



# MISSOURI PREGNANCY-ASSOCIATED MORTALITY REVIEW

2018 Annual Report

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In 2022, there was a coding concern discovered with regard to the CDC recommended programming as it relates to how the MMRIA system handled the timing of death. The issue primarily affected timing in two scenarios. The first is when the mother died the same day that she gave birth. The original coding would have treated this as pregnant at time of death due to there being zero days between the date of birth and the date of death. The second is when the mother was pregnant but had also had a birth within the past year. Under the original coding this would have been calculated using the date of birth and often would default to 43-365 days postpartum. In order to address this coding issue, the CDC introduced a manual calculation field which allows the PAMR abstractor to specify the timing of death.

## **Dedication**

The Missouri Department of Health and Senior Services (DHSS) and the Pregnancy Associated Mortality Review (PAMR) board would like to convey our deepest sympathies to the children, partners, parents, and all those who love and miss the 68 women who died while pregnant, or within one year of pregnancy in 2018. This report is dedicated to their memory, in the hope that our continued efforts to understand the causes and contributing factors of maternal mortality in the state of Missouri will prevent others from experiencing such a loss.



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## Executive Summary

Maternal mortality events, those where a mother dies during or shortly after pregnancy, are internationally viewed as an indicator that may be used to judge the overall health of a country, state, or community. This report describes the state of maternal mortality in Missouri based on deaths that occurred in 2018. The DHSS identified deaths of Missouri residents that occurred when a woman was pregnant or within one year postpartum, and referred information regarding the pregnancy and death to the PAMR board. The PAMR board performed a comprehensive review of these deaths. The board's findings and recommendations are summarized in this report, with the goal to prevent future instances of maternal mortality. Below are key findings and recommendations from the PAMR board.

### Key Findings

- The pregnancy-related mortality ratio (PRMR) in Missouri was 33 deaths per 100,000 live births.
- The PRMR for Black women was 87.6 per 100,000 live births which is more than 4 times greater than the rate for White women (21.9).
- Eighty-two percent of pregnancy-related deaths were determined to be preventable.
- A majority (63%) of pregnancy-related deaths occurred between 43 days and one year after pregnancy.
- Mental health conditions were the leading underlying cause of pregnancy-related deaths (50%).
- Sixty-five percent of deaths were pregnancy-associated but not related for a rate of 60 per 100,000 deaths.
- The leading cause of injury-related deaths were overdoses/poisonings (49%) followed by motor vehicle crashes (MVC) (28%).
- Substance use disorder (SUD) contributed to 54% of pregnancy-related and 43% of pregnancy-associated but not related deaths.
- The rate of pregnancy-associated deaths for women on Medicaid was more than 4 times greater than the rate for those with private insurance.

## Key Recommendations

After reviewing cases, the PAMR board proposed changes at the patient, provider, facility, community, and/or systems level that could potentially prevent similar deaths in the future. Recommendations developed by the board are summarized below with additional discussion throughout the body of this report.

- In order to ensure implementation of these recommendations, it is recommended that the Missouri Legislature should:
  - Provide funding for a statewide Perinatal Quality Collaborative (PQC) by 2022.
- In order to enhance the mental and behavioral health care of Missouri mothers, it is recommended that the Missouri Legislature:
  - Provide immediate funding to establish a statewide Perinatal Consult Center to provide telehealth services for Substance Use Disorder (SUD) and mental health conditions.
- In order to ensure comprehensive assessment practices, it is recommended that all providers:
  - Perform validated depression/anxiety (i.e. EPDS, PHQ, et al.) and SUD screenings on every patient at every interaction throughout the pregnancy and postpartum period.
  - Make referrals to mental health professionals, social workers, community health workers, and SUD treatment programs as appropriate.
- In order to address the concerns of racial disparity and health equity with regard to the influence of comorbidities on a patient's health, it is recommended that all health care workers (physicians, nurses, doulas, etc.) should:
  - Complete trainings on trauma-informed care at least annually.
  - Complete implicit bias training at least annually.
- In order to fill knowledge deficits, as well as address financial and access issues identified during case reviews, it is recommended that community outreach organizations on an ongoing basis target vulnerable populations with a focus on the following topics:
  - Reduction of stigma surrounding treatment for SUD and mental health conditions during the perinatal period and provide resources for these conditions.
  - Intimate Partner Violence resources and assistance.
  - Optimizing a woman's preconception health prior to pregnancy (specifically chronic disease management, obesity reduction and tobacco cessation).
- In order to optimize the healthcare of Missouri moms and babies:
  - The state should extend Medicaid coverage to one year postpartum for all conditions (including medical, mental health and substance use disorder), even if the woman did not start treatment prior to delivery, to target women whose

condition is exacerbated in the postpartum period. (*Please see Recommendation Implementation section for progress*)

- The Missouri Legislature should provide funding by 2022 for the extension of Medicaid.
  - The Missouri Legislature should remove barriers to telehealth care by participating in the proposed interstate counseling compact, expanding the pool of mental healthcare providers available while decreasing the interruptions to patient services.
  - The state should expand broadband infrastructure to accommodate the rapid advancements made in telehealth options.
- In order to optimize safety for our Missouri mothers, it is recommended that the state should:
- Increase public awareness on the importance of seat belt safety during the perinatal period.
- In order to provide standardized, evidence-based care to all pregnant women, it is recommended that:
- All birthing hospitals should standardize practices and procedures across the healthcare system through utilization of evidence-based practices such as AIM bundles.
  - Providers should be further educated regarding screening, referral, and treatment of:
    - Mental health conditions during and after pregnancy.
    - Substance use disorder during and after pregnancy.
    - Cardiovascular disorders associated with pregnancy (i.e. cardiomyopathy, hypertension, etc.).



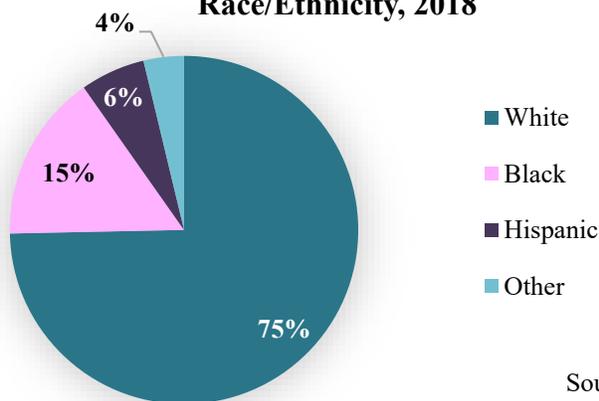
## **Maternal Health**

A woman's health influences the well-being of her children, family, and communities. During this time, women may become more engaged with the health care system. For this reason, pregnancy provides an opportunity to identify and manage underlying chronic diseases, such as obesity, hypertension, diabetes, and asthma. The death of a woman during pregnancy, childbirth, or within the first year postpartum is a tragic occurrence that has immediate and lasting influence on her family and communities. These deaths also act as an early warning system for a society's health, reflecting upon a variety of health determinants ranging from individualized factors to more systemic issues.

## Maternal Demographics in Missouri

Missouri is a demographically and socially diverse state, comprised of 115 counties (114 counties and one independent city, St. Louis), with a total population of 6,126,452 based on 2018 estimates.<sup>1</sup> Overall, Missouri is a largely rural state, with 16 urban counties and 99 rural counties.<sup>2</sup> Over half of Missouri's population falls within the Metropolitan Statistical Areas of St. Louis and Kansas City. Most Missouri residents are White\* (80%) with the majority of the remainder being Black (12%).<sup>3</sup>

**Figure 1: Percent of MO Live Births by Race/Ethnicity, 2018**



Source:  
DHSS-MOPHIMS-Birth MICA

White women represented 75% of live births in Missouri during 2018. Black women represented 15% of live births, and Hispanic women of any race represented 6% of live births. Women who did not fall into any of the above categories, including Asian, American Indian, Pacific Islander, and other groups, represented 4% of live births (Fig. 1).<sup>4</sup> This population of live births was slightly more diverse than the population of women of child bearing

age (defined as 10-60 years old) in Missouri.

### Statewide Challenges

There are a number of challenges that are likely to influence maternal morbidity and mortality trends in Missouri. One known challenge is a low rate of timely initiation of prenatal care. Between 2017 and 2019, nearly one-third (32%) of new Missouri mothers did not begin prenatal care in the first trimester. Among Black women, these rates are significantly higher as half (50%) experienced late entry into prenatal care. Prenatal care utilization provides medical professionals with an opportunity for early identification and potential intervention regarding risk factors that affect maternal mortality. This includes the chance to address chronic disease challenges such as obesity, which disproportionately affects Black women (37%, compared to 28% among White women).<sup>5</sup>

Another challenge facing Missouri mothers is limited availability of maternity leave. Missouri state law does not require employers offer paid or unpaid leave to pregnant women other than what is required by the Family Medical Leave Act (FMLA). The result of this has been that more than half of employees are at worksites that do not offer paid maternity leave.<sup>6</sup> Without paid maternity leave, women must make choices between earning a paycheck and proper

\* Those cases that indicated Hispanic ethnicity were treated as Hispanic, regardless of other race indicators.

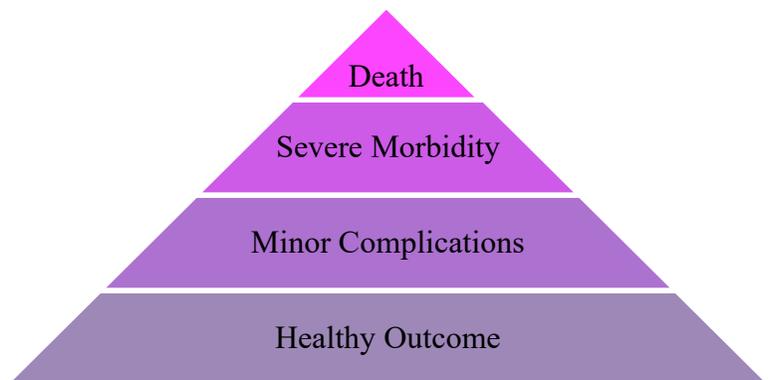
postpartum recovery. This potentially increases the chance of adverse short- or long-term outcomes related to both mental and physical postpartum health concerns. Fewer than one in three (30%) White mothers received paid maternity leave, and only one in five (20%) Black mothers received paid maternity leave.<sup>7</sup>

Maternal health experiences also differ between rural and urban counties. Regardless of race, women residing in rural counties are nearly twice as likely to smoke while pregnant (20% vs 11%).<sup>8</sup> They are also likely to be older, and experience challenges obtaining risk-appropriate care for complex or high-risk births at rural hospitals.<sup>9</sup> From 2015-2019, 69% of high-risk births to rural-county residents were at Level III facilities compared with 89% of high risk births to urban-county residents.<sup>10</sup> Some of these rural/urban disparities are exacerbated by race, as rural White mothers (69%) were more likely than rural Black mothers (58%) to receive risk-appropriate care.

### Maternal Morbidity and Mortality

There is a continuum of healthy birth outcomes experienced by families. The most common experience for women is a healthy outcome, a birth with minor or no complications, to maternal death. In general, the more severe the outcome, the less frequently it occurs (Fig. 2). Maternal morbidity, including Severe Maternal Morbidity (SMM) is an overarching term for unexpected outcomes of labor and delivery. These acute conditions may directly cause maternal deaths and/or have a significant impact on a woman's short- or long-term health, and may include blood transfusions, renal failures, and hysterectomies.<sup>11</sup>

**Figure 2: Maternal Health Outcome Continuum**



- In 2018, there were 823 instances of SMM in the state of Missouri for an overall rate of 112 per 10,000 live births.<sup>†</sup>
- Those most at risk for SMM are women over the age of 35, who are either obese or had other preexisting chronic conditions, or had a prior cesarean delivery.
  - White mothers experienced SMM at a rate of 89.7 per 10,000 live births, while Black mothers experienced SMM at a rate of 220.9 per 10,000 live births.
  - The most common indicator of a SMM event is a transfusion (61.5 per 10,000).
  - The second most common indicator was Renal Failure (11.5 per 10,000).

<sup>†</sup> This data is based on the 25 Indicators metric, recalculated for severity using the Callaghan 2012 methodology.

- The third most common was Disseminated Intravascular Coagulation (DIC) and Respiratory distress (each at a rate of 8.5 per 10,000).<sup>12</sup>

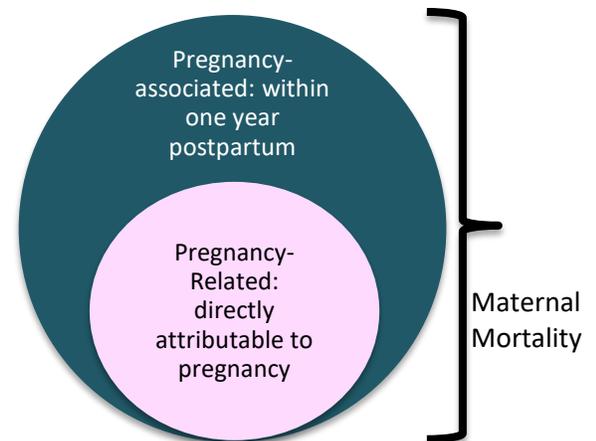
The most severe outcome is death during or after pregnancy. This report is focused on these most extreme outcomes, and seeks to accent opportunities to improve maternal health and health care. While maternal mortality continues to decline globally, the rate of maternal mortality in the United States is three to four times higher than in other developed nations. It is estimated that approximately 700 women in the United States die as a result of pregnancy or pregnancy-related complications annually.<sup>13</sup>

### Definitions

There are a number of operational definitions for maternal mortality. While some organizations define maternal mortality as occurring during or within 42 days of pregnancy, Missouri PAMR aligns with the Centers for Disease Control and Prevention (CDC) and utilizes the following definition:

- Pregnancy-associated death: The death of a woman during or within one year of pregnancy due to any cause. This comprises all the deaths the PAMR board reviews. Pregnancy-associated deaths can further be classified into pregnancy-related deaths or pregnancy-associated but not related deaths.
  - Pregnancy-related death: The death of a woman 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 (Fig. 3).
  - Pregnancy-associated but not related death: The death of a woman during or within one year of pregnancy, from a cause that is not related to pregnancy.

