



# Indiana Maternal Mortality Review Committee

## 2023 Annual Report



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Dear Colleagues:

The Indiana Department of Health (IDOH) is honored to release the fourth annual Indiana Maternal Mortality Report. This report shares the findings and recommendations of the Indiana Maternal Mortality Review Committee (MMRC) from its diligent review of all pregnancy-associated deaths that occurred during 2021.

The MMRC members share their knowledge and time in hope that fewer Hoosiers will experience the pain of a maternal loss. IDOH is committed to learning from the review process and implementing preventative recommendations through partnerships with state and local agencies.

There are many efforts throughout Indiana already underway to help prevent maternal mortality.

In 2022, state policy allowed for the expansion of postpartum Medicaid. Through the American Rescue Plan Act, this expansion allows for 12 months of Medicaid coverage in the postpartum period. This allows for health coverage for the entire one-year postpartum period for the mother and coverage for the first year of the infant's life. This coverage is vital to improving the health of mothers of Indiana through increasing access to necessary medical care and medication.

The Indiana Pregnancy Promise Program (PROMISE- Promoting Recovery from Opioid use, Maternal Infant Support and Engagement) is a statewide initiative implemented by the Family and Social Services Administration since July 1, 2021. The Pregnancy Promise Program is a free, voluntary program that aims to identify pregnant Medicaid beneficiaries with Opioid Use Disorder (OUD) as early as possible in their pregnancies. The program offers comprehensive case management and care coordination services and connects participants with prenatal and postpartum care, mental health services, and OUD treatment/recovery services and addresses health-related social needs, such as housing, nutrition, transportation, and other safety needs.

In addition, Indiana participates in the Alliance for Innovation on Maternal Health (AIM) and has continued to assist in the implementation of patient safety bundles. The Indiana Hospital Association (IHA) and IDOH have successfully adopted multiple bundles including Obstetric Hemorrhage and Severe Hypertension in Pregnancy. The next bundle, Care for Pregnant and Postpartum People with Substance Use Disorder, is now available for any hospital that would like to adopt this safety bundle. IDOH and IHA are assisting 13 facilities that have chosen to pilot this bundle and offer additional education, resources, and a connection to states that have successfully implemented this bundle. Partnering with AIM has continued to promote safer births across Indiana.

The Indiana Perinatal Quality Improvement Collaborative (IPQIC) has continued working diligently to improve the health of women and infants in Indiana with the assistance of all perinatal care providers and hospitals throughout the state. IPQIC has successfully implemented the adoption of Levels of Care for birthing hospitals, the implementation of toolkits which align with AIM patient safety bundles, and the dissemination of breastfeeding guidance regarding infant safe sleep, reproductive planning, and substance use. In 2021, IPQIC reviewed comprehensive data to create a new set of goals for the future. As it continues to improve the care and resources available for women of childbearing age and increase equitable access, it ensures maternal mortality remains at the forefront of the Collaborative's focus. We appreciate all IPQIC does as a partner in the betterment of Indiana health and wellbeing.

These programs will impact the work of the Indiana MMRC as it continues to identify and review 2022 maternal deaths. I believe the work of the MMRC and its preventative recommendations will benefit Indiana.

I want to share my gratitude for the IDOH staff who coordinate the MMRC and the volunteer members of the committee for their time. I would like to thank Dr. Mary Pell Abernathy, chair of the MMRC for her leadership and Dr. Kris Box for her support of this committee during her time as State Health Commissioner. The MMRC has devoted many hours to review each maternal death and help provide guidance to prevent future maternal mortality and improve the health of Hoosiers.

Yours in health,

A handwritten signature in black ink that reads "Lindsay Weaver". The signature is fluid and cursive, with the first name "Lindsay" and last name "Weaver" clearly distinguishable.

Lindsay Weaver, M.D., FACEP  
State Health Commissioner

## DEDICATION

IDOH dedicates this report to the 80 pregnant and postpartum women who lost their lives in 2021. While the review process provides necessary information that allows for the creation of evidence-based recommendations, Indiana would like to acknowledge this process does not take away any pain felt by family and friends who lost loved ones. We would like to thank those who shared their expertise, stories, and time with us during the review process.

## ACKNOWLEDGEMENTS

This report was made possible through the reviews of maternal deaths by a multidisciplinary volunteer committee. We are grateful for the members of this review committee and their continuous dedication, knowledge, and time. We acknowledge the IDOH Vital Records, Trauma and Injury Prevention, Maternal and Child Health, and Epidemiology Resource Center Divisions for their collaboration and support on the identification and review of maternal mortalities in Indiana. Thank you to the health systems, healthcare providers and facilities, Indiana Hospital Association, Indiana Department of Child Services, Indiana Family and Social Services Administration, and local coroners for providing information and records.

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# Section 3: Executive Summary



Maternal mortality is a key indicator of a state's overall health and wellbeing. Maternal Mortality Review Committees (MMRCs) identify and review pregnancy-associated deaths to gain a better understanding of the causes and contributing factors to create preventative recommendations.

The cases reviewed by Indiana are all pregnancy-associated and deemed either pregnancy-related or pregnancy-associated, but not related upon committee review.

*Pregnancy-associated death:* A death during or within one year of pregnancy irrespective of the cause.

*Pregnancy-associated, but not related:* A death during pregnancy or within one year of the end of pregnancy, from a cause that is not related to pregnancy.

*Pregnancy-related death:* A death during pregnancy or within one year of the end of a pregnancy from a pregnancy complication, a chain of events initiated by the pregnancy, or the aggravation of an unrelated condition by the physiologic effects of pregnancy.

The data found in this report do not identify any trends in maternal mortality in Indiana. The data presented are descriptive and should not be used to assume or assign mortality risk.

## 2021 Indiana MMRC Key Findings

- 80 pregnancy-associated deaths occurred during pregnancy or within one year postpartum.
- 14 (18%) pregnancy-related deaths occurred during pregnancy or within one year postpartum.
- 32 (40%) deaths occurred during pregnancy or within 42 days postpartum.
- 48 (60%) deaths occurred 43 days to one year postpartum.
- In 2021, the Indiana MMRC deemed 71% of pregnancy-associated deaths and 77% of pregnancy-related deaths preventable.
- Aggregate data from pregnancy-associated deaths that occurred from 2018 through 2021 showed that women with Medicaid started prenatal care later and attended fewer appointments than women with private insurance.
- Overdose, both accidental and undetermined intent, was the top cause of pregnancy-associated deaths in 2018, 2019, 2020, and 2021.

As a result of review, recommendations were created for systems of care, facilities, communities, providers, and patients/families. Change must occur at each level to adequately address maternal mortality in Indiana.

# Section 4: Introduction



The Indiana MMRC includes representation from a broad range of clinical and nonclinical professionals. The committee consists of physicians and nurses from multiple specialties (obstetrics and gynecology, cardiology, pulmonary medicine, anesthesiology, pathology, maternal-fetal medicine, psychiatry), along with social workers, perinatal mood specialists, public health professionals, substance use treatment experts, coroners, health advocates, law enforcement, and other allied health professionals. These volunteers review pregnancy-associated deaths to identify opportunities for prevention. As the goal of the review is identifying prevention recommendations and not assigning individual blame, the names of patients, medical providers, and institutions are not disclosed to MMRC members, nor are they included in this report.

The Indiana MMRC was created in July 2018 in accordance with [IC 16-50](#), which required the multidisciplinary review of pregnancy-associated deaths in Indiana and ensured the process would remain confidential. The MMRC was developed with guidance from the *Building U.S. Capacity to Review and Prevent Maternal Deaths* program, a collaboration between Centers for Disease Control and Prevention (CDC), the CDC Foundation and the Association of Maternal and Child Health Programs (AMCHP). The Indiana program is modeled after other well-established MMRCs in the United States, and the IDOH Division of Fatality Review and Prevention (FRP) coordinates the MMRC and its related activities.

