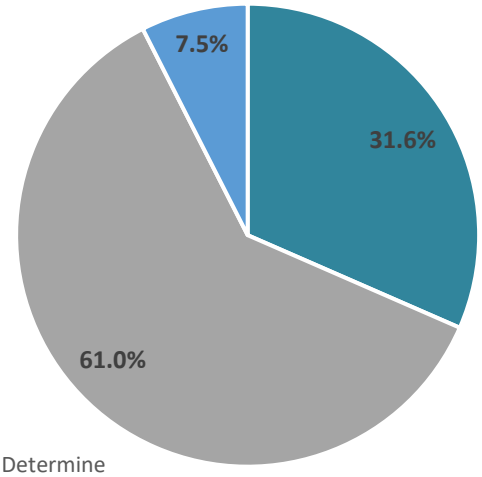


Figure 12. Preventability for Pregnancy-Associated, Not Related Deaths, MI 2014-2018[a]



[a] Not all pregnancy-associated, not related maternal deaths are reviewed for preventability, typically due to expedited nature of the case. Between 2014 and 2018, 187 pregnancy-associated, not related cases were reviewed for preventability (Figure 12).

The majority of pregnancy-related deaths (62.3%) and pregnancy-associated, not related deaths (61.0%) were determined to be preventable by the MMRC.

Date Source: Michigan Department of Health and Human Services, Michigan Maternal Mortality Surveillance Program, 2014-2018.

Recommendation Process

The MMMS program is a state-level structured process by which a multidisciplinary committee reviews cases of maternal death that occur during pregnancy, at delivery or within one year of the end of pregnancy. The purpose of the review is to identify medical systems and patient issues that can be addressed to better understand the underlying factors associated with each death and develop recommendations aimed at improving health outcomes for pregnant and parenting women at the community, provider, facility and system levels. The MMRCs generated 57 recommendations through their review of maternal deaths in Michigan and a full list can be found on our website at Michigan.gov/MMMS. Determinations are guided by the U.S. Center for Disease Control and Prevention, Maternal Mortality Review Information Application's (MMRIA) Committee Decisions Form.

Priority Recommendations

The following table displays the MMMS priority recommendations (abbreviated) which meet the following criteria:

- Highest prioritization score
- Primary and/or secondary prevention
- Large and medium impact level
- Recommendations that have been made for more than one case

To view the full list of recommendations, visit Michigan.gov/MMMS.

MMMS/MMRC Priority Recommendations
The committee and MI-AIM staff will work toward **full implementation** of the AIM safety bundles: **Obstetric Hemorrhage** and **Severe Hypertension** in Pregnancy while working to adopt & implement the Safety Bundles: 1. Obstetric Care for Women with Opioid Use Disorder (+AIM) 2. Safe Reduction of Primary Cesarean Birth (+AIM) 3. Mental Health: Depression and Anxiety (+AIM) 4. Maternal Venous Thromboembolism (+AIM) 5. Sepsis bundle (CMQCC) 6. Improving Health Care Response to Cardiovascular Disease in Pregnancy and Postpartum (CMQCC)
Enact improved polices regarding; the completion of **depression screening** once a trimester and at postpartum visits and early follow up and referral for women who screen positive.
Increase access to home visiting/family support services for all pregnant and postpartum women in Michigan.
Facilitate a partnership between MI AIM and other medical organizations to **increase access to provider education** (on topics such as how to provide care coordination, what resources exist, etc.)
Partner with Family Planning and Chronic Disease to provide **contraceptive counseling** and **reproductive life planning** education to providers working with individuals of reproductive age.
Implement a comprehensive **state-wide education initiative** to address pregnancy and its intersection with mental health, sexual abuse, IPV, trauma, substance use, and chronic health conditions as well as its increased occurrence in populations of women who are most **vulnerable and marginalized**.
Promote the National Suicide Prevention Lifeline and support expanding the capacity of the program in Michigan.
Provide women **wrap-around services** to help align systems of care and transform every interaction into an opportunity for change.
Continue to expand and implement **telemedicine interventions** to ensure timely access.
Encourage providers and hospital discharge planners to **use doulas, community health workers, family support professionals** and **home visiting programs** to **improve access to care and provide peer support** to pregnant and parenting women.

Focus on Health Equity

In December 2019, the MMRCs convened a Health Equity Work Group Meeting to review MMRC recommendations, specifically related to racial disparities, and examine opportunities for integrating a health equity framework into our maternal mortality reviews. MMRC members (Injury and Medical) generated the following recommendations:

MMRC Health Equity Work Group Recommendations (abbreviated)
The MMRCs will continue to integrate a **health equity framework** to address **systemic inequities** and the **social determinants of health** that result in disparate outcomes for all Michigan mothers.
MMRCs, in conjunction with MDHHS, will increase access to education for providers and systems on **delivering culturally competent care and reducing stigma, bias and barriers when implementing services** and recommend that all providers are exposed to **implicit bias training** that leads to use of best practices for dignity and respectful care.
The MMMS program will continue to seek out and/or expand access to internal and external data sources so MMRCs can better understand the **modifiable social and environmental determinants of health and health inequities**.
The MMMS program will make an annual health equity and implicit bias training mandatory for all (MMRC) members.
MDHHS will provide practical tools at the community level to **reduce health inequities**.
The MMRCs will evaluate all maternal death cases to determine if **social, economic, environmental and/or structural disparities** affected health outcomes.