**Figure 3: Maternal Mortality Distinctions**



### Surveillance of Maternal Mortality

The increasing rate of maternal mortality, and the disparities in those rates, has led to an increased interest in these topics. Reducing maternal mortality and improving maternal health are both state and national priorities. Studying these sentinel events highlights critical issues in women’s health, and is crucial for identifying opportunities for improvement. To this end, in 2019 the State of Missouri was awarded the Enhancing Reviews and Surveillance to Eliminate Maternal Mortality (ERASE-MM) grant from the CDC. This five-year grant supports the PAMR

program by facilitating timely identification of deaths, the formation of prevention strategies, and implementation of strategies to reduce maternal deaths and associated disparities.

### **Distinguishing PAMR**

The CDC oversees multiple programs that seek to monitor maternal mortality. These programs offer valuable information at the national level regarding causes of death and associated risk factors. However, they are not able to evaluate contextual factors that contributed to individual deaths, or determine preventability. These programs are also limited by an inability to provide recommendations that would prevent future instances of maternal mortality.

The PAMR program differs from these national programs in that it functions as the states' Maternal Mortality Review Committee (MMRC). MMRCs operate using a standardized and comprehensive system to better understand the context and causes surrounding a woman's death. They are able to determine if a death could have been prevented, and can make recommendations to help similar situations have better outcomes.<sup>14</sup> While focused on the prevention of death, MMRCs also act to improve health and wellness throughout the pregnancy cycle. See Appendix C for a breakdown of differences between maternal mortality surveillance programs.

The objective of this report is to describe the state of maternal mortality in Missouri in 2018, and to provide an update on progress made based on the findings from the previous report. Information in this report comes from PAMR board findings and recommendations for improvement in health outcomes. These recommendations are informed by a thorough evaluation of cases identified by the Missouri Bureau of Epidemiology and Vital Statistics (BEVS) as potential instances of maternal mortality.



## **PAMR Process**

The BEVS worked to identify cases of maternal mortality for investigation by the PAMR program. Once identified, information was gathered on each case. This included medical records, toxicology reports, news articles, social media postings, and other information. This information was used to create a summary of the events that led up to and ended in the decedent's death. The de-identified summary was then given to the multi-disciplinary PAMR board who evaluated the case to determine pregnancy relatedness, as well as the contributing factors and preventability of a death. The PAMR board made recommendations in order to help improve the outcome of similar situations in the future. The PAMR program and partnering organizations are now working on the implementation of these recommendations, while continuing to identify and abstract cases for board review.

## **Identification: Issues and Solutions**

PAMR coordinated with BEVS to accurately identify eligible pregnancy-associated deaths for review. All death certificates of Missouri residents (including those residents who died out of state) between the ages of 10 and 60 in 2018 were evaluated. Those certificates where the cause of death indicated it was due to pregnancy, or the pregnancy checkbox indicated that the woman was, or had been pregnant within the last year, were flagged for further investigation. In addition, a birth/fetal-death linkage was performed. This linkage flagged any death certificates where the decedents name, social security number, or date of birth appeared on a birth certificate or a fetal death report from the preceding year for further investigation.

Case identification presents some concerns regarding false negatives (when a decedent was pregnant within the last year but was not identified) and false positives (when a decedent was not pregnant but was identified). False negative cases primarily come from instances where a woman was pregnant, but death occurred too early in the pregnancy for it to have been known. At present, there is no viable way to detect these instances.

The pregnancy checkbox has greatly aided case identification, but it is the most common source of false positives, in particular for older decedents and Black women.<sup>15</sup> In 2018, there were nine women aged 45 or older who had an incorrectly marked pregnancy checkbox.<sup>16</sup> Additionally, reliance on the pregnancy checkbox can yield false negatives as there were 37 records that were corrected when a death certificate was linked to a birth certificate or fetal death report without the checkbox indicating that the decedent had been pregnant. BEVS staff routinely seek verification of the pregnancy status for cases which lack supporting documentation, or are deemed questionable based on age.

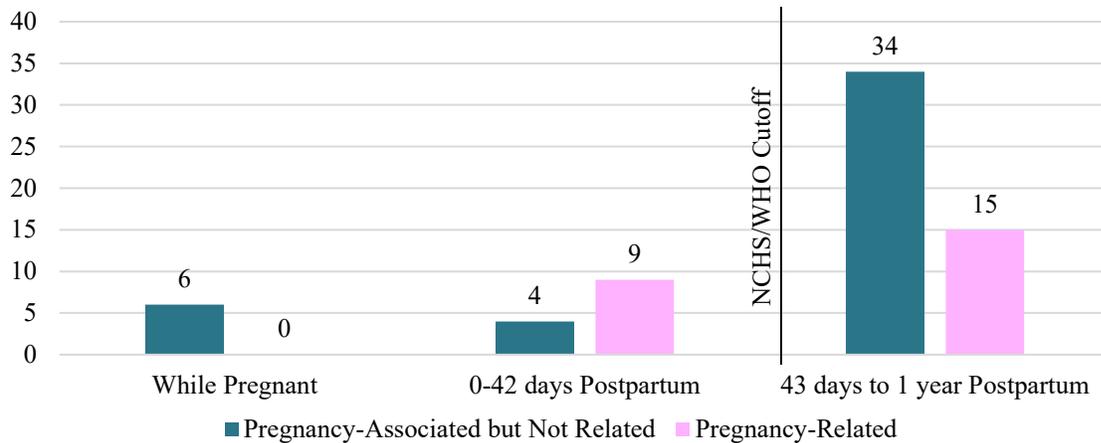
False positives and negatives also occur when the linkage between a death certificate and a birth certificate, or fetal death report, is due to an error in data entry. This is detected during the case verification process and the Bureau of Vital Records (BVR) is alerted to the error and contacts the data provider for correction. For a more detailed breakdown of case identification criteria, see Appendix A.

## **Identification: Timing and Sources**

When a death occurs may influence whether or not it is identified as a case of maternal mortality. As previously discussed, Missouri uses the PAMR standard, which considers a death to be a possible case of maternal mortality if it occurs within one year of the end of pregnancy, regardless of outcome. This aligns with the timeframe utilized by the Pregnancy Mortality Surveillance System (PMSS). However, the definition utilized by the CDC National Center for

Health Statistics (NCHS) and the World Health Organization (WHO) identifies deaths that occur during pregnancy, or within 42 days postpartum as possible cases of maternal mortality.

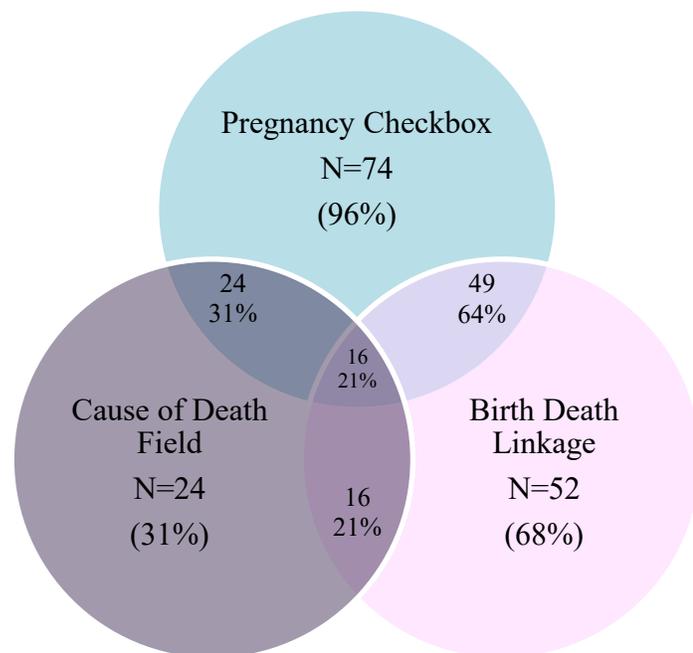
**Figure 4: Timing of Death by Relationship to Pregnancy, 2018**



If traditional NCHS/WHO standards were utilized, 49 cases of maternal mortality would not have been identified or reviewed, 15 of which the board determined were pregnancy-related (Fig. 4). The NCHS/WHO standard also differs in that it classifies cases as maternal mortality using the ICD-10 codes from death certificates. The PAMR and PMSS standards, use the ICD-10 codes as part of their case

identification process; and then evaluate these cases to determine if they are pregnancy related or if the association was a temporal one. In 2018, the pregnancy checkbox identified 74 cases. Twenty-four cases were identified by the ICD-10 codes, and the linkage identified 52 cases. No more than 64% of these identified cases overlap (Fig. 5). This supports findings from NCHS that reliance upon the pregnancy checkbox alone is insufficient to capture all pregnancy-associated deaths.<sup>17</sup>

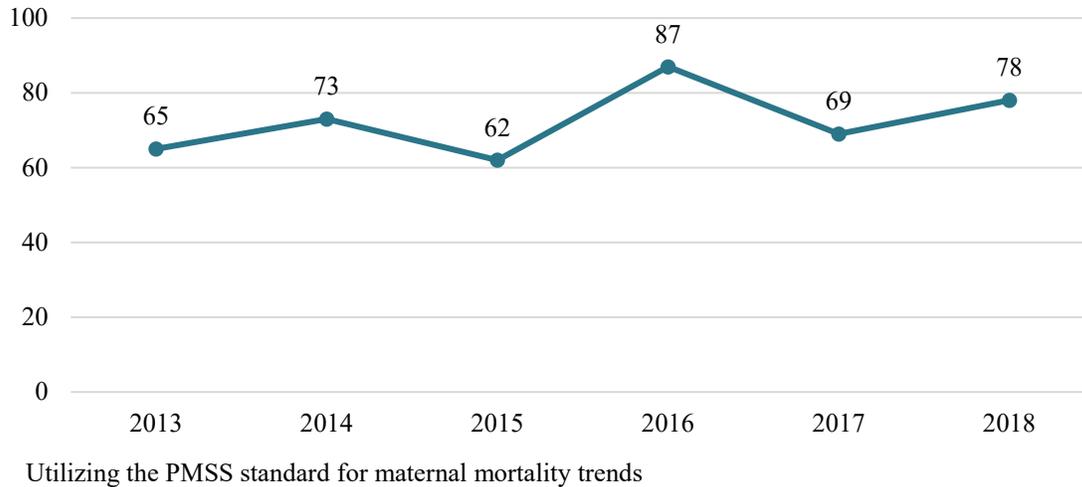
**Figure 5: Pregnancy-Associated Death Case Identification**



The way which maternal mortality is defined, as discussed, affects the rate. The difference between the PAMR definition and the PMSS definition is that PMSS looks at deaths which were

recorded in Missouri regardless of residency. However, in order to look at trend data, as in Figure 6, the PMSS standard is the one which must be utilized at this time.

**Figure 6: Number of Deaths, Missouri 2013-2018**

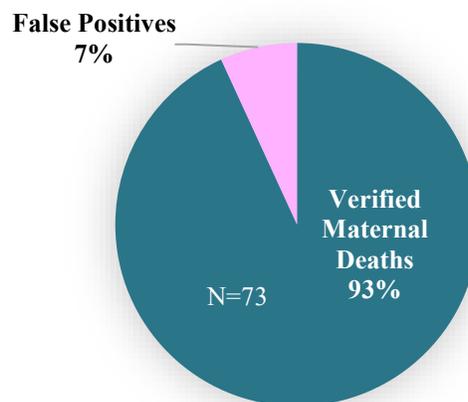


### Case Verification

When cases were identified through a linkage, they were further scrutinized prior to sending them to the PAMR abstractor. This involved examining the identified certificates to ensure that the data were indeed a match. At this juncture, those cases which were linked based on data entry errors were detected. For example, if a case was matched based on the social security number, but the names, date of birth, and other information did not match, the case was considered unverified, or a false positive as described above. Initially, there were 77 cases identified.

Once cases underwent this first round of verification, the cases were forwarded to the PAMR abstractor. During this first round of verifications, four cases were identified as false positives. The abstractor gathered data from medical records, toxicology, autopsy reports, and an array of other resources in order to accurately capture the events leading up to and including the death of the women identified as potential cases. Through this verification process there were five cases identified as false positives

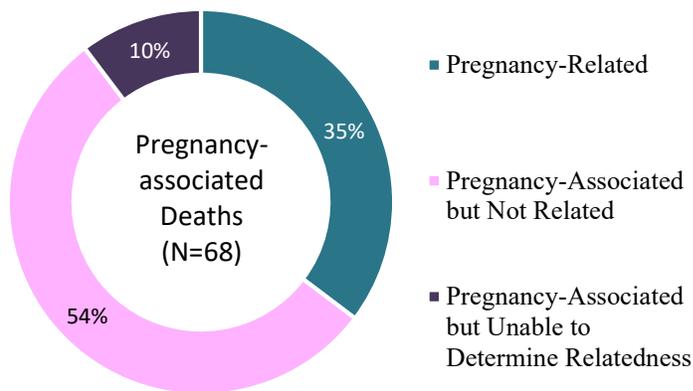
**Figure 7: PAMR Case Verification, MO, 2018**



(meaning that pregnancy was contraindicated, for example by a previous hysterectomy) to 68 cases that were verified in 2018 (Fig. 7). Then, using the information obtained, the abstractor created a detailed, but de-identified, case summary for each case that retained any indication of pregnancy within the year preceding death. Finally, these summaries were routed to the PAMR board for review.