In 2019, IDOH FRP was awarded funding through the CDC project titled Enhancing Reviews and Surveillance to Eliminate Maternal Mortality (ERASE MM). This grant and the associated technical assistance have allowed for the expansion of efforts already underway to systematically identify and collect relevant information pertaining to pregnancy-associated deaths, review the findings, and make data-driven recommendations.

## OUTCOMES FOR ERASE MM AND THE INDIANA MMRC INCLUDE:

- Timely, accurate, and standardized information available about deaths of women during pregnancy and the year after the end of pregnancy, including opportunities for prevention within Indiana,
- Increased awareness of the existence and recommendations of the MMRC among the public, clinicians, policymakers, and communities, and
- Implementation of data-driven recommendations, such as evidence-based practices, screenings, and patient education, in the communities that need them most.

## THE ROLE OF THE MMRC

The MMRC aims to understand medical and non-medical contributors to death and informs interventions to reduce maternal mortality. To successfully understand the burden of

maternal mortality in Indiana, the committee uses multiple data sources, including the CDC National Vital Statistics System (NVSS) and the CDC Pregnancy Mortality Surveillance System (PMSS). The Indiana MMRC collects information from these datasets and uses additional data to ensure the information on death records is accurate. The Indiana MMRC also matches maternal death certificates to birth or fetal records to ensure no maternal death is overlooked. Using medical records, social services records, autopsy and toxicology reports, police reports, and family interviews allows the Indiana MMRC to comprehensively review a maternal death. The additional information and record sources used by the MMRC allow the data presented in this report to be the most accurate representation of maternal mortality in Indiana. This information cannot be compared to other state or national maternal mortality datasets or statistics because the data sources and methodology used may be different.

Figure 1 shows the CDC and ERASE MM definitions used by Indiana to categorize maternal deaths. All deaths during pregnancy or within one year of the end of pregnancy are classified as pregnancy associated. Those deaths are then subcategorized into pregnancy-associated, but not related and pregnancy-related.

**Figure 1: CDC and ERASE MM Definitions of Pregnancy-Associated Deaths and Relatedness**



**Pregnancy-Associated Death-** A death during or within one year of pregnancy irrespective of the cause.

**Pregnancy-Associated, But Not Related, Death-** A death during pregnancy or within one year of the end of pregnancy, from a cause that is not related to pregnancy.

**Pregnancy-Related Death-** A death during pregnancy or within one year of the end of a pregnancy from a pregnancy complication, a chain of events initiated by the pregnancy, or the aggravation of an unrelated condition by the physiologic effects of pregnancy.

Indiana's MMRC is thankful for Governor Eric J. Holcomb's commitment to public health throughout the state. According to America's Health Rankings 2022, Indiana ranks 43<sup>rd</sup> in access to mental health care when compared to other states. Governor Holcomb has shown continued engagement in bettering the mental health of Hoosiers, including mothers. The Governor's focus on ensuring easier access to those in need of services and expanding the workforce in mental health aligns with recommendations from the MMRC, as the state continues to see an increase in pregnancy-associated deaths due to mental health issues and substance use disorder (SUD). Access to mental health care will improve maternal health throughout Indiana.

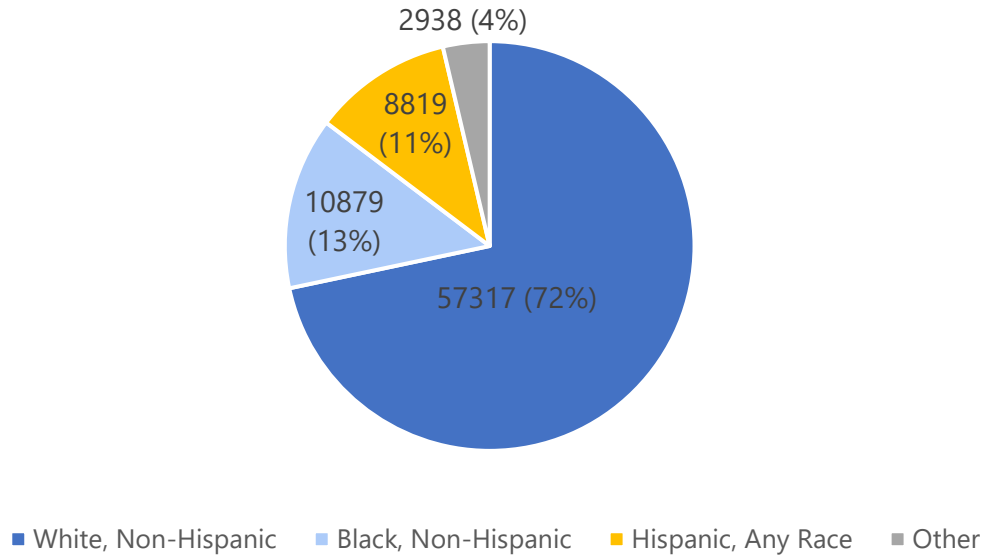
The work of the Indiana MMRC aligns with Indiana's health improvement priorities as well. Improving birth outcomes and addressing the drug epidemic are among the goals listed in Indiana's 2022-2026 State Health Assessment and Improvement Plan. The MMRC continues to align with IDOH priorities by focusing on social determinants of health while reviewing cases. This is demonstrated by the committee's examination of socioeconomic status, education level, healthcare access, built and natural environment, social and community aspects, and mental health and wellness of Indiana mothers throughout their lifetimes.

## **MATERNAL HEALTH IN INDIANA**

According to the most recent United States Census Estimates, Indiana is the 17th most populous state in the United States, with 6.8 million residents, including almost 2.2 million women between the ages of 10 and 60 years. The Indiana MMRC reviews cases involving women between the ages of 10 and 60 years to ensure that all who are of child-bearing age are included, and no maternal deaths are missed. There were 79,953 live births among Indiana residents in 2021.

Figure 2 shows the number of Indiana live births by race/ethnicity of mother in 2021. The majority of births (71.7%) were among White, non-Hispanic women, followed by births among Black, non-Hispanic women (13.6%) and among Hispanic women of any race (11.0%).

**Figure 2: Indiana Live Births by Race/Ethnicity of Mother**  
Vital Records, 2021



The other 3.7% of live births were among women of another race (including those identifying as Asian, Pacific Islander, American Indian or Alaska Native and those who indicated multiple races on birth certificates) or where race and ethnicity was unknown.

Indiana has geographic considerations that influence the availability of healthcare resources that may impact health outcomes. Figure 3 displays the mapped out 30-minute distances to a birthing facility or physician providing labor and delivery care created by The Bowen Center for Health Workforce Research and Policy. The figure displays potential challenges associated with accessing the appropriate level of obstetric care for some Indiana women.