## Case Review

**Figure 8: Committee Determination of Pregnancy-Related Deaths**

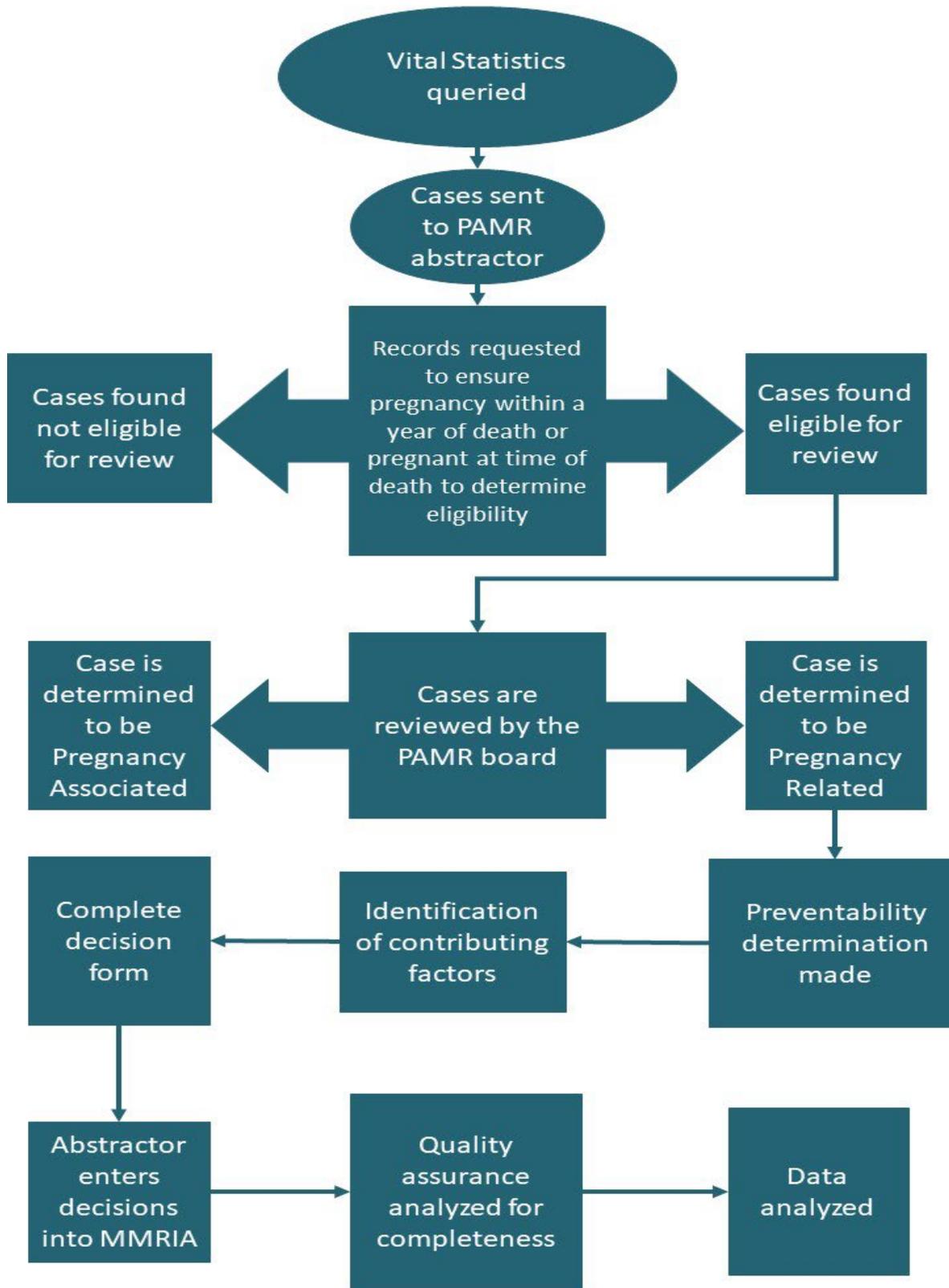


The PAMR board members collaboratively reviewed the case summaries provided by the abstractor. As requested, and as appropriate, additional information was made available beyond the case summaries. While some states divide the caseload by the cause of death, the entire PAMR board evaluated all pregnancy-associated cases. They worked to determine pregnancy-relatedness, evaluated the cause and contributing factors of death, and provided recommendations for improved outcomes.

- In 2018, 24 cases were determined to be related to pregnancy (Fig. 8).
- Thirty-seven cases were found to be pregnancy-associated but not related.
- A further seven cases were determined to be pregnancy-associated but the board was unable to determine relatedness.
  - For the purposes of this report, these are treated as pregnancy-associated but not related cases.

See Figure 9 for a visual overview of the PAMR process.

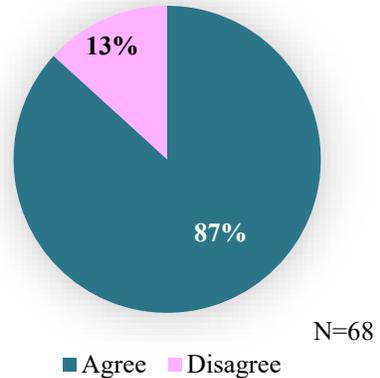
**Figure 9: Flow Chart of PAMR Program Process**



## Data Evaluation

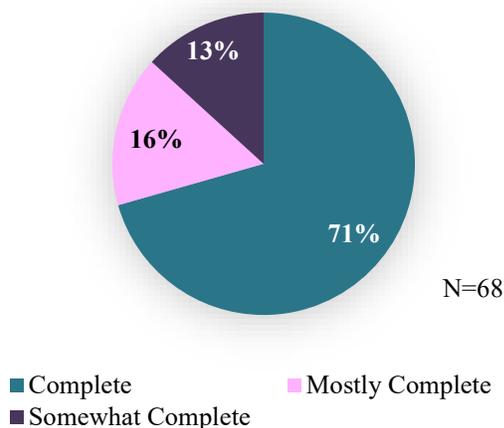
The PAMR board agreed with the underlying cause of death listed on the death certificate the majority of the time (87%, Fig. 10). This is the default approach the PAMR board took, disagreeing with the provided cause of death only when there was sufficient evidence to justify disputing the information found on the death certificate. As with most things, the decisions of the PAMR board were dependent upon the quality of information they received, and their abilities were also limited by that same restriction. For this reason, the PAMR board evaluated every case for completeness, to ensure they were being given data of sufficient quality with which to make their determinations.

**Figure 10: Committee Agreement with Underlying Cause of Death Listed on Death Certificate**



Regarding 2018 cases, the PAMR board found that 87% were complete or mostly complete, and 13% were somewhat complete (Fig. 11). In order to assure the best data quality possible, the PAMR program did attempt to obtain more specific information if the board requested such. Every attempt was made to obtain records from healthcare providers and facilities, as well as coroners and medical examiners. However, toxicology screenings and autopsies were not always performed, and additional information from the healthcare system was not always obtainable. As such, the PAMR program occasionally did find itself desiring information that simply did not exist.

**Figure 11: Case Completeness**



Case completeness was also complicated because not all relevant information was documented or known. For instance, a woman could have sought medical treatment from a provider in another location and not disclosed that visit at her next healthcare interaction, or the previous provider may not have been able to be identified. Such concerns helped to drive the board's recommendations regarding continuity of care and adoption of a centralized medical record system. The PAMR program also developed linkages with the Patient Abstract System (PAS). The PAS

reports patient procedure and discharge codes for healthcare interactions across inpatient and outpatient records. Cases were probabilistically linked to the PAS based on matching social security numbers and date of birth, social security number and last name, name and date of birth,

and date of birth and census tracts. Records were evaluated for the year of death and the year preceding death. This linkage permitted previously unreported case interactions with the healthcare system to be identified and provided the opportunity to more fully explore case medical histories.



## Demographic Disparities

After cases are reviewed by the PAMR board, the data gathered is broken down based on demographic factors, including age, race, and educational attainment. It is further evaluated by place of residence, healthcare insurance coverage, and Body Mass Index (BMI). Comparing these rates helps us determine the degree of disparity in health outcomes between each group. Pregnancy-related mortality ratios are reported as number of deaths per 100,000 live births.

- The rate of pregnancy-related deaths was nearly two times higher for those who were more than 40 years old compared to those who were between 20 and 29.
- The rate of pregnancy-related deaths for Black women was more than four times higher than the rate of deaths for White women.
- The rate of deaths was lowest for those who had obtained more than a high school education compared with those who had a high school education or less.
- The rate of pregnancy-related deaths for women who were obese was nearly two times greater than for women with an average (or normal) BMI.

## A Word of Caution

Instances of maternal mortality, and in particular pregnancy-related instances, are rare events. As such, the sample size for this analysis is small. The problem of having a small sample size is there is an increased likelihood of the results being skewed; meaning some effects may be exaggerated, while others may remain hidden. This skewness may be increased when data are missing. Due to these concerns, the rates presented here should be approached carefully. The PAMR board makes their recommendations with this in mind, seeking to not only lower rates of maternal mortality, but to improve the reproductive health outcomes of women overall.

## Missouri Mothers and Disparities

- The average woman giving birth in the state of Missouri in 2018 was a married, White woman between the ages of 20 and 29 who attained more than a high school education, from an urban county, and most frequently had a normal BMI.
- Comparatively, women who experienced a pregnancy-related death were most commonly White, obese, from an urban county between the ages of 20 and 29 with more than a high school education.
  - The overall rate of pregnancy-related deaths was 32.8 deaths per 100,000 live births.
- Women who experienced a pregnancy-associated but not related death were most commonly White women, with a normal or obese BMI, from an urban county between the ages of 20 and 29 who attained a high school education.
  - The overall rate of pregnancy-associated but not related deaths was 60 deaths per 100,000 live births.

Maternal Age	Pregnancy-associated but Not Related Deaths		Pregnancy-Related Deaths		Total Missouri Births	
	Freq.	Rate per 100,000 live births	Freq.	Rate per 100,000 live births	Freq.	%
< 20 years old	‡	48.3 §	‡	24.2 §	4139	5.7
20 to 29 years old	25	63.1	13	32.8	39,635	54.1
30 to 39 years old	17	61.0	9	32.3	27,849	38.0
40 + years old	‡	0.0 §	‡	60.9 §	1,641	2.2
Unknown	-	-	-	-	17	0.0

‡ Information redacted due to small sample size on Tables 1 through 7.

§ These rates are considered unstable due to low sample size on Tables 1 through 7.

The rate of pregnancy-associated but not related death was highest among women 20-29 years old, with a rate of 63 deaths per 100,000 live births. Due to low sample sizes, the rates calculated are considered unstable for ages < 20 and 40 or older, and further analysis was not deemed feasible at this time.

**Table 2: Maternal Race/Ethnicity Comparison of Rates, 2018**

Maternal Race	Pregnancy-associated but Not Related Deaths		Pregnancy-Related Deaths		Total Missouri Births	
	Freq.	Rate per 100,000 live births	Freq.	Rate per 100,000 live births	Freq.	%
White	27	49.3	12	21.9	54,720	74.7
Black	14	122.7	10	87.6	11,410	15.6
Hispanic	‡	0.0 §	‡	22.7 §	4,407	6.0
Other	‡	109.3 §	‡	36.4 §	2,744	3.7

Black women had the highest rate of pregnancy-associated but not related and pregnancy-related deaths. The rate of pregnancy-associated but not related deaths for Black women (123) was more than twice the rate for White women (49). The rate of pregnancy-related deaths (88) was four times the rate of White women (22). The disparity in racial outcomes was statistically significant.\*\*

**Table 3: Educational Attainment Comparison of Rates, 2018**

Maternal Education Level	Pregnancy-associated but Not Related Deaths		Pregnancy-Related Deaths		Total Missouri Births	
	Freq.	Rate per 100,000 live births	Freq.	Rate per 100,000 live births	Freq.	%
< High School	11	126.0	‡	57.3 §	8,730	12.0
High School	21	113.6	7	37.9	18,492	25.3
More than High School	12	26.2	12	26.2	45,819	62.7

Women who had attained less than a high school diploma or GED had the highest rate of pregnancy-associated but not related death (126 per 100,000). Though not a statistically significant difference due to low sample size, this rate was more than four times the rate of women who attained more than a high school education. Due to low sample size, the rate of pregnancy-related deaths for women with less than a high school education is considered unstable. As such, further analysis regarding pregnancy-related deaths and education was not deemed feasible at this time.

\*\* Statistical significance was determined at the ( $p \leq 0.05$ ) level using Chi-Square testing.

County of Residence	Pregnancy-associated but Not Related Deaths		Pregnancy-Related Deaths		Total Missouri Births	
	Freq.	Rate per 100,000 live births	Freq.	Rate per 100,000 live births	Freq.	%
<b>Urban</b>	33	67.9	21	43.2	48,601	66.3
<b>Rural</b>	10	40.5	‡	12.2 §	24,680	33.7

The rate of pregnancy-associated but not related deaths was highest for urban residents (68). The rate for rural pregnancy-related deaths was considered unstable. However, the differences between urban and rural locations were found to be statistically significant despite this low sample size. Rural areas were those counties not coded as metropolitan based on population size.

Healthcare Insurance Type	Pregnancy-associated but Not Related Deaths		Pregnancy-Related Deaths		Total Missouri Births	
	Freq.	Rate per 100,000 live births	Freq.	Rate per 100,000 live births	Freq.	%
<b>Private Insurance</b>	7	17.6	8	20.1	39,738	54.2
<b>Medicaid</b>	22	77.1	10	35.0	28,535	38.9
<b>Other/Unknown</b>	‡	20.0 §	‡	39.9 §	5,008	6.8

Women who utilized Medicaid services had the highest rate of pregnancy-associated but not related deaths (77) when compared to other insurance types. This was more than four times the rate of women who were on private insurance (18). Despite the low sample size for pregnancy-related deaths where their payment type was unknown, resulting in an unstable rate, the difference between groups was found to be statistically significant with the lowest rate occurring among privately insured women.

Maternal Weight	Pregnancy-associated Deaths		Pregnancy-Related Deaths		Total Missouri Births	
	Freq.	Rate per 100,000 live births	Freq.	Rate per 100,000 live births	Freq.	%
<b>Underweight</b>	‡	38.9 §	‡	0.0 §	2,574	3.6
<b>Normal weight</b>	12	39.1	6	19.6	30,677	42.4
<b>Overweight</b>	8	44.2	‡	27.6 §	18,085	25.0
<b>Obese</b>	12	57.2	8	38.1	20,970	29.0

Body Mass Index (BMI) was calculated based on a woman's pre-pregnancy height and weight. Women who were obese had the highest rate of pregnancy-associated deaths (57). Women who were obese also had the highest rate of pregnancy-related deaths (38). The differences between BMI categories for pregnancy-related deaths was not statistically significant.

The PAMR program employed a life course perspective to help better understand the context around a pregnancy-associated death. Beyond the demographic analyses reported above, it was determined that women whose deaths were pregnancy-related showed evidence of undergoing social and emotional distress. Unemployment impacted 29% of these women, and a history of substance use impacted 42%. More than one in five (21%) had a history of domestic violence and 29% had previous involvement with child protective services. This expanded perspective aids in the development of recommendations.

Data concerning the statewide challenges is limited regarding prenatal care and maternity leave. For those women who had a live birth but experienced a pregnancy-related death, 67% (N=16) did not receive prenatal care during the first trimester in 2018. For half of pregnancy-related deaths, the trimester of first prenatal care visit was unknown. While currently limited by low sample size, as additional data is gathered further investigation into this challenge may be possible. Presently, the PAMR program does not have sufficient data to address the challenge of limited maternity leave in the state of Missouri.



## **Cause and Context**

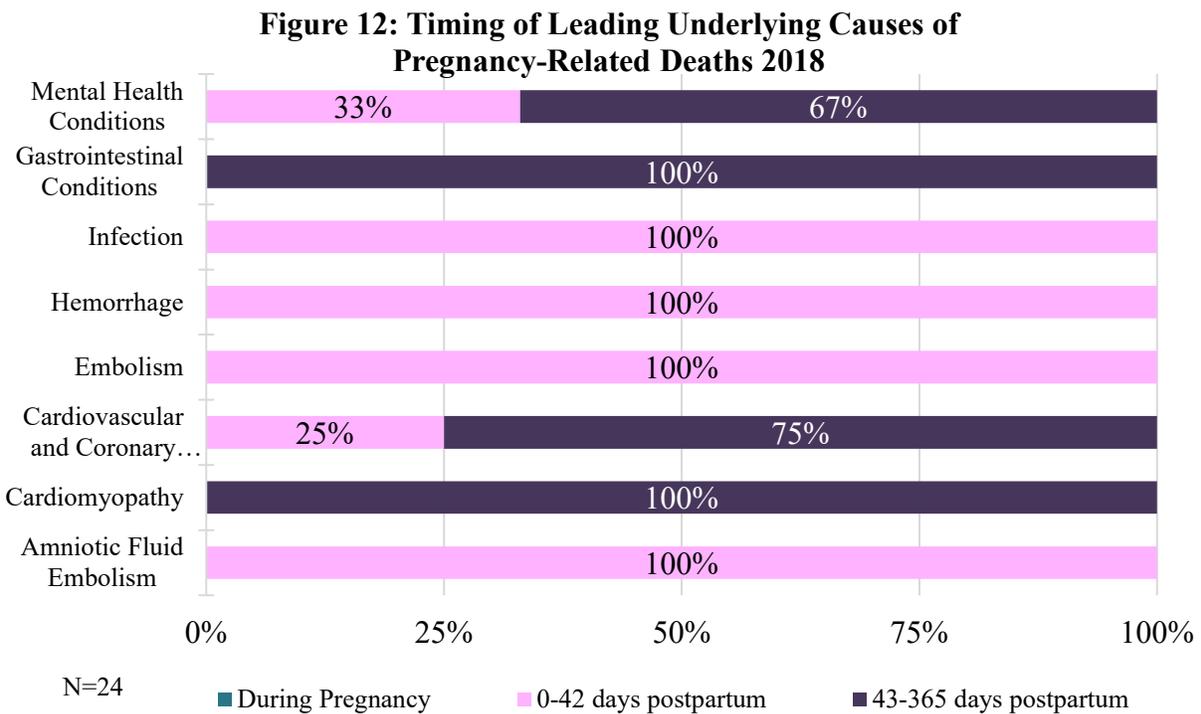
Upon reviewing the information obtained, and determining pregnancy-relatedness, the PAMR board worked to establish a consensus between board members regarding the underlying cause of death and indicated a contributing cause of death for pregnancy-related cases, as appropriate. The leading underlying cause of pregnancy-related deaths in 2018 was determined to be mental health conditions whereas in 2017 the leading underlying cause was cardiomyopathy. Among injury-related deaths in 2018, the most frequent cause of death was overdoses/poisonings, followed by motor vehicle crashes (MVC) compared to 2017 where the leading cause of injury-related deaths was MVC's.

Additional data were provided to help offer context for understanding the circumstances leading up to death. One of these data points was the timing of a death in relation to the pregnancy. Nearly two-thirds (63%) of pregnancy-related deaths occurred in the period between 43 days and one year postpartum. The PAMR board also took into consideration additional information surrounding the death, such as the means of fatal injury in the case of deaths that were not attributed to natural causes, when evaluating cases.

## Causes of Death

Overall, mental health conditions was the most common underlying cause of death for pregnancy-related cases. This was the leading cause of death for mothers between 0 and 42 days postpartum, as well as between 43 days and one year postpartum. For 2018, there were no pregnancy-related deaths that occurred during pregnancy.

Figure 12 shows when, during the perinatal period, different causes resulted in a pregnancy-related death. As shown, cardiovascular conditions, and cardiomyopathy predominantly occur after the six week follow up period. This finding supports PAMR board recommendations for improvements to the assessment and identification of these conditions. It also supports the conclusions that follow up care beyond the initial six week period is necessary, and bolsters the recommendations for the removal of financial and access barriers to care, such as the extension of Medicaid coverage during this period.



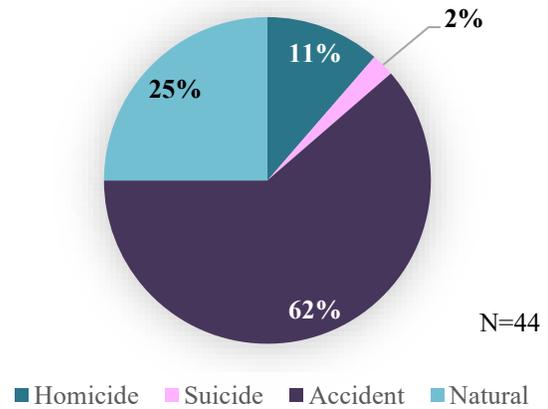
For nine of 24 pregnancy-related cases, the PAMR board indicated a secondary contributing cause of death. Other psychiatric conditions/not otherwise specified (NOS) was a secondary contributor in 12.5% of these cases. Other secondary causes included hemorrhage, sepsis, injury, other cardiovascular disease, and cerebrovascular accident.

To evaluate pregnancy-associated but not related deaths the manner of death as found on the death certificates was utilized. The majority of pregnancy-associated but not related deaths were due to accidents (62%) (Fig. 13). Of these accidents, 61% were overdoses/poisonings while 36% were MVCs. In addition, more than 85% of homicide deaths were attributed to firearms.

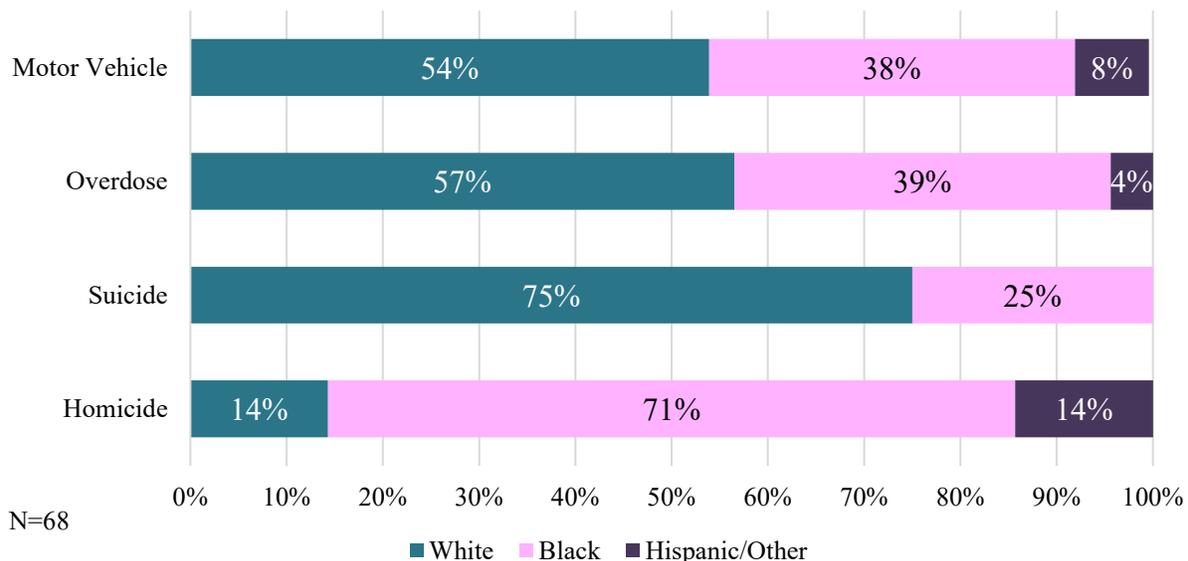
For the purposes of this report, those deaths which were not determined to be due to natural causes are here termed “injury-related”.

Additional analysis of these deaths demonstrated racial disparities. While 15% of live births were to Black Missouri mothers, in 2018 they represented 71% of homicide, 39% of overdose, and 38% of MVC deaths (Fig. 14). These disparities were not as strongly pronounced for those who were Hispanic/Other. In this report, those cases that were determined to “Probably” be suicides were treated as suicides.

**Figure 13: Manner of Pregnancy-Associated but Not Related Deaths**



**Figure 14: Injury-Related Death by Race**



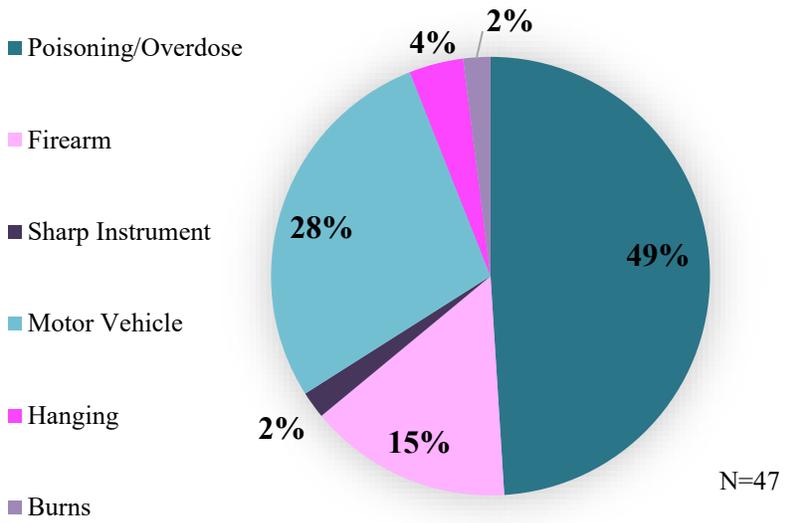
Deaths which the board determined were homicides comprised 10% of all pregnancy-associated deaths. In 43% of homicide cases, the relationship of the perpetrator was unknown, or determined not applicable. In another 43% of cases the perpetrator was the decedent’s partner. Of those women whose deaths were ruled homicides, 71% had a history of substance use, while 28% had a history of domestic violence. Additionally, 43% had engagement with Child Protective Services, the same number had experienced unemployment.

Due to the extremely low sample size of cases that were determined to be suicides by the PAMR board, further demographic analysis of these instances was not reportable in accordance with best practices of statistical reporting and regarding messaging and suicide.<sup>18</sup> Cases that were ruled suicides were generally lacking socio-environmental data. Further analysis of suicide data will likely require aggregating several years, when available, in order to be properly performed.

Deaths that were due to injury-related causes, based upon the manner of death, were evaluated by the board to determine the means of fatal injury (Fig. 15).

The largest proportion of pregnancy-associated deaths due to an injury-related event were from poisonings/overdoses (49%). This was followed by deaths due to motor vehicle crashes (28%). The third largest category was firearm related deaths at roughly 15%.

**Figure 15: Means of Injury, 2018**



Regarding deaths that were injury-related, such as homicides, suicides, MVCs and overdoses, the majority (73%) occurred between 43 days and one year postpartum. The means of injury data predominantly pertain to pregnancy-associated deaths (72%). However, this information helps provide context for 28% of pregnancy-related deaths as well.