**Figure 3: Highest Level of Birthing Care Within a 30-minute Drive, Indiana**

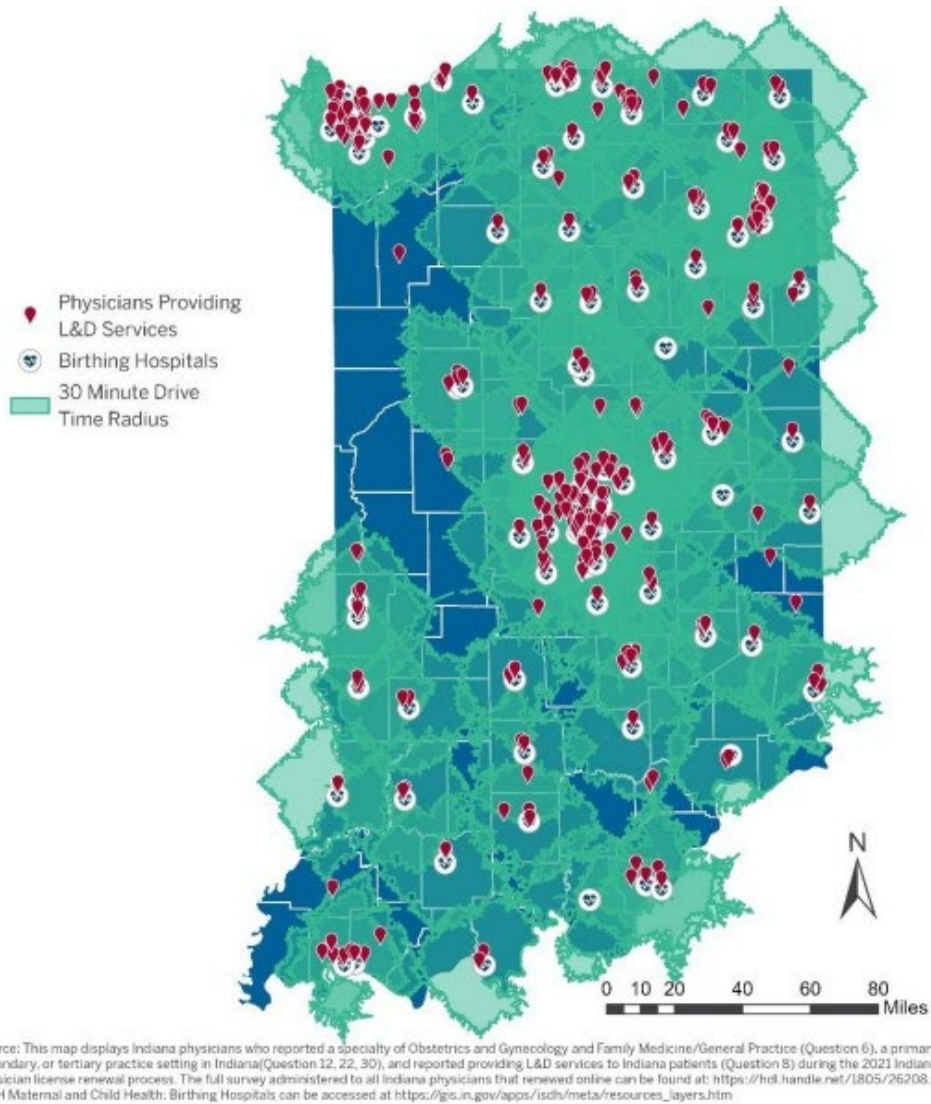
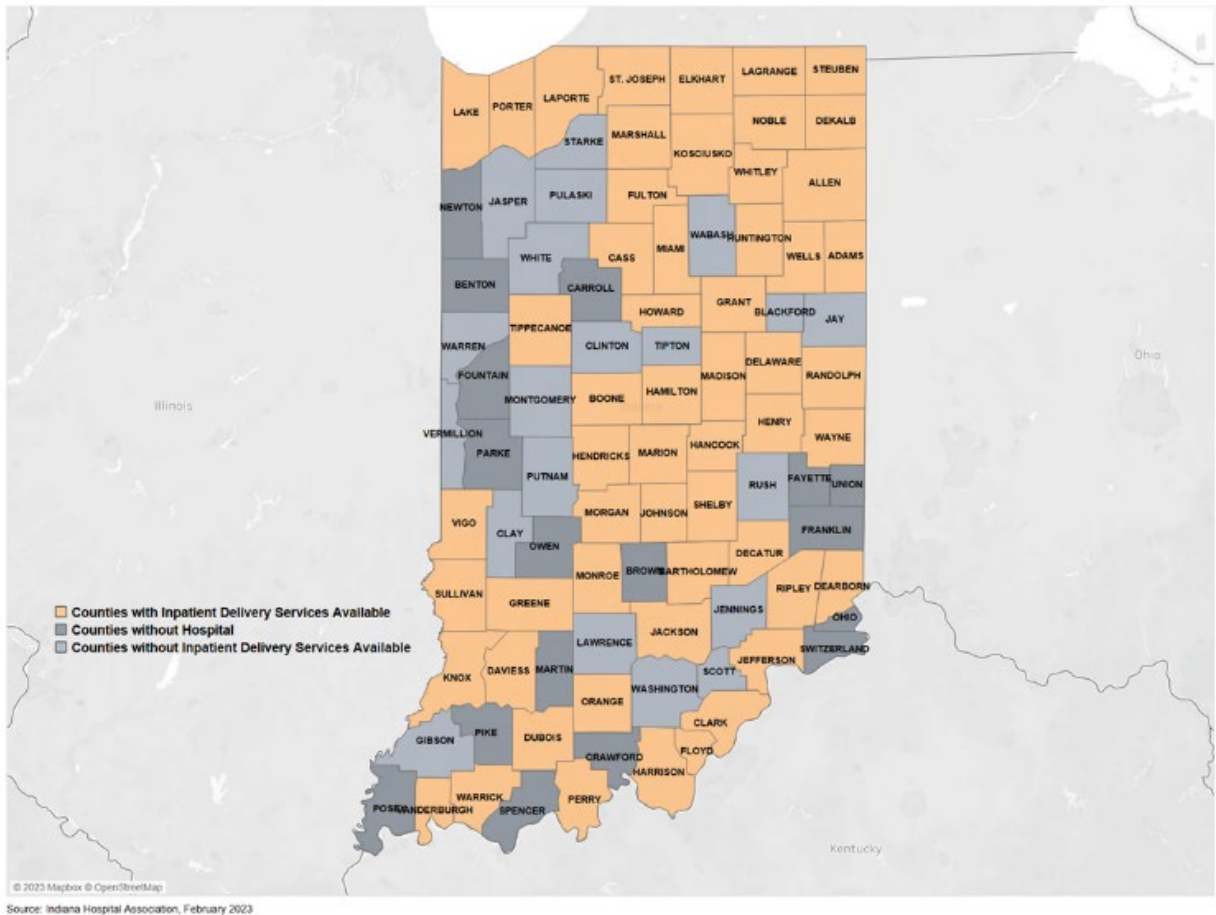


Figure 4 shows a graphic created by IDOH in cooperation with the IHA. IDOH identified 37 counties in Indiana that lack a hospital with inpatient delivery services. Current initiatives, including My Healthy Baby, the IDOH Obstetrical Navigator program, Pregnancy Promise, and group prenatal programs, connect pregnant women in low-resource regions with prenatal and obstetric care and other resources to improve health outcomes.

**Figure 4: Inpatient Hospital Obstetric Services by Indiana County**



## IDENTIFYING AND COUNTING DEATHS

There are two essential phases for tracking and understanding maternal mortality in Indiana. The first phase is to identify all pregnancy-associated deaths. The second is reviewing those deaths to closely examine the cause of death, identify factors that influenced the death, and develop potential recommendations for preventing future fatalities.