**Figure 16: Timing of Injury-Related Deaths by Type 2018**

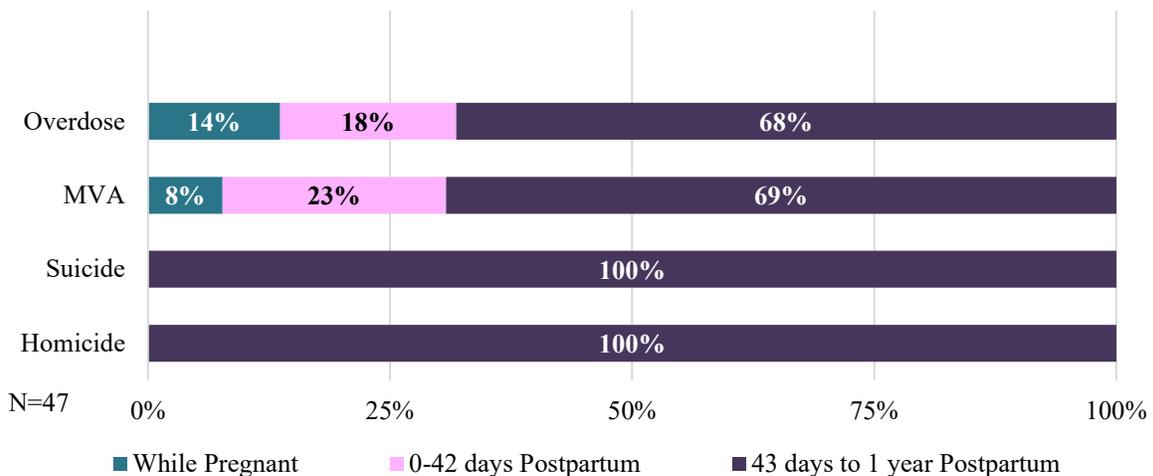


Figure 16 provides a graphic representation of when a given type of injury-related death occurred in relation to a pregnancy.

- The majority of overdose deaths (68%) were found to occur between 43 days and one year postpartum, while another 18% occurred both between zero and 42 days postpartum and 14% occurred during pregnancy.
  - Overdoses made up 34% of all deaths occurring between 43 days and one year postpartum.
  - Overall in the state of Missouri, white women comprised 77% of opioid deaths for women of child-bearing age.<sup>19</sup>
- The majority of MVC's (69%) occurred between 43 days and one year postpartum while 8% occurred during pregnancy.
  - MVC's comprised 17% of all injury-related deaths occurring between 43 days to one year postpartum.
  - MVC's comprised 17% of all injury-related deaths occurring while pregnant.
  - In 77% of MVC deaths, the decedent was unrestrained (not including pedestrians hit by vehicles).
- All homicides (100%) occurred between 43 days and one year postpartum.
  - Homicides comprised 21% of all injury-related deaths occurring between 43 days and one year postpartum.
- In 2018, 100% of suicides occurred between 43 days and one year postpartum.
  - Due to sample size limitations, information on suicides should be used cautiously.



**Contributing Factors**

In accordance with CDC best practice standards, contributing factors leading to an instance of pregnancy-associated death are evaluated by the PAMR board. Additionally, there are three specific factors that are captured in checkboxes to determine whether they contributed to an instance of pregnancy-associated mortality. The first checkbox is mental health conditions other than substance use disorder (SUD). Although SUD is recognized as a mental health condition per the Diagnostic and Statistical Manual of Mental Disorders (DSM – V), it is important to capture data on mental health conditions that do not include SUD such as postpartum depression. While instances of postpartum psychosis are extremely rare, postpartum depression affects 1 out of 7 mothers.<sup>20</sup> Mental Health conditions were determined to be contributing factors in 45% of pregnancy-related deaths which were considered injury-related.

SUD is the second checkbox evaluated. As previously mentioned, SUD is a recognized mental health disorder, and therefore a subset of mental health conditions. Given the increase in overdose-related deaths in Missouri, this remains an area of public health concern.<sup>21</sup> SUD contributed to nearly half of those deaths determined to be from injury-related causes.

Maternal obesity is the final checkbox evaluated by the PAMR board. Obesity continues to be a problem across the country and is a high risk factor for both maternal mortality and SMM.

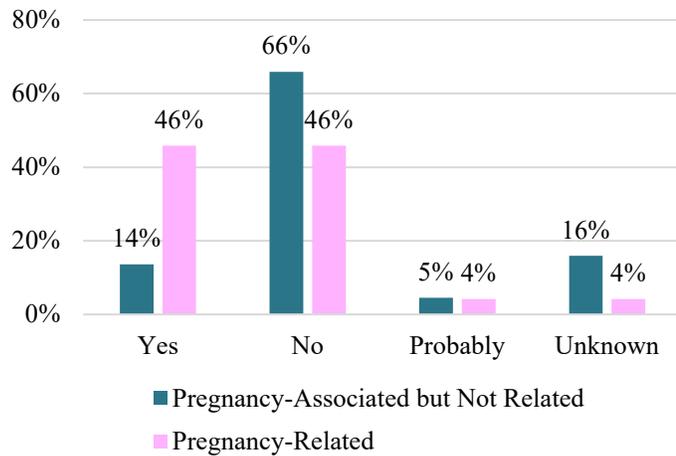
Obesity was only found to be a contributing factor in those deaths which were considered natural based upon the manner of death on the death certificate.

### Mental Health Conditions Other Than SUD

Overall, mental health conditions other than SUD contributed to 14% of pregnancy-associated deaths, and 46% of pregnancy-related deaths.

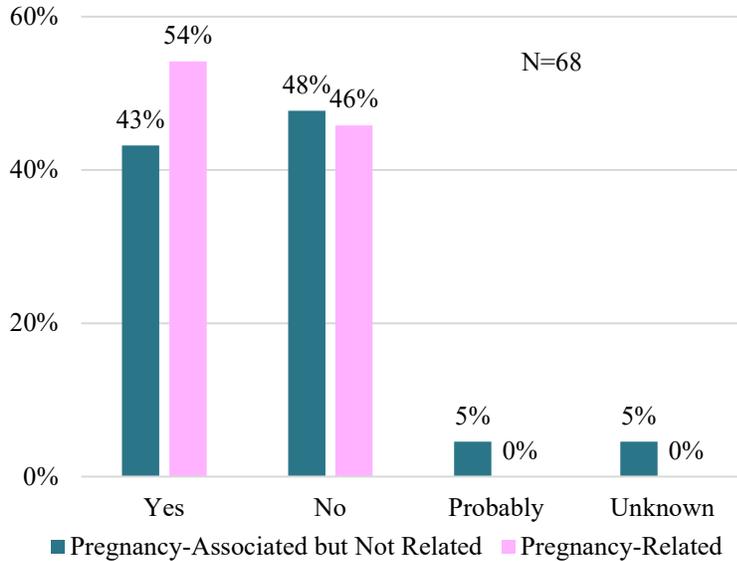
- In 65% of deaths where a mental health condition other than SUD was determined to be a contributing factor, the records also indicated that the decedent had a history of substance use.
- For 16% of pregnancy-associated deaths, the board was unable to definitively say if mental health conditions were a contributing factor (Fig. 17).
- Additionally:
  - Seventeen percent of women for whom mental health conditions other than SUD contributed to their deaths had a history of domestic violence.
  - Thirty-five percent had a history of psychiatric hospitalizations or treatment.
  - Forty-one percent of these women had dealt with unemployment.
  - Forty-one percent had involvement with child protective services.

**Figure 17: Contribution of Mental Health Conditions Other Than SUD, 2018**



N=68

**Figure 18: Contribution of Substance Use Disorder, 2018**



## Substance Use Disorder

### State of Missouri

There were 1,132 fatal opioid overdoses in Missouri in 2018. This has continued a trend of increasing since 2015.

- The majority of opioid fatalities in 2018 (74%) had a history of substance misuse, and
- Thirteen percent had experienced a previous overdose.<sup>22</sup>

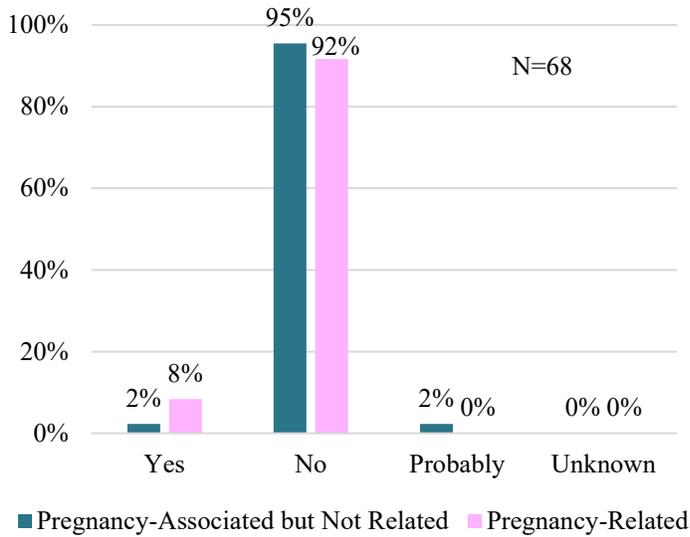
### PAMR Deaths

In 2018, SUDs (including opiates, alcohol and other substances) were a contributing factor in 43% of pregnancy-associated but not related

and 54% of pregnancy-related deaths (Fig. 18). There was insufficient evidence for the PAMR board to definitively say whether SUDs were a contributing factor for 5% of pregnancy-associated but not related deaths, and 5% of pregnancy-associated but not related deaths were unknown.

- Less than half (44%) of those deaths where the board determined SUD was a contributing factor also listed mental health conditions other than SUD as a contributing factor.
- Of those for whom SUD was a contributing factor:
  - Thirty-eight percent had evidence of unemployment.
  - Thirty-one percent had involvement with child protective services.
  - Thirty-one percent had a history of substance use treatment.
  - Nineteen percent had a history of psychiatric hospitalization or treatment.
  - Sixteen percent had a history of domestic violence.

**Figure 19: Contribution of Obesity, 2018**



## Obesity

Obesity, here defined as BMI of 30 or above, was a contributing factor in 8% of pregnancy-related deaths. The PAMR board indicated that obesity contributed to two percent of pregnancy-associated but not related deaths and probably contributed to an additional 2%, but they were unable to reach a definitive conclusion (Fig. 19). The finding that obesity was not a contributing factor for an instance of maternal mortality does not mean the decedent was not obese. While 29% of total live births were to obese women in 2018, they comprised 33% of pregnancy-related deaths.



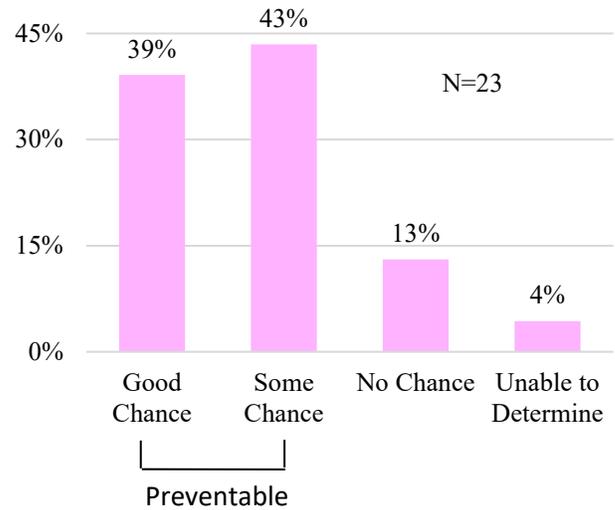
**Preventability and Recommendations**

The PAMR board evaluated whether or not a death was preventable and the likelihood of altering the outcome. For preventable deaths, the board made recommendations about the specific and feasible actions that, if taken, might have changed the course of events. The board recommended interventions across five categories: patient/family, provider, facility, system, and community.

## Preventability

A pregnancy-related death is considered to have been preventable if the committee determines that there was at least some chance of the death being averted by one or more reasonable changes<sup>††</sup> to patient/family, provider, facility, system, and/or community factors. Among these deaths, the majority (82%) were considered preventable, while 17% were either non-preventable, or the committee felt that it could not determine preventability (Fig. 20).

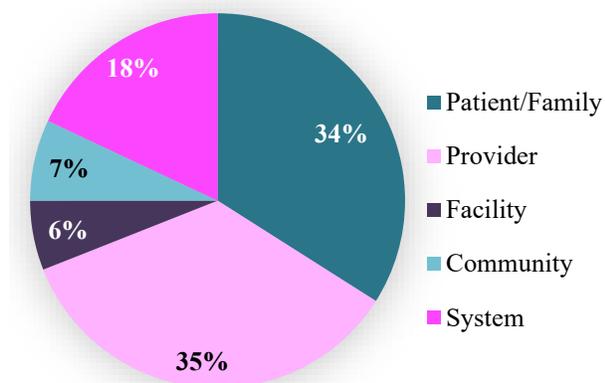
**Figure 20: Chance to Alter Outcome of Pregnancy-Related Deaths**



## Recommendations: Level and Class

The ultimate goal of the PAMR program is to prevent future maternal deaths. To achieve this goal, the PAMR board identifies recommendations for action that could prevent similar, future deaths. These opportunities for prevention are grouped into five categories (Fig. 21). After categorization, they are then classified along common themes.

**Figure 21: Contributing Factors - Level**



Around two thirds of all the PAMR board’s recommendations identified opportunities at the provider or patient/family levels. The board works with de-identified information, as such, interventions within these levels were based on what is anticipated to have a statewide impact. However, the percentage of system level factors the board identified did increase by 4% from 2017.

<sup>††</sup> The board exercised their judgment and applied the reasonable person standard in considering whether or not a change was reasonable.

Table 8: Overall Contributing Factor Classifications					
	#	%		#	%
Adherence	17	10.8	Social Support/Isolation	5	3.2
Knowledge	13	8.2	Violence	8	5.1
Continuity of Care	6	3.8	Other	11	7.0
Clinical Skill/Quality of Care	4	2.5	Tobacco Use	2	1.3
Delay	5	3.2	Chronic Disease	1	0.6
Access/Financial	6	3.8	Outreach	3	1.9
Referral	8	5.1	Communication	3	1.9
Assessment	19	12.0	Law Enforcement	1	0.6
Substance Use Disorder	21	13.3	Cultural/Religious	2	1.3
Mental Health Conditions	13	8.2	Discrimination*	7	4.4
Policies/Procedures	3	1.9	Total	158	100.1

\*Discrimination was not added as an option until later in the year

The factors contributing to a death do not take place in a vacuum and so may influence each other. A delay in seeking treatment may have been rooted in a gap in knowledge regarding a chronic disease. A woman may have begun using substances to deal with social isolation which compounded a mental health condition. A patient or provider may have decided to change or alter treatment of a pre-existing mental health condition unnecessarily, resulting in the development of a perinatal mood or anxiety disorder. Policies may be in place at some facilities that prevent providers from making some referrals, interrupting continuity of care by preventing communication across systems, or even conducting more comprehensive patient assessments. As such, implementation of a single recommendation at one level may have an effect on the others.