Indiana uses multiple methods to ensure pregnancy-associated deaths are accurately identified and counted each year. The cases for 2021 were identified via a pregnancy checkbox on death certificates, causes of death listed on death certificates, assistance from the IHA, matching death certificates to birth certificates and fetal death certificates, and facility notifications. After these individuals are identified, abstraction staff obtain any



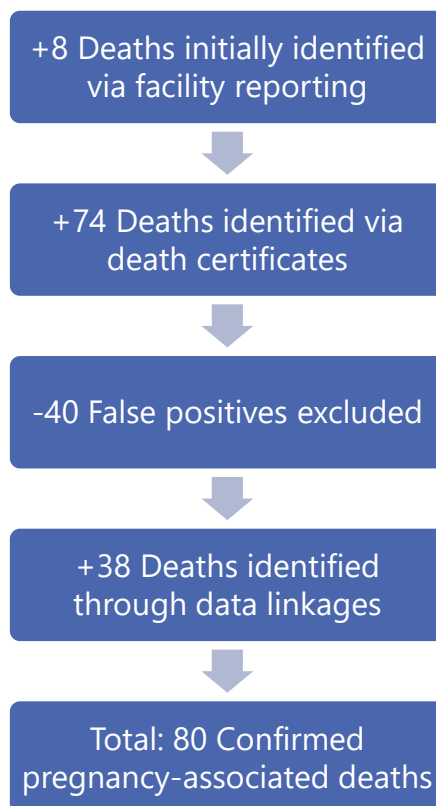
records necessary to confirm or negate pregnancy status. These may include hospital records from death, birth, or prenatal care, autopsy reports, and communication with coroners. This process is critical to eliminate any false positives.

All Indiana hospitals are required by IC 16-50 to report any known pregnancy-associated deaths to IDOH, and a communication system exists for this purpose (Appendix A). Eight pregnancy-associated deaths that occurred in 2021 were reported directly by facilities for maternal mortality review.

For the 2021 cohort, 40 false positives and 38 false negatives were identified during the case identification process. These would not have been identified if the abstraction team had not utilized multiple methods to ensure the accuracy of the death records.

Figure 5 displays the Indiana MMR case identification process including the number of cases identified and ruled out at each step of the process. Cases were identified through a collaborative process involving healthcare facilities, use of internal vital records, and external partners. Eighty cases were confirmed for MMRC review.

**Figure 5: 2021 Case Identification Process**



1. Direct facility reporting to the Indiana MMR staff initially identified eight deaths. Seven of eight women had death certificates that were marked to indicate they had been pregnant or recently pregnant at the time of death. One indicated pregnancy status as unknown.
2. Subsequent case identification used the 2021 death certificates of women ages 10 through 60 years with a pregnancy checkbox on the death certificate indicating the individual was pregnant at the time of death or pregnant within one year of death. Also included were those with causes of death coded with ICD-10 codes starting with "O," as well as A34. Through this process, an additional 74 reviewable deaths were identified.
3. The abstraction team acquired medical records and autopsies and spoke with death certifiers to confirm pregnancy status. Through these efforts the team excluded 40 falsely identified cases.
4. The Indiana MMR staff matched all 2021 women's deaths in Indiana (ages 10 through 60 years) to all birth and fetal death records in Indiana between 2020 and 2021 to identify individuals with a recent birth or fetal death (within a year of maternal death). An additional 38 pregnancy-associated deaths (not correctly marked on the death certificates) were identified.
5. The FRP Epidemiologist and MMR Epidemiologist verified the established list via a Statistical Analysis Software (SAS) matching program, created with IDOH's Office of Data and Analytics, to validate the case identification process and confirm the number of positive identified cases.

### **REVIEWING AND ASSESSING PREGNANCY-ASSOCIATED DEATHS**

Though information from death certificates and other public health records may help identify counts of pregnancy-associated deaths, these records cannot determine the preventability of cases, or the factors involved in the case. The CDC recommends gathering additional information (e.g., medical records, mental health records, social service records, and law enforcement records) to support comprehensive reviews of pregnancy-associated deaths by a multidisciplinary MMRC to determine how the woman died, whether the death was preventable, and opportunities for preventing future deaths.

Once all available records and information are obtained, the abstraction staff assembles a de-identified, redacted narrative and timeline and presents this to the MMRC for review. Following review of all the available information, the Indiana MMRC makes the following decisions for each case:

1. Was the death pregnancy-related?
2. What was the underlying cause of death?
3. Was the death potentially preventable?
4. What were the factors that contributed to the death?
5. What are the recommendations and actions that address those contributing factors?

All these questions are critical, but the last three highlight the unique role of the MMRC. Using a standardized decision form, each case is assessed for the following:

**Chance to Alter Outcome:** The MMRC determines if there was no chance, some chance, or a good chance “of the death being prevented by one or more reasonable changes to patient, family, community, provider, and/or systems factors.”

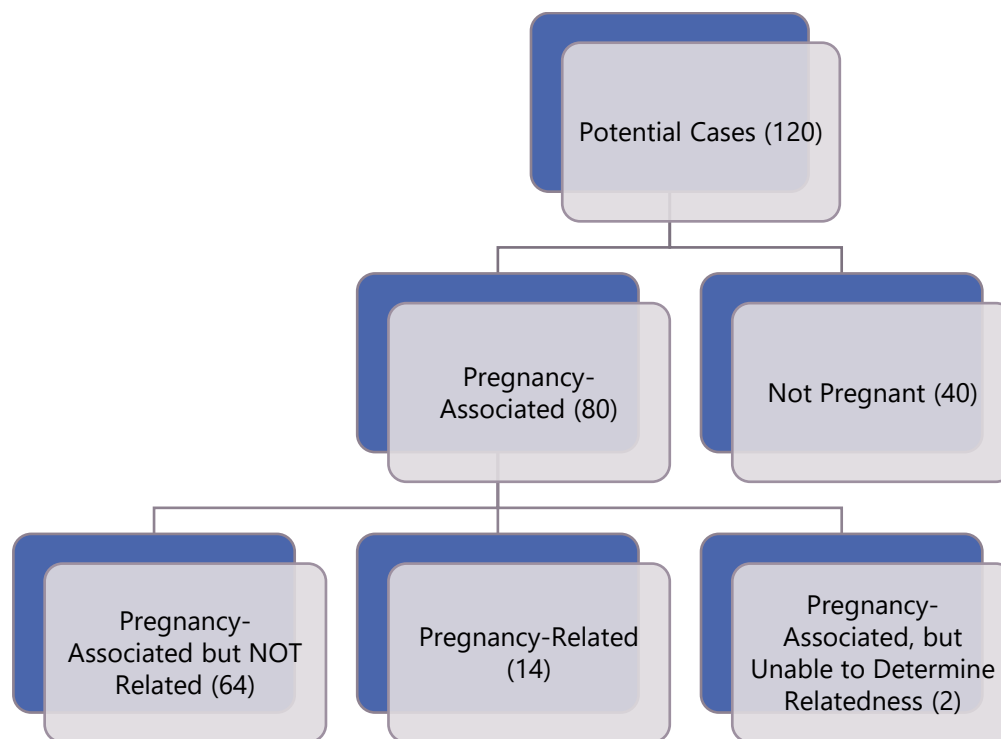
**Preventability:** A death was considered preventable if the MMRC determines that there was at least some chance of death being averted.

**Contributing Factor:** Factors identified by the MMRC that contributed to the death. These are steps along the way that, if altered, may have prevented the person’s death. The factors may be related to the patient, healthcare providers, facilities/hospitals where the individual sought care, or to the systems that influence the lifestyle, care, and health services for women.

The Indiana MMRC identified 80 pregnancy-associated deaths among women in 2021 and convened 10 times between May 2022 and April 2023 to review each death. All discussions included determinations of pregnancy-relatedness, preventability, and contributing factors to the death. From these data, the Indiana MMRC created recommendations for prevention.

Figure 6 displays a breakdown of MMRC cases by pregnancy-relatedness. The IDOH abstraction team acquired medical records and autopsies and spoke with death certifiers to confirm pregnancy status for 120 cases total during the review period. Forty cases were determined as not pregnant and did not make it into MMRC review. Eighty were determined to be pregnancy-associated. Those 80 cases can be further subcategorized into 64 pregnancy-associated but not related, 14 pregnancy-related and two pregnancy-associated, but unable to determine relatedness cases.

**Figure 6: 2021 Indiana MMRC Case Breakdown**



The committee determined 14 deaths to be pregnancy related. This means the Indiana MMRC could state with confidence that the deaths occurred as a direct result of a pregnancy complication, a chain of events initiated by pregnancy, or the aggravation of an unrelated condition by the physiological effects of pregnancy. Examples of these causes of death included postpartum/peripartum cardiomyopathy, anxiety disorder (including

posttraumatic stress disorder), and amniotic fluid embolism.

Another 64 deaths were determined to be pregnancy-associated, but NOT related. For the remaining two deaths, the Indiana MMRC was unable to conclusively determine the relatedness from the available records and case narratives.

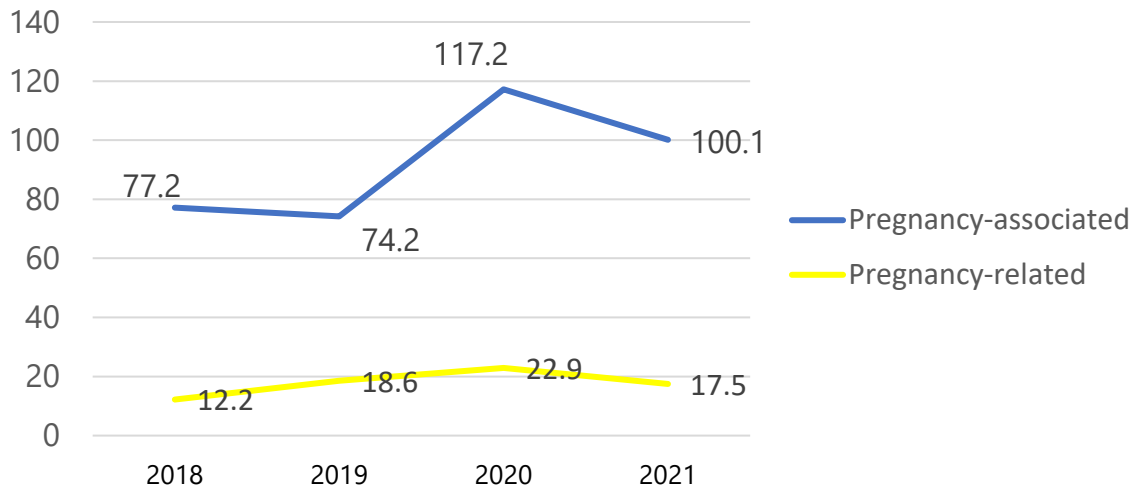
Using the pregnancy-associated deaths identified and the Indiana MMRC's decisions on relatedness, pregnancy-associated and pregnancy-related mortality ratios were calculated for 2021 cases.

Whenever possible, the data presented here will be both for the 2021 cohort of deaths and the overall four-year analysis from 2018 through 2021. Single-year data can show how numbers and rates change from year to year, but the multi-year data offer better insight into the average rates or numbers, allowing for a more accurate analysis of contributing factors, as single-year data often include very small numbers and unstable statistics.

Maternal Mortality Ratios 2021	<u>Average Four-Year</u> Maternal Mortality Ratios (2018-2021)
<ul style="list-style-type: none"><li>• <b>100.1/100,000 live births:</b> pregnancy-associated mortality ratio</li><li>• <b>17.5 per 100,000 live births:</b> pregnancy-related mortality ratio</li></ul>	<ul style="list-style-type: none"><li>• <b>92.2/100,000 live births:</b> pregnancy-associated mortality ratio</li><li>• <b>17.8 per 100,000 live births:</b> pregnancy-related mortality ratio</li></ul>

Figure 7 shows all-cause pregnancy-associated (shown in blue) and pregnancy-related deaths (shown in gold) mortality rates per 100,000 live births in Indiana 2018 through 2021. The pregnancy-associated mortality ratio in 2021 was 100.1 deaths per 100,000 live births. This is the overall ratio of death to live births in Indiana to women ages 10-60 years who died during or within one year of pregnancy due to any cause. The pregnancy-related mortality ratio in 2021 was 17.5 deaths per 100,000 live births. This is the specific ratio of death to live births in Indiana to those ages 10 through 60 years who died either during or within one year of pregnancy as a direct result of a pregnancy complication, a chain of events initiated by pregnancy, or the aggravation of an unrelated condition by the physiological effects of pregnancy. The pregnancy-related mortality ratio is a subset of the overall pregnancy-associated mortality ratio. This summary of rates shows the overall maternal mortality ratio for both pregnancy-associated and pregnancy-related deaths peaked in 2020.

**Figure 7: Pregnancy-Associated Mortality Rates, per 100,000 Live Births**  
 Indiana MMRC, 2018-2021 (N=295)



The rates noted above show only four years of data. The Indiana MMR program will continue to evaluate the mortality ratios over time to identify trends.

The average four-year maternal mortality ratio reflects pregnancy-associated and pregnancy-related deaths that occurred in 2018 through 2021 and is the best estimate of the average rate of deaths per year.

**COMPARISON TO PREVIOUS MATERNAL MORTALITY RATES OR OTHER SOURCES**

Historically, Indiana and other states have used maternal mortality rates determined by the NVSS at the CDC’s National Center for Health Statistics to access the most complete data on birth and deaths on a national level. These maternal deaths are established exclusively via the death certificate “O” codes, including A34, and the pregnancy checkbox to determine the number and rate of maternal deaths. These numbers do not include late maternal deaths (defined as those occurring 43 days to one year after the end of the pregnancy).

As a result, the rates for maternal deaths traditionally represented in data presented nationally by the NVSS and those focusing on Indiana differ greatly. The calculated pregnancy-associated and pregnancy-related mortality ratios presented in this report are a much more accurate measure of the burden of maternal mortality in Indiana and should be used in place of PMSS and NVSS data where possible.

The 2021 mortality ratios presented in this report can be used for comparisons to the previously reported mortality ratios. The Indiana MMRC previously published annual reports documenting deaths among pregnant and postpartum women in 2018 through 2020. Any ratios or numbers determined in this report should not be used for comparisons to any rates based on NVSS, ratios based on PMSS, or other data.

### **MMRC REVIEWED PREGNANCY-ASSOCIATED DEATHS: CASE CHARACTERISTICS**

Through the review of birth and death certificates, prenatal records, delivery records, mental health and social histories, family interviews, and any other records available, the abstraction team was able to identify and report to the Indiana MMRC any primary characteristics for 2021 pregnancy-associated deaths. These included demographics, geography, and some other possible contributing factors to maternal mortality in Indiana.

Data in this report are descriptive in nature and meant to illustrate the characteristics of the 2021 cohort of pregnancy-associated deaths. Because of the relatively low number of deaths (n=80) and having only a subset of those that were pregnancy-related (n=14), categorizing will result in small numbers and unstable rates. Numbers under five may be suppressed to ensure confidentiality. Unstable rates – or those based on counts less than 20 – may not be accurate for comparisons, and they will be noted below.

The Indiana MMRC has reviewed a total of 295 pregnancy-associated deaths that occurred in 2018 through 2021. Where small numbers prohibit further analysis or create unstable ratios, these four-year cumulative data is presented. As the Indiana MMRC continues to review pregnancy-associated deaths over the coming years, multiyear cumulative data will be presented, which should result in fewer unstable ratios.