The most common contributing factor was classified as *substance use disorder* (13.3%). This indicates that the issues in the cases involved a recurrent use of alcohol and/or drugs causing clinically and functionally significant impairment. Many recommendations were identified that tied to an overall area of SUD including addressing patient education, provider screening, referral and treatment practices, standardized practices at facilities, community outreach regarding education and resources, and system wide telehealth solutions.

The second most frequent contributing factor was classified as *assessment* when the PAMR board determined that the woman was placed at risk for a poor clinical outcome due to screening failures, and as a result the proper course of treatment was not initiated. As such, the PAMR board recommended that **all providers perform validated depression/anxiety (i.e. EPDS PHQ, et al.) and SUD screenings on every patient at every interaction throughout the pregnancy and postpartum period.** Additionally, **make referrals to mental health professional, social workers, community health workers, and SUD treatment programs as**

**appropriate.** The third most frequent contributing factor was classified as *adherence* (10.8%). Adherence is the classification used when an identified issue was related to the provider or patient not following protocol or failing to comply with standard procedures.

In addition to identifying themes using the category and classification, qualitative analysis was undertaken to supplement these quantitative measures. There were four dominant themes which emerged through this process to help target efforts at decreasing maternal mortality. The most prominent theme was recommendations for the use of validated screenings of mental health conditions and substance use disorder to be conducted at multiple intervals during pregnancy and postpartum. Two more themes emerged which focused on the need for increased community outreach, and increased knowledge of how to treat mental health conditions during pregnancy. Additionally, the board recommended increasing services and knowledge for the treatment of SUD.

*Patient/Family*

**Table 9: Contributing Factors for Patient/Family Level**

	Adherence	Substance Use Disorder	Knowledge	Delay	Mental Health Conditions	Social Support / Isolation	Access/Financial	Violence	Cultural/Religious	Tobacco Use	Other	TOTAL
#	17	14	2	4	5	4	1	2	1	2	2	54
%	31.5	25.9	3.7	7.4	9.3	7.4	1.9	3.7	1.9	3.7	3.7	100.1

Contributing factors that were classified as *adherence* all connected to the patient/family level, and comprised nearly one-third (32%) of this category. **This included continued recommendations that the state conduct annual seat belt safety campaigns and trainings. This was extended to also address the need to follow recommendations for postpartum care, to attend follow up appointments, and adhere to prescribed medications in the context that women on Medicaid during pregnancy lose insurance coverage 60 days postpartum and may not be able to afford prescription medications.**

While, *SUD* made up the second largest group of factors that contributed at the patient/family level (26%), the bulk of the recommendations for the patient/family level focused on a need for education. This was most commonly targeted at preconception health and prenatal healthcare issues, but also dealt with substance use, mental health and Intimate Partner Violence (IPV). In order to address these issues, the PAMR board recommended that **community organizations**

**target vulnerable populations with a focus on the following: reduction of stigma surrounding treatment for SUD and mental health conditions, IPV, and preconception health, by providing outreach and resources to address these issues.** By examining the data qualitatively and quantitatively, a more detailed picture emerged from the recommendations. Thus many of the issues and contributing factors identified in the reviews manifest at the patient/family level, but the opportunity for intervention is largely at another level. For example, while patient adherence was identified as a contributing factor, the opportunity to intervene was largely around improved screening practices at the provider level and outreach at the community level.

Contributing factors that were classified as *mental health conditions* comprised roughly 9% of the patient/family level. This includes perinatal mood and anxiety disorders like postpartum depression. The PAMR board recommended that **all providers screen for mental health conditions with validated tools throughout the pregnancy and postpartum period.** They further identified gaps in knowledge regarding treatment of mental health conditions during pregnancy on the part of patients and their families, and providers, and recommended **the establishment of a statewide Perinatal Consult Center to provide telehealth services for SUD and mental health conditions. Additionally, the PAMR board recommended providers be further educated on mental health conditions, SUD, and cardiovascular disorders during and after pregnancy (See Key Recommendations for a more detailed description).**

Contributing factors were classified as *delays* when the board determined there was a failure to seek care or provide follow-up. This classification comprised 7% of the patient/family level. Although delays were identified at the patient/family level, the PAMR board recognized the opportunity for intervention fell within the provider and facility levels. The PAMR board recommended **providers and facilities aggressively pursue missed follow-ups as standard practice.** This was done to recognize that healthcare providers and systems can do more to ease the burden of responsibility from patients.

Contributing factors involving a lack of support from family, partners, or friends were classified as *social support/isolation*. This comprised nearly 7% of the patient/family level. When the board found that a woman's beliefs acted as a barrier to care due to lack of understanding, or led to refusal of therapy, the contributing factor was classified as *cultural/religious*. This classification was used for 2% of the patient/family level.

Contributing factors where the patient's use of tobacco directly compromised their health status were classified as *tobacco use*. This was the case in 4% of the identified factors at the patient/family level. However, tobacco use warrants a little more discussion. Missouri has the lowest cigarette tax in the country by far, bringing in roughly \$258.9 million against an annual

smoking caused health care cost of \$3.03 billion.<sup>23</sup> While it may not have been a direct contributor to death, the negative health impacts of smoking on a person are well documented. **In 2018, at least 42% of pregnancy-related deaths were to smokers** with another 8% considered unknown. As such, the PAMR board requested the program begin tracking tobacco use, regardless of whether it was considered a contributing factor.

*Provider*

**Table 10: Contributing Factors for Provider Level**

	Clinical Skill / Quality of Care	Knowledge	Assessment	Referral	Continuity of Care / Care Coordination	Delay	Discrimination	Mental Health Conditions	Chronic Disease	Violence	Substance Use Disorder	Communication	Other	TOTAL
<b>#</b>	3	7	15	8	1	1	6	3	1	2	1	2	5	55
<b>%</b>	5.5	12.7	27.3	14.5	1.8	1.8	10.9	5.5	1.8	3.6	1.8	3.6	9.1	99.9

At the provider level, contributing factors were most commonly identified as issues with *assessment* (27%). Addressing issues with assessment was a common theme in the provider recommendations. The PAMR board recommended that **all providers should perform validated screenings for mental health and substance use disorders** which was the most repeated. However, connected to this was the recommendation that **screenings needed to be performed at multiple intervals during the pregnancy and the postpartum period for all patients**. An emphasis was also placed on community organizations providing **outreach and patient/family education on issues such as SUD treatment, IPV resources, as well as chronic and mental health conditions**.

Related to these problems of assessment are instances where the board determined that the appropriate specialists were not consulted. These were classified as *referral* (15%). While the PAMR board did recommend **improved referrals to medical specialists, they also recommended referrals to social workers, and to mental health providers**. Recommendations for improved assessment practices were readily tied to recommendations that providers make appropriate referrals, particularly for identified SUD and mental health conditions.

Contributing factors were classified as gaps in *knowledge* when the board found that either the provider or the patient had an inadequate understanding of the significance of a health event, or they lacked understanding about the need for treatment/follow-up after evaluation for a health

event (13%). This led to recommendations including **increasing provider knowledge of treatment practices and the importance of screening for chronic conditions that may be exacerbated by pregnancy (i.e. cardiovascular diseases)**. Contributing factors where it was determined that the occurrence of one or more significant pre-existing medical conditions contributed to a woman’s health outcome were classified as *chronic disease* (2%).

Contributing factors were classified as *discrimination* (11%) when it was determined that someone had been treated less or more favorably based on the group, class or category they belong to resulting from biases, prejudices, and stereotyping. Analysis of this was limited by the fact that it was formalized as a classification late into the review of 2018 deaths. To this end, the PAMR board recommended that **facilities conduct implicit bias trainings annually to combat stereotypes regarding race, sexual orientation, and substance use among other biases which negatively affect the care a patient may receive**.

Contributing factors where the PAMR board determined personnel were not appropriately skilled for the situation or failed to exercise clinical judgment consistent with current standards of care were classified as *clinical skill/quality of care* (6%). Recommendations specifically targeted the need for **all birthing facilities to standardize practices and procedures through the utilization of the Alliance for Innovation on Maternal Health (AIM) bundles as well as increase education regarding the identification of warning signs for complications and unusual circumstances**.

*Facility*

**Table 11: Contributing Factors for Facility Level**

	Policies / Procedures	Continuity of Care / Care Coordination	Assessment	Communication	Discrimination	Substance Use Disorder	TOTAL
#	1	2	2	1	1	3	10
%	10.0	20.0	20.0	10.0	10.0	30.0	100.0

While *SUD* made up the largest percentage of contributing factors at the facility level (30%), within these were contributing factors regarding *assessment* as well as *policies and procedures*. When the PAMR board found that the facility lacked basic policies or infrastructure suitable for the woman’s needs, these were classified as *policies/procedures* (10%). While the recommendations may have targeted a specific subject, throughout the facility level there was a

consistent theme that **facilities should implement standard operating procedures regarding assessment and referral issues. The implementation of AIM bundles was the most common theme for this category.**

Contributing factors classified as *continuity of care* comprised 20% of the facility level. While continuity of care between providers was a theme in the recommendations based on 2017 deaths, it appeared less frequently in 2018. Though it was recommended that facilities begin use of a centralized medical record system for ensuring providers are able to easily and reliably access all patient data across systems. Contributing factors were classified as *communication* (10%) when the PAMR board determined that the health outcome may have been improved had care not been fragmented among or between healthcare facilities or healthcare units.

*Community*

**Table 12: Contributing Factors for Community Level**

	Knowledge	Violence	Mental Health	Outreach	Other	TOTAL
#	2	3	1	3	2	11
%	18.2	27.3	9.1	27.3	18.2	100.1

While contributing factors were limited at the community level, they have increased from the number of contributing factors in this level for 2017 deaths, this may be attributable to the board resolving to do better at evaluating issues within this level to improve their recommendations. Contributing factors where the board found a lack of coordination between healthcare systems and other organizations in the area that work with maternal child health issues were classified as *outreach*.

While the argument could be made that some of the calls for community outreach deal with issues that may be centered on the patient/family responsibility, the patient/family can hardly be blamed for not knowing what they do not know. Providers are restricted to those instances where a woman engages the healthcare system, as are facilities, and thus the PAMR board recommended that community groups endeavor to reach out to individuals. As such, 74% of the recommendation themes in the community level focused on outreach through the qualitative analysis. **Management of mental health conditions and substance use disorders as well as preconception health were the most frequently targeted.** Additionally, recommendations for **outreach included eliminating the stigmatization of individuals, particularly regarding mental health conditions and SUD’s, at the community level.**

Contributing factors were classified as *violence* when there was evidence of physical or emotional abuse perpetrated by a current or former intimate partner, family member, friend, acquaintance, or a stranger. This comprised 27% of contributing factors at the community level. This led to recommendations generally targeted at **increasing the outreach of community and faith based organizations, particularly to victims of domestic violence regarding resources and warning signs.**

*System*

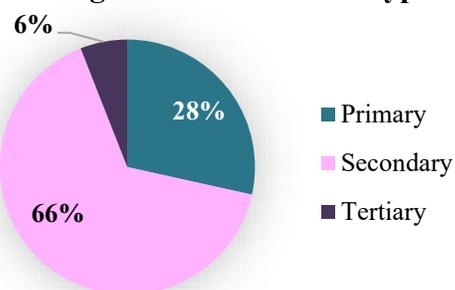
**Table 13: Contributing Factor for System Level**

	Continuity of Care / Care Coordination	Access / Financial	Knowledge	Other	Violence	Mental Health Conditions	Cultural/Religious	Substance Use Disorder	Social Support	Policies/Procedures	Law Enforcement	Clinical Skill/Quality of Care	Assessment	TOTAL
<b>#</b>	3	5	2	2	1	4	1	3	1	2	1	1	2	28
<b>%</b>	10.7	17.9	7.1	7.1	3.6	14.3	3.6	10.7	3.6	7.1	3.6	3.6	7.1	100.0

Contributing factors were classified as *access/financial* when system issues, e.g. lack or loss of healthcare insurance or other financial duress, as opposed to an issue with adherence, impacted a woman’s ability to care for herself. This made up the largest group of system level classifications (18%). The PAMR board continued to urge the **extension of the Medicaid program to cover up to one year postpartum for all conditions (including medical, mental health and substance use disorder), even if the woman did not start treatment prior to delivery, to target women whose conditions is exacerbated in the postpartum period.** This classification was also used to indicate other barriers to accessing care, such as insurance non-eligibility, provider shortage in a woman’s location and lack of public transportation. Roughly 7% of contributing factors were classified as referrals and *other* factors. However, the dominant theme of these recommendations was the **expansion of telehealth options.** Telehealth recommendations were targeted at mental health and SUD, as well as follow up care with the context that Missouri has a shortage of providers who can treat mental health conditions and SUD, especially during and after pregnancy. Additional recommendations at the system level included a **motor vehicle safety campaign.**

## Recommendations: Prevention and Impact

**Figure 22: Prevention Type**



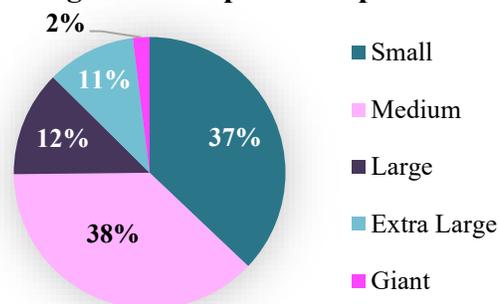
Recommendations at the primary type of prevention were those that prevent the contributing factor before it ever occurs and comprised 28% of recommendations. The majority of ranked recommendations (66%) were directed at the secondary type of prevention. These were those recommendations targeted at reducing the impact of the contributing factor once it has occurred. Lastly, tertiary prevention comprised six percent of the recommendations (Fig. 22). These were

recommendations that would reduce the impact of the progression of what has become an ongoing contributing factor.