Table 1 shows the proportion of MMRC cases by race and ethnicity in Indiana, with White non-Hispanic mortalities accounting for 65% of cases reviewed in the 2021 cohort. The racial proportions of cases reviewed year to year differs. Therefore, comparisons must be made between mortality ratios.

**Table 1: Maternal Deaths by Race and Ethnicity**

Indiana MMRC, 2018-2021 (N=295)

Indiana MMRC, 2021 (N=80)

	N	%	% of Live Births in Indiana	Rate per 100,000 Live Births
White, Non-Hispanic (2021)	52	65%	72%	90.7
White, Non-Hispanic (2018-2021)	209	71%	71%	91.3
Black, Non-Hispanic* (2021)	17	21%	13%	156.3
Black, Non-Hispanic* (2018-2021)	58	20%	13%	135.6
Hispanic, Any Race* (2021)	7	9%	11%	79.4
Hispanic, Any Race* (2018-2021)	19	6%	12%	55.8
Other* (2021)	4	5%	4%	136.1
Other* (2018-2021)	9	3%	4%	69.5

Figure 8 shows the differences in the ratio of mortality by race and ethnicity, with Black, non-Hispanic women experiencing the highest ratio of mortality (156.3 deaths per 100,000 live births) and Hispanic women of all races experiencing the lowest ratio of mortality in 2021 (79.4 deaths per 100,00 live births).

Looking across four years of data, the race-specific mortality ratios among Black, non-Hispanic women compared to White, non-Hispanic women show a 20% higher ratio in 2018, a comparable mortality ratio in 2019, a 93% higher ratio in 2020, and a 73% higher ratio in 2021 data. Additional case review is necessary to speak more broadly on patterns in race-specific mortality ratios.



**Figure 8: Rate of Pregnancy-Associated Deaths by Race and Ethnicity, per 100,000 Live Births**

Indiana MMRC, 2021 (N=80)

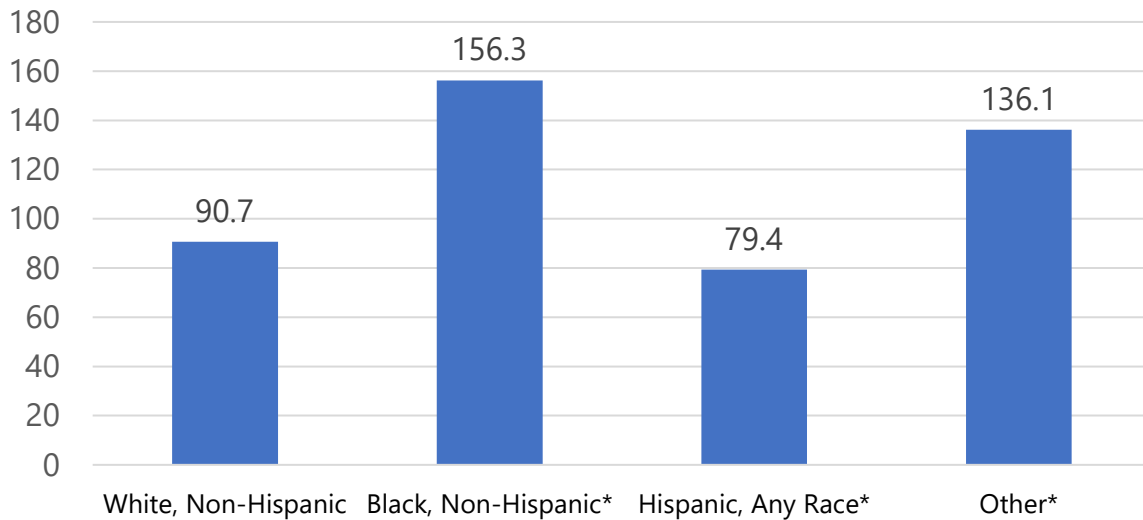


Figure 9 shows mortality ratios aggregated across four years for pregnancy-associated (shown in blue) and pregnancy-related deaths (shown in gold) by race and ethnicity. The data show disparities, with non-Hispanic Black women experiencing 135.6 pregnancy-associated deaths per 100,000 live births, compared to 91.4 for non-Hispanic White women. The four-year ratios for Hispanic women and women of other races are much lower, but they remain unstable.

Similar racial disparities can be seen across pregnancy-related deaths with Black, non-Hispanic women experiencing 28.0 pregnancy-related deaths per 100,000 live births, compared to 15.9 deaths among non-Hispanic White women. Because of small numbers and variations from year to year, disparity is best assessed using multiple years of data. Please note only four-year data are presented for the breakdown of pregnancy-related deaths, as the total sample size is small and rates for individual years are unstable. Take caution when interpreting these ratios, as they are based on small numbers and are unstable ratios.

**Figure 9: Average Four-Year Rate of Pregnancy-Associated and Pregnancy-Related Deaths by Race and Ethnicity, per 100,000 Live Births**

Indiana MMRC, 2018-2021 (N=295)

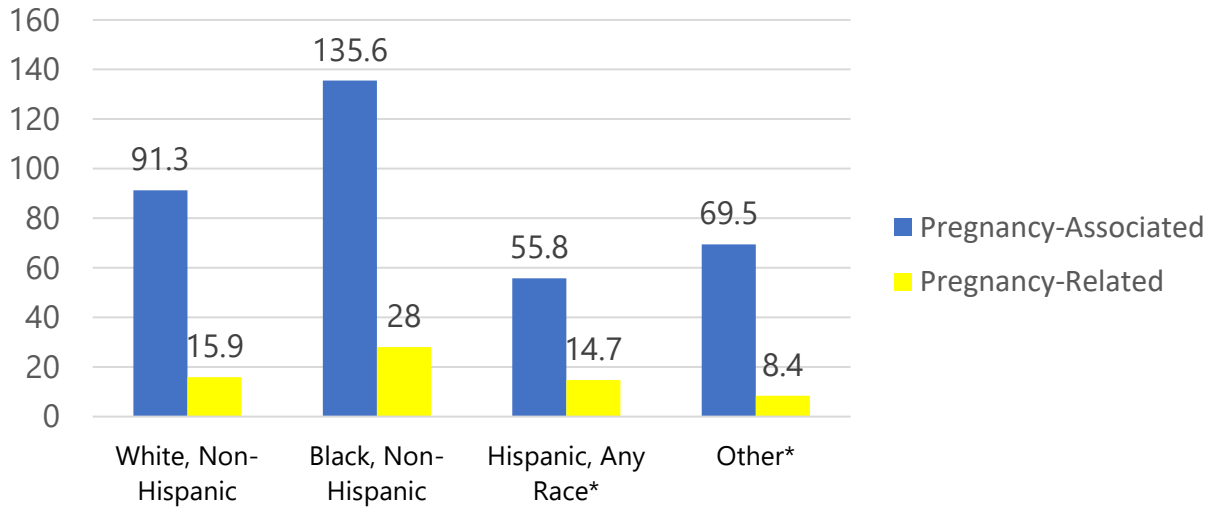


Table 2 shows the age at death for all 2021 MMRC cases. Individuals 20 to 29 years of age accounted for 49% of all pregnancy-associated deaths and those 30 to 39 years of age accounted for another 45%. However, women in their 20s and 30s also accounted for the largest number of births in Indiana. Due to the differences in pregnancy and childbirth rates among different age groups, disparity is best represented by age-specific mortality ratios, seen in Figure 9.

**Table 2: Maternal Deaths by Age at Death**

Indiana MMRC, 2018-2021 (N=295)

Indiana MMRC, 2021 (N=80)

	N	%	% of Population in Indiana	Rate per 100,000 Live Births
15-19 years* (2021)	1	1%	5%	25.1
15-19 years* (2018-2021)	9	3%	5%	50.9
20-24 years* (2021)	17	21%	22%	93.2
20-24 years (2018-2021)	67	23%	23%	89.8
25-29 years (2021)	22	28%	32%	83.5
25-29 years (2018-2021)	93	31%	32%	89.4
30-34 years (2021)	20	25%	27%	89.3
30-34 years (2018-2021)	63	21%	26%	73.7
35-39 years* (2021)	16	20%	12%	164.7
35-39 years (2018-2021)	49	17%	11%	133.9
40+ Years* (2021)	4	5%	2%	311.0
40+ Years* (2018-2021)	14	5%	2%	211.3

Figure 10 shows the rate of pregnancy-associated deaths by age of the mother, per 100,000 live births. The age-specific mortality ratios appear to increase with age. The 2021 rate for women 40 years and older is not included in Figure 10 because it is based on a very small number of cases and is unstable.

**Figure 10: Rate of Pregnancy-Associated Deaths by Age of the Mother at Death, per 100,000 Live Births**

Indiana MMRC, 2021 (N=80)

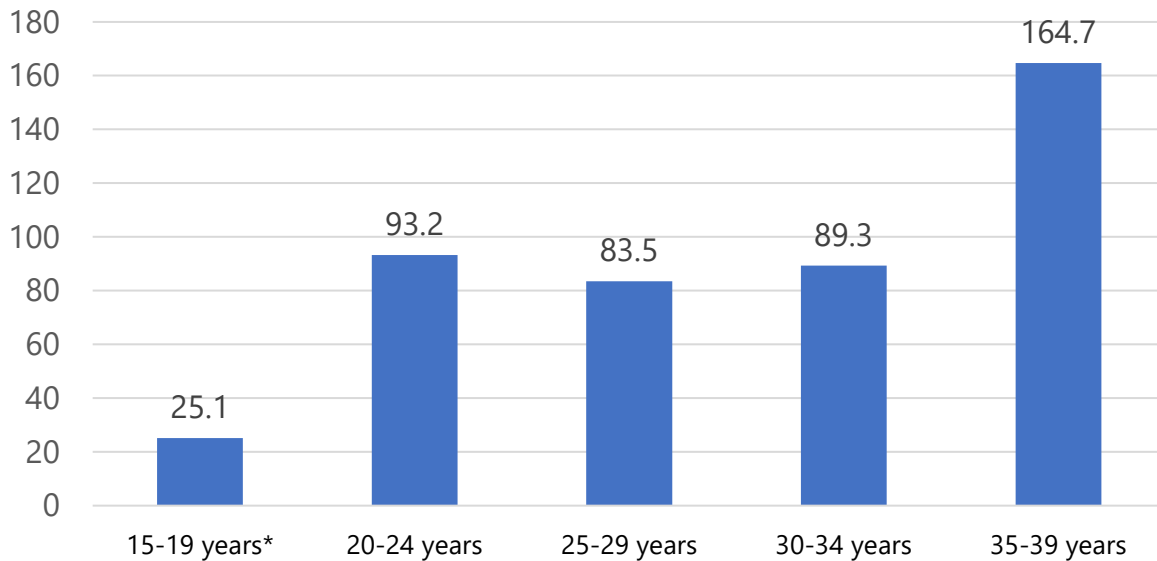


Figure 11 shows the average four-year ratio of pregnancy-associated deaths (shown in blue) and pregnancy-related deaths (shown in gold) by age of the mother. Looking across four years of data, the age-specific mortality ratios appear to increase with age and appear to be highest for the 40+ years old age group, but caution should be taken as the 40+ years old age group consistently accounts for less than 5% of cases reviewed annually. Comparing to the previous ratios of pregnancy-associated deaths, we see negligible fluctuations in rates in all age groups. Because the total sample size of pregnancy-related deaths is so small, only four-year data are presented, and caution is urged when interpreting the results. The Indiana MMR program will continue to evaluate the potential association between age of mother and risk of pregnancy-related death.

**Figure 11: Average Four-Year Ratio of Pregnancy-Associated and Pregnancy-Related Deaths by Age group, per 100,000 live births:**

Indiana MMRC, 2018-2021 (N=295)

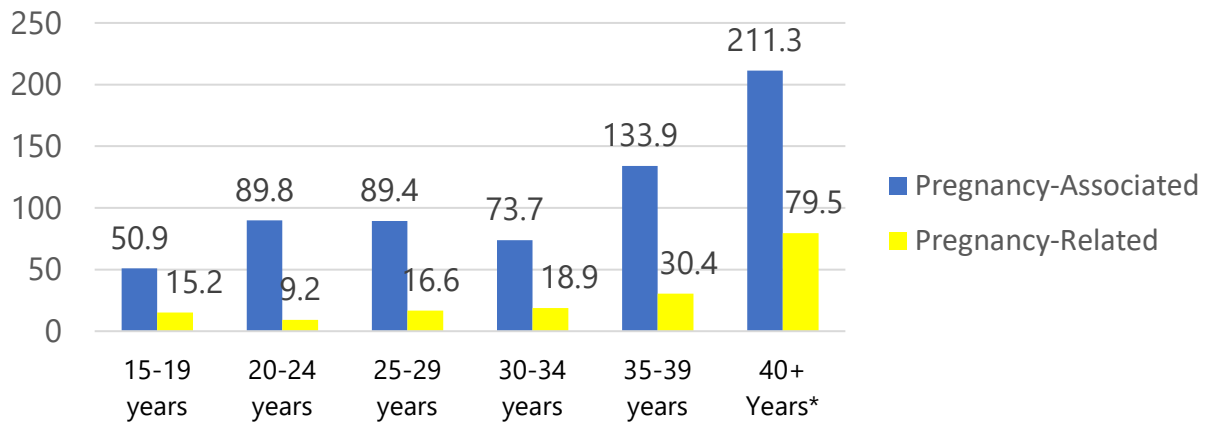


Table 3 shows the timing of pregnancy-associated and pregnancy-related deaths for 2021 and aggregated four-year data. One of the main differences noted between the overall pregnancy-associated deaths and the subset of pregnancy-related deaths in both 2021 and aggregated 4-year data was the timing of death relative to pregnancy. While most of the pregnancy-associated deaths (60%) occurred 43 days or more postpartum, 86% of the deaths determined to be pregnancy-related occurred either during pregnancy or within the first 42 days postpartum. These findings suggest women are most at risk of dying from a pregnancy complication or other condition aggravated by pregnancy either during pregnancy or in the first six weeks following childbirth. However, their risk of dying from other causes, including injury or other medical conditions, is highest more than six weeks after childbirth.

**Table 3: Timing of Pregnancy-Associated and Pregnancy-Related Deaths**

Indiana MMRC, 2018-2021 (N=295)

Indiana MMRC, 2021 (N=80)

	N	%
Pregnant at time of death Pregnancy-Associated (2021)	13	16%
Pregnant at time of death Pregnancy-Related (2021)	3	21%
Pregnant at time of death Pregnancy-Associated (2018-2021)	47	16%

Pregnant at time of death Pregnancy-Related (2018-2021)	9	16%
Delivered but Pregnant Within 42 Days of Death Pregnancy-Associated (2021)	19	24%
Delivered but Pregnant Within 42 Days of Death Pregnancy-Related (2021)	9	64%
Delivered but Pregnant Within 42 Days of Death Pregnancy-Associated (2018-2021)	70	24%
Delivered but Pregnant Within 42 Days of Death Pregnancy-Related (2018-2021)	35	61%
Delivered but Pregnant 43 Days to 1 Year Before Death Pregnancy-Associated (2021)	48	60%
Delivered but Pregnant 43 Days to 1 Year Before Death Pregnancy-Related (2021)	2	14%
Delivered but Pregnant 43 Days to 1 Year Before Death Pregnancy-Associated (2018-2021)	178	60%
Delivered but Pregnant 43 Days to 1 Year Before Death Pregnancy-Related (2018-2021)	13	23%

These findings suggest that prevention and maternal health initiatives for pregnancy-related deaths should be targeted to the specific risks experienced by women during pregnancy and the postpartum period.