The expected impact of a recommendation was ranked from small to giant. Small impacts, those involving education/counseling (community- and/or provider-based health promotion and education activities) were expected from 37% of recommendations. The largest percent of recommendations (38%) were anticipated to have a medium impact. These involved clinical interventions and coordination of care across the continuum of well-woman visits (protocols, prescriptions).

Large impacts, those that act as long-lasting protective interventions (improved readiness, recognition and response to obstetric emergencies, and long-acting reversible contraceptives) were anticipated for 12% of recommendations. Extra-large impacts, those that create a change in context (promoting environments that support healthy living/ensure available and accessible services) were anticipated for 11% of recommendations (Fig. 23). Giant impacts, those which address social determinants of health (poverty, inequality, etc.) were expected from two percent of PAMR board recommendations. After the 2017 report, the PAMR board had resolved to make recommendations that would have a larger impact. In 2018, 25% of recommendations were expected to have at least a large impact, compared with 16% in 2017.

**Figure 23: Expected Impact**





## Implementation and Improvement

The ability to take action on the recommendations provided by the PAMR board in 2020 was severely impaired by the necessity of responding to the COVID-19 pandemic. Staff time was moved away from these projects and reallocated to aid in the state efforts to combat the pandemic as necessary. Additionally, the COVID-19 response resulted in delays of approval and distributions of fact sheets and other documents which were created in response to the recommendations of the PAMR board.

However, while the PAMR program was unable to focus on this project as intended, staff continued to develop processes, procedures, and documents throughout the year (Appendix C). Some changes to processes and procedures were made to allow for the best opportunity to meet the goals of the ERASE-MM grant, which funds the PAMR program, as expeditiously as possible. Other changes were implemented to provide the PAMR board with enhanced insights into the lives, experiences, and healthcare interactions of the cases being evaluated. Though the PAMR program would have liked to create more documents to disseminate the recommendations of the PAMR board, those which were developed helped to carve a path for the development of more documents in the future. The efforts undertaken are further detailed below.

### **Process and Procedure Improvements:**

One area in which the program was able to improve was in the timely identification of death certificates. Prior years had been unable to use provisional data and had to wait for the master files to be released from BEVS. This meant that some deaths were unable to be identified within one year from the date of death. However, by using provisional datasets, the majority of deaths were able to be identified inside the one year timeframe per CDC's guideline. The use of provisional data appears to have resulted in an increase in cases identified as false positives. However, the cost of investigating these was deemed negligible compared with the benefits of having more time to gather records and more fully abstract cases. This change to the identification process was implemented and will be reflected in analysis of 2019 cases.

In addition to changing the process for case identification to improve timeliness, the program also made procedural changes to allow for improvements to the timeliness of case reviews. Cases previously had been grouped by common themes, so that similar cases would follow each other. The benefit of this was that it allowed for subtle distinctions between similar cases to be more readily apparent. However, this did not allow for review within two-years from date of death per CDC's guideline. As such, the program has shifted so that the board now reviews cases in death order. This was a running change implemented during 2020 and as such timeliness is anticipated to improve with 2019 death reviews.

In order to aid the case abstraction process, a linkage with the Patient Abstract System (PAS) was developed. The PAS collects hospital discharge data, both inpatient and outpatient. This includes data from emergency rooms and ambulatory surgical centers. The purpose of this linkage was to improve case abstraction by identifying when and where women received medical care in the year leading up to their death. 2019 cases served as the testing ground for the PAMR/PAS linkage which did identify interactions with the healthcare system which had previously not been found through the available medical histories associated with the birth and death certificates.

In an attempt to improve the ability of the board to make recommendations related to the community and system levels, particularly those relating to the social determinants of health, the program began developing community dashboards for inclusion with the case summaries. These dashboards utilize a number of databases to look at a variety of factors related to the geographic area in which a person lived. This includes information on birth outcomes, built environment, and socioeconomic indicators. The inclusion and development of these dashboards is an evolving process that should continue to develop as new sources of information are uncovered and presentation methods are evaluated for efficacy. The development of these dashboards was hindered by staff being redirected to focus on the state response to the COVID-19 pandemic.

An additional procedural change was the expansion of the age range used to identify pregnancy-associated cases. Previously, child-bearing age had been defined as between the ages of 12 and 55 years old. This was expanded per CDC so that the age range used to identify cases became 10

to 60 years old. The guidance to adjust the age range was published while 2018 cases were being reviewed. While expanding the age range did not result in additional cases for 2018, this expansion was undertaken in order to ensure that as many pregnancy-associated cases were identified as possible.

In order to better address concerns regarding implicit bias and discrimination, new fields were added to the Committee Decisions Form (Appendix D). Interpersonal racism and structural racism, were included as contributing factor options, as was discrimination. Discrimination was defined as treating someone differently based on the group, class or category they belong to, based upon biases, prejudices and stereotyping, which can manifest in differences in care and communication. This was implemented late in the year with time taken to develop the application of these new metrics. As such, data from these questions is not reported in detail throughout this document and will not be available until 2019 deaths are reviewed.

In October of 2020, new fields were also added to help further the analysis of the recommendations. Previously, the level (patient/family, provider, facility, community, system) had been assigned at the point of the contributing factor. The new fields allow for delineation between the level of the contributing factor and the level targeted by the recommendation addressing the contributing factor. This will allow for more detailed analysis on how the various categories interact in the future. For example, contributing factors at the patient level may have a solution that could be implemented at the provider level. This change was implemented late in the process of reviewing 2018 deaths and as such, this analysis will begin with the review of 2019 deaths.

### **Document Development:**

The development and distribution of documents intended to disseminate the findings of the PAMR board was the area most negatively impacted by the COVID-19 pandemic in 2020. For a period, it was difficult if not impossible to have documents not related to the COVID-19 pandemic approved for dissemination. Those that were approved were quickly lost in the volume of reports, guidelines, and other news associated with COVID-19. In addition, staff were redirected away from these development and dissemination projects to aid in the states contact tracing, call center, testing, notification, and reporting efforts.

The “*Missouri Pregnancy Associated Annual Review: 2017 Annual Report*” was presented to the state legislature in June of 2020. In addition, the report was made available online at <https://health.mo.gov/data/pamr/>. Physical copies of the report were disseminated to staff and PAMR board members as requested. The report was also forwarded to the Missouri Hospital Association (MHA), the Missouri Chapter of the American College of Obstetricians and Gynecologists, and to many other stakeholders.

A poster utilizing PAMR data was presented virtually at the CityMatCH 2020 conference. This presentation utilized information from the Missouri Pregnancy Risk Assessment Monitoring

Survey, the State Opioid Overdose Surveillance System and PAMR to examine the problem of substance use holistically without having to sacrifice generalizability or specificity. By contextualizing PAMR findings with population-based surveillance efforts, epidemiologists were able to develop a greater contextual understanding of opiate use in the maternal population.

Two fact sheets on peripartum cardiomyopathy were developed. Though very similar, each was targeted at different populations. The first, targeted at health care providers, was more technical in nature and focused on things that providers could do to address the problem. The second was focused on a more general audience and was aimed at helping individuals identify when they are having a problem and how serious that problem might be. These fact sheets were supplemented with the development of an infographic.

A flyer was developed in response to the recommendation that the department work with partners to develop a perinatal seat belt safety campaign for dissemination targeted at women of childbearing age. This was done with approval of the Missouri State Highway Patrol in an attempt to address the largest cause of pregnancy-associated but not related deaths from the 2017 report.

### **Recommendation Implementation:**

The recommendation to “standardize practices and procedures across the healthcare system through utilization of evidence-based practices such as AIM bundles” was implemented through the use of Missouri’s AIM collaborative. Through a contract funded by the ERASE-MM grant, the MHA began implementation of the AIM “Severe Hypertension in Pregnancy Bundle” in the fall of 2019. In the spring of 2021, MHA will lead efforts to implement the “Obstetric Care for Women with Opioid Use Disorder Bundle.” Additional efforts were undertaken to address this recommendation through Show-Me ECHO (Extension for Community Healthcare Outcomes). This team uses teleconferencing to connect interdisciplinary teams of experts with primary care providers and other professionals twice a month. Improving perinatal care and SUD were particularly targeted by this team of expert members from across the state. The previously discussed cardiomyopathy fact sheets were also generated to address this recommendation.

The PAMR board’s recommendation to extend Medicaid coverage for all maternal conditions to include one year postpartum was provided to the state legislature through the 2017 annual report. This recommendation was highlighted in the Preventions and Recommendations summary, discussed as one of the primary systems level recommendations, and included as an action item in Appendix C. In 2018, Missouri’s legislature passed HB 2280 which expanded coverage for pregnant women receiving substance use treatment within 60 days of giving birth from 60 days post-partum to 12 months. In August of 2020, Missouri voters approved an amendment to the state constitution to expand Medicaid eligibility. The full implementation of this has yet to be developed, postponing further evaluation until a later date.



## Conclusions

Maternal mortality in the state of Missouri is exceptionally complex. It touches the societal issues of rampant obesity, health inequity, and the ongoing opioid epidemic. Seeking to understand this problem brings to light a variety of other concerns rooted in the healthcare system, provider education, patient accountability, and community failings. Through addressing the issues identified by the PAMR board, the state of Missouri seeks to decrease our rate of maternal mortality, while simultaneously improving those situations related to this issue. It is with this goal in mind that the PAMR board recommended standardization regarding the practices and procedures within the healthcare system, as well as improvements to the continuity of care abilities within and between systems. The board also found a demonstrated need for increases in education of both providers and patients regarding treatment during and after pregnancy; and the expansion of options for telehealth. Furthermore, the board concluded that community organizations could be utilized to help women understand the importance of optimizing health prior to conception, as well as maintenance of their mental health care and provide resources related to SUD. Moving forward, the PAMR board will continue to review cases of maternal mortality and provide recommendations to eliminate preventable maternal mortality in the future.

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## Appendix A: Case Identification Criteria

PAMR coordinates with the BEVS to accurately identify eligible pregnancy-associated deaths for review. All death certificates of Missouri residents (including those residents who died out of state) between the ages of 10 and 60 in 2018 were considered a potential case if:

1. The underlying cause of death is coded with an International Classification of Diseases (ICD-10) code. If the code indicates that the cause of death was due to pregnancy, it will identify the case. These codes are:
  - a. A34.
  - b. O00-O99.
  - c. More information on these ICD-10 codes can be found here:  
[https://www.cdc.gov/nchs/data/dvs/2e\\_volume1\\_2017.pdf](https://www.cdc.gov/nchs/data/dvs/2e_volume1_2017.pdf).
2. Linkage to a birth certificate or fetal death report within one year prior to date of death using the following criteria:
  - a. Matched based on Social Security Number.
  - b. Matched based on mothers first and last name.
  - c. Matched based on common misspellings and transposed names.
  - d. Matched based on mothers' date of birth and name.
3. Completion of the pregnancy checkbox on the death certificate to indicate the decedent either was pregnant at the time of death, or had been pregnant within the last year.

## Appendix B: Sources of Mortality Review Outline

National Sources of Maternal Mortality Information				
	Missouri Vital Statistics (MVS)	NCHS (2003-2017) / WHO	PMSS	MMRC (PAMR)
Data Sources	Death Certificates	Death Certificates	Death Certificates linked to fetal death and birth certificates	Death certificates lined to fetal death and birth certificates, medical records, social service records, informant interviews, social media etc.
Time Frame	During Pregnancy – 1 year	During Pregnancy – 42 days	During Pregnancy – 1 year	During Pregnancy – 1 year
Inclusion	Missouri Residents	Missouri Residents	Missouri Resident/Recorded	Missouri Residents
Source of Classification	ICD-10 codes	ICD-10 codes	Medical epidemiologists (PMSS-MM)	Multidisciplinary committee
Terms	Maternal Death	Maternal Death	Pregnancy-Associated, Pregnancy-Related	Pregnancy-associated, Pregnancy-Related
Measure	Maternal Mortality Rate - # of Maternal Deaths per 100,000 live births	Maternal Mortality Rate - # of Maternal Deaths per 100,000 live births	Pregnancy-Related Mortality Ratio - # of Pregnancy-Related Deaths per 100,000 live births	Pregnancy-Related Mortality Ratio - # of Pregnancy-Related Deaths per 100,000 live births
Purpose	Show state trends and provide a basis for national comparison	Show national trends and provide a basis for international comparison	Analyze clinical factors associated with deaths, publish information that may lead to prevention strategies	Understand medical and non-medical contributors to deaths, prioritize interventions that effectively reduce maternal deaths.

Appendix C: Documents Developed from Previous Year

Seatbelt Safety Flyer

# MISSOURI BABIES NEED THEIR MOTHERS TO BUCKLE UP

41% of injury related maternal deaths\* in 2017 were due to Motor Vehicle Crashes (MVC).

Seat belts would have saved the lives of more than half of the people killed in MVC's every year.†

Missouri State Law: Everyone riding in the front seat must be buckled in.

After pregnancy, continue to buckle up. To take care of your baby, you have to take care of yourself.

During Pregnancy:

- 1) Place the shoulder belt across your chest (between your breasts) and over your collar bone (away from your neck).
- 2) Buckle the lap belt below your belly so that it fits snugly across your hips and pelvic bone.
- 3) Pull any slack (looseness) out of the belt.



85% of maternal deaths due to MVC were unbuckled.