Table 4 shows the timing of pregnancy-associated and pregnancy-related deaths by gravidity of last pregnancy for 2021 and aggregated four-year data. Gravidity indicates the number of times a woman has been pregnant, regardless of the outcome, and includes current pregnancies. The count differences between gravidity are not very pronounced. Maternal mortality does not therefore affect only women during their first pregnancy or women with many previous pregnancies. Women at any gravidity can be at risk for pregnancy-associated mortality. Programs that are made to promote maternal health and reduce maternal mortality should thus not be limited to women in their first pregnancy but should be targeted at all women who are pregnant, looking to become pregnant, or recently postpartum.

**Table 4: Timing of Pregnancy-Associated and Pregnancy-Related Deaths by  
Gravidity of Last Pregnancy**

Indiana MMRC, 2018-2021 (N=293)

Indiana MMRC, 2021 (N=80)

	N	%
1 <sup>st</sup> Pregnancy Pregnancy-Associated (2021)	9	11%
1 <sup>st</sup> Pregnancy Pregnancy-Associated (2018-2021)	54	18%
1 <sup>st</sup> Pregnancy Pregnancy-Related (2018-2021)	12	21%
2 <sup>nd</sup> Pregnancy Pregnancy-Associated (2021)	19	24%
2 <sup>nd</sup> Pregnancy Pregnancy-Associated (2018-2021)	71	24%
2 <sup>nd</sup> Pregnancy Pregnancy-Related (2018-2021)	16	28%
3 <sup>rd</sup> Pregnancy Pregnancy-Associated (2021)	16	20%
3 <sup>rd</sup> Pregnancy Pregnancy-Associated (2018-2021)	53	18%
3 <sup>rd</sup> Pregnancy Pregnancy-Related (2018-2021)	10	18%
4 <sup>th</sup> Pregnancy Pregnancy-Associated (2021)	13	16%
4 <sup>th</sup> Pregnancy Pregnancy-Associated (2018-2021)	45	15%
4 <sup>th</sup> Pregnancy Pregnancy-Related (2018-2021)	7	12%
5 <sup>th</sup> + Pregnancy Pregnancy-Associated (2021)	23	29%
5 <sup>th</sup> + Pregnancy Pregnancy-Associated (2018-2021)	70	24%
5 <sup>th</sup> + Pregnancy Pregnancy-Related (2018-2021)	12	21%

\*Gravidity could not be determined for two deaths that occurred in 2019 due to limited records

Examining the gravidity of the sentinel pregnancy for pregnancy-related deaths from 2018 through 2021 suggests women in their second pregnancies have the highest risk of pregnancy-related deaths, followed by women on their first pregnancy or women who have had five or more pregnancies. These data are based on a small number of deaths, so it should be examined with caution. This trend will continue to be monitored in the future years of MMRC work.

Table 5 shows a breakdown of urban status of last residence. Eighty-three percent of all pregnancy-associated deaths in 2021 last resided in one of Indiana’s metropolitan areas. The four-year aggregated data show that these geographic trends were consistent with 2021 findings, with three-quarters of deaths occurring to women in metropolitan counties. The smallest share of deaths occurred among women from rural counties.

Metropolitan counties contain an urbanized area of 50,000 or more population, plus adjacent territory that has a high degree of social and economic integration with the core as measured by commuting ties. Micropolitan counties have at least one cluster of 10,000-50,000 population, plus adjacent territory that has a high degree of social and economic integration with the core as measured by commuting ties. Rural counties contain neither metropolitan nor micropolitan core areas.

**Table 5: Urban Status of Last Residence**

Indiana MMRC, 2018-2021 (N=295)

Indiana MMRC, 2021 (N=80)

	N	%
Metropolitan 2021	66	83%
Metropolitan 2018-2021	220	75%
Micropolitan 2021	7	9%
Micropolitan 2018-2021	43	14%
Rural 2021	4	5%
Rural 2018-2021	21	7%
Unable to determine 2021	3	4%
Unable to determine 2018-2021	11	4%



Recognizing the geography and rurality of residence of women lost to pregnancy-associated death is important for assessing access to services and providers. Geography can reveal where to target interventions and services for women and new mothers. Examining maternal health outcomes related to identified counties without inpatient delivery services in Indiana can show the impact of obstetric resource access for Hoosier women.

Of all pregnancy-associated deaths in 2021, 11.3% of those women had last resided in a county without inpatient obstetrical services. Of these cases, 6.3% occurred in counties without inpatient delivery services, and 5% occurred in counties without a hospital. For pregnancy-related deaths in 2021 specifically, zero deaths occurred to women who last resided in counties without inpatient obstetrical services. By comparison, in 2021, 9.2% of all births in Indiana occurred among women who resided in counties without inpatient delivery services. To further break this down, 3.3% of live births occurred in counties without a hospital, and 5.8% occurred in counties with a hospital but without inpatient delivery services. While this is based on relatively small numbers, the preliminary data show that women residing in counties without inpatient obstetrical services make up a greater share of pregnancy-associated deaths than expected, given the share of births occurring in those counties. To address this disparity, any prevention or maternal health initiative should consider women's access to obstetrical care or other specialized care during their pregnancies in these counties.

The addresses for the women's last residences, including the county, were accessed from the IDOH's Division of Vital Records death certificates. However, it is important to note that a woman's place of residence at the time of death is not necessarily where she lived over the course of her pregnancy. This is especially true for women who, for any reason, were experiencing housing instability. The ability to access regular prenatal or other medical care is not limited just by a woman's address or county of residence. Unstable housing can make it difficult to access and maintain care with one provider throughout a woman's pregnancy, as she may be staying in multiple places. In addition, issues with access to transportation, time off from a job, or childcare can make prenatal or other medical care hard to access, even if it is available.

Social determinants of health, such as income level, education level, housing status, and employment status, are known to be upstream factors for many public health topics, including maternal and infant health. While individual or family income levels were not included in the review, other social factors below can be used as a best estimate of socioeconomic status. These measures provide insights as to what roles social determinants are playing in maternal mortality.

Table 6 shows a breakdown of education level for all pregnancy-associated deaths in

Indiana in 2021 and across four-year aggregated data. Seventy percent of all pregnancy-associated deaths in 2021 had completed high school, obtained a GED, or pursued higher education. This proportion holds true when looking at the four-year data as well, with 78% of cases completing a GED or greater.

**Table 6: Education Level**  
 Indiana MMRC, 2018-2021 (N=295)  
 Indiana MMRC, 2021 (N=80)

	N	%	% of Population in Indiana
High School or Less (2021)	23	29%	14%
High School or Less (2018-2021)	59	20%	15%
High School Grad or GED Completed (2021)	39	49%	29%
High School Grad or GED Completed (2018-2021)	144	49%	29%
Some College Credit, but No Degree (2021)	9	11%	18%
Some College Credit, but No Degree (2018-2021)	49	16%	19%
Associate or Bachelor's Degree (2021)	6	7%	29%
Associate or Bachelor's Degree (2018-2021)	36	12%	29%
Advanced Degree (2021)	2	3%	9%
Advanced Degree (2018-2021)	4	1%	8%
Unknown (2021)	1	1%	<1%
Unknown (2018-2021)	3	1%	<1%

Table 7 shows a breakdown