Data provided by the Missouri Pregnancy-Associated Mortality Review program  
\* Here maternal death refers to those deaths to a mother during pregnancy or within one year postpartum that are not related to pregnancy  
† Data provided by the Missouri State Highway Patrol

## Cardiomyopathy and Pregnancy

Nationally, peripartum cardiomyopathy is the most common cause of pregnancy-associated heart failure.<sup>1</sup> From 2014-2018, the leading causes of death in the state of Missouri were diseases of the heart. The Missouri Pregnancy Associated Mortality Review (PAMR) Board found that 26% of pregnancy-related deaths were due to cardiomyopathy, with another 5% being attributed to other heart conditions in 2017.<sup>2</sup>



Peripartum cardiomyopathy (PPCM) is a disorder in which initial left ventricular systolic dysfunction and symptoms of heart failure occur late in pregnancy or during the postpartum period.<sup>3</sup>

This increased difficulty in cardiac function may ultimately result in heart failure.<sup>4</sup> During pregnancy, a woman's heart rate and ejection volume increase, taxing her cardiovascular system. This increased demand on a woman's heart during pregnancy may worsen a heart disorder that had previously been undetected, or may cause a heart disorder to develop. The risk of these problems increases throughout pregnancy as the requirements on the heart concurrently increase. Additionally, a woman's cardiac

workload is further increased during labor and delivery by sudden changes in blood flow and pressure.<sup>5</sup> These additional demands further increase a woman's risk. However, mortality rates may be improved with proper treatment. To that end, the PAMR board has recommended performing baseline echocardiogram's in the presence of PPCM risk factors.

After giving birth, it can take substantial time to return to a woman's preconception baseline levels. Some women will return to full strength within two weeks, but a number may recover only a portion of their cardiac function at six months postpartum, and others may take longer still. As such, instances of PPCM often occur with subsequent pregnancies. However, while those with decreased cardiac function are at greater risk for PPCM, women with a completely healthy heart remain at higher risk during a subsequent pregnancy.<sup>6</sup> The PAMR board emphasized the need for increased patient education regarding healthy birth spacing, and preconception health in order to lower the risk of developing PPCM.

### **Risk factors for Peripartum Cardiomyopathy:**

- Having had several pregnancies
- Carrying more than one child
- Advanced maternal age (30 or older)
- Having preeclampsia or eclampsia

Because the symptoms of cardiomyopathy overlap those of normal pregnancy, diagnosis can be a challenge. As such, cardiomyopathy often goes undiagnosed in general, and as many as 1 in 500 adults may have this condition. For this reason, it is important that patients know the warning signs of cardiomyopathy. Women who have been pregnant within the last year in particular should contact a physician if they experience:<sup>7</sup>

### Warning Signs of Peripartum Cardiomyopathy

- Difficulty Breathing: after minimal physical exertion, such as walking across a room
- Swelling: in the ankles, feet, legs, abdomen and veins of the neck
- Fainting / Fatigue: including dizziness or lightheadedness while seated, feeling like you're going to pass out while standing
- Unusual Heart Beat: discomfort, heaviness, pressure, aching, burning, fullness, squeezing or painful feeling in your chest
- Persistent Cough: coughing that won't go away, regardless of position, and has been present for a while
- Trouble Sleeping: requiring multiple pillows to elevate yourself so you can sleep

Consideration and diagnosis of cardiovascular disease during pregnancy could reduce the national rate of maternal mortality annually.<sup>8</sup> Based upon the recommendations of the PAMR board, providers are encouraged to educate their patients regarding preconception health, and to work toward increased surveillance of potential cardiovascular disease from conception until at least one year postpartum. In addition, communities should also work to educate prospective mothers regarding preconception health, as they otherwise might not engage with the healthcare system until they become pregnant.

<sup>1</sup> Fett JD. Promoting awareness of peripartum cardiomyopathy (PPCM). *International Journal of Cardiology*. 2020;305:113-114. doi:10.1016/j.ijcard.2020.01.057.

<sup>2</sup> Pregnancy Associated Mortality Review Annual Report. 2020. Forthcoming.

<sup>3</sup> Sliwa K, Fett J, Elkayam U. Peripartum cardiomyopathy. *The Lancet*. 2006;368(9536):687-693. doi:10.1016/s0140-6736(06)69253-2.

<sup>4</sup> Cardiomyopathy. Mayo Clinic. <https://www.mayoclinic.org/diseases-conditions/cardiomyopathy/symptoms-causes/syc-20370709>. Published January 23, 2019. Accessed March 17, 2020.

<sup>5</sup> Managing heart conditions during pregnancy. Mayo Clinic. <https://www.mayoclinic.org/healthy-lifestyle/pregnancy-week-by-week/in-depth/pregnancy/art-20045977>. Published July 18, 2017. Accessed March 17, 2020.

<sup>6</sup> Day JA. Peripartum Cardiomyopathy: Johns Hopkins Women's Cardiovascular Health Center. Peripartum Cardiomyopathy: Johns Hopkins Women's Cardiovascular Health Center. [https://www.hopkinsmedicine.org/heart\\_vascular\\_institute/centers\\_excellence/womens\\_cardiovascular\\_health\\_center/patient\\_information/health\\_topics/peripartum\\_cardiomyopathy.html](https://www.hopkinsmedicine.org/heart_vascular_institute/centers_excellence/womens_cardiovascular_health_center/patient_information/health_topics/peripartum_cardiomyopathy.html). Published April 15, 2016. Accessed March 17, 2020.

<sup>7</sup> PPCM Symptoms and Self Test. Save The Mommies. <https://savethemommies.com/ppcm-symptoms/>. Accessed March 17, 2020.

<sup>8</sup> ACOG Practice Bulletin No. 212. *Obstetrics & Gynecology*. 2019;133(5). doi:10.1097/aog.0000000000003243.

Missouri Department of Health and Senior Services • Section for Women's Health

For More Information Visit: [health.mo.gov/data/pamr/](http://health.mo.gov/data/pamr/)

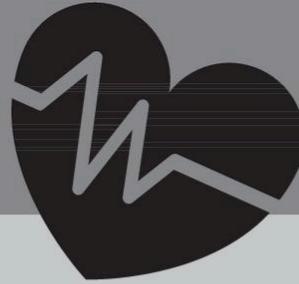
An EO/AA employer: Services provided on a nondiscriminatory basis.

Individuals who are deaf, hard-of-hearing, or have a speech disability can dial 711 or 1-800-735-2966



## Cardiomyopathy Infographic

# Missouri Moms Are Dying From Broken Hearts



Cardiomyopathy is a medical condition which makes it more difficult for a person's heart to pump blood to the rest of their body, which ultimately may result in heart failure.

The stress of pregnancy can cause or worsen a mother's heart condition. Cardiomyopathy was the leading cause of pregnancy-related maternal death in the state of Missouri in 2017

**26%**  
of all  
pregnancy-related  
deaths



Cardiomyopathy was the cause of roughly 8% of all maternal deaths that occurred between 43 days and 1 year postpartum in Missouri in 2017

### **RISK FACTORS**

- Not First Pregnancy
- Maternal Age of 30+
- Carrying Multiples
- Having Preeclampsia or Eclampsia

### **WARNING SIGNS OF CARDIOMYOPATHY**

- Difficulty Breathing
- Swelling
- Fainting / Fatigue
- Unusual Heart Beat
- Persistent Cough



If you experience any of these warning signs, call a doctor.

# Appendix D: Committee Decisions Form

<span style="float: right; font-weight: normal; font-size: small;">MATERNAL MORTALITY REVIEW COMMITTEE DECISIONS FORM v21 <span style="margin-left: 20px;">1</span></span>																																																										
<b>REVIEW DATE</b> <input style="width: 100%; height: 20px;" type="text"/> <small>Month/Day/Year</small>	<b>RECORD ID #</b> <input style="width: 100%; height: 20px;" type="text"/>	<b>COMMITTEE DETERMINATION OF CAUSE(S) OF DEATH</b> <div style="background-color: #2c3e50; color: white; padding: 5px; text-align: left; font-size: small;"> <b>IF PREGNANCY-RELATED, COMMITTEE DETERMINATION OF UNDERLYING* CAUSE OF DEATH</b>                      Refer to page 3 for PMSS-MM cause of death list.                 </div>																																																								
<b>PREGNANCY-RELATEDNESS: SELECT ONE</b>  <input type="checkbox"/> <b>PREGNANCY-RELATED</b> <small>A death during pregnancy or within one year of the end 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</small>  <input type="checkbox"/> <b>PREGNANCY-ASSOCIATED, BUT NOT-RELATED</b> <small>A death during pregnancy or within one year of the end of pregnancy from a cause that is not related to pregnancy</small>  <input type="checkbox"/> <b>PREGNANCY-ASSOCIATED BUT UNABLE TO DETERMINE PREGNANCY-RELATEDNESS</b>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #2c3e50; color: white;"> <th style="width: 30%;">TYPE</th> <th>OPTIONAL: CAUSE (DESCRIPTIVE)</th> </tr> </thead> <tbody> <tr><td>UNDERLYING*</td><td></td></tr> <tr><td>CONTRIBUTING</td><td></td></tr> <tr><td>IMMEDIATE</td><td></td></tr> <tr><td>OTHER SIGNIFICANT</td><td></td></tr> </tbody> </table>	TYPE	OPTIONAL: CAUSE (DESCRIPTIVE)	UNDERLYING*		CONTRIBUTING		IMMEDIATE		OTHER SIGNIFICANT		<div style="background-color: #2c3e50; 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<b>ESTIMATE THE DEGREE OF RELEVANT INFORMATION (RECORDS) AVAILABLE FOR THIS CASE:</b>  <input type="checkbox"/> <b>COMPLETE</b> <small>All records necessary for adequate review of the case were available</small>  <input type="checkbox"/> <b>MOSTLY COMPLETE</b> <small>Minor gaps (i.e, information that would have been beneficial but was not essential to the review of the case)</small>  <input type="checkbox"/> <b>SOMEWHAT COMPLETE</b> <small>Major gaps (i.e, information that would have been crucial to the review of the case)</small>  <input type="checkbox"/> <b>NOT COMPLETE</b> <small>Minimal records available for review (i.e, death certificate and no additional records)</small>  <input type="checkbox"/> <b>N/A</b>	<p>DOES THE COMMITTEE AGREE WITH THE UNDERLYING* CAUSE OF DEATH LISTED ON DEATH CERTIFICATE? <input type="checkbox"/> YES <input type="checkbox"/> NO</p>																																																									

\*Underlying cause refers to the disease or injury that initiated the chain of events leading to death or the circumstances of the accident or violence which produced the fatal injury.  
 \*\*Encompasses Discrimination, Interpersonal Racism, and Structural Racism as described on page 4.

**COMMITTEE DETERMINATION OF PREVENTABILITY**

A death is considered preventable if the committee determines that there was at least some chance of the death being averted by one or more reasonable changes to patient, family, provider, facility, system and/or community factors.

WAS THIS DEATH PREVENTABLE?  YES  NO

CHANCE TO ALTER OUTCOME  GOOD CHANCE  SOME CHANCE  
 NO CHANCE  UNABLE TO DETERMINE

**CONTRIBUTING FACTORS AND RECOMMENDATIONS FOR ACTION** (Entries may continue to grid on page 5)

**CONTRIBUTING FACTORS WORKSHEET**

What were the factors that contributed to this death?  
 Multiple contributing factors may be present at each level.

**RECOMMENDATIONS OF THE COMMITTEE**

If there was at least some chance that the death could have been averted, what were the specific and feasible actions that, if implemented or altered, might have changed the course of events?

DESCRIPTION OF ISSUE (enter a description for EACH contributing factor listed)	CONTRIBUTING FACTORS (choose as many as needed below)	LEVEL	COMMITTEE RECOMMENDATIONS [Who?] should [do what?] [when?] Map recommendations to contributing factors.	LEVEL	PREVENTION TYPE (choose below)	EXPECTED IMPACT (choose below)

**CONTRIBUTING FACTOR KEY  
 (DESCRIPTIONS ON PAGE 4)**

- Access/financial
- Adherence
- Assessment
- Chronic disease
- Clinical skill/ quality of care
- Communication
- Continuity of care/ care coordination
- Cultural/religious
- Delay
- Discrimination
- Environmental
- Equipment/ technology
- Interpersonal racism
- Knowledge
- Law Enforcement
- Legal
- Mental health conditions
- Outreach
- Policies/procedures
- Referral
- Social support/ isolation
- Structural racism
- Substance use disorder - alcohol, illicit/prescription drugs
- Tobacco use
- Trauma
- Unstable housing
- Violence
- Other

**DEFINITION OF LEVELS**

- **PATIENT/FAMILY:** An individual before, during or after a pregnancy, and their family, internal or external to the household, with influence on the individual
- **PROVIDER:** An individual with training and expertise who provides care, treatment, and/or advice
- **FACILITY:** A physical location where direct care is provided - ranges from small clinics and urgent care centers to hospitals with trauma centers
- **SYSTEM:** Interacting entities that support services before, during, or after a pregnancy - ranges from healthcare systems and payors to public services and programs
- **COMMUNITY:** A grouping based on a shared sense of place or identity - ranges from physical neighborhoods to a community based on common interests and shared circumstances

**PREVENTION TYPE**

- **PRIMARY:** Prevents the contributing factor before it ever occurs
- **SECONDARY:** Reduces the impact of the contributing factor once it has occurred (i.e, treatment)
- **TERTIARY:** Reduces the impact or progression of what has become an ongoing contributing factor (i.e, management of complications)

**EXPECTED IMPACT**

- **SMALL:** Education/counseling (community- and/or provider-based health promotion and education activities)
- **MEDIUM:** Clinical intervention and coordination of care across continuum of well-woman visits (protocols, prescriptions)
- **LARGE:** Long-lasting protective intervention (improve readiness, recognition and response to obstetric emergencies/LARC)
- **EXTRA LARGE:** Change in context (promote environments that support healthy living/ensure available and accessible services)
- **GIANT:** Address social determinants of health (poverty, inequality, etc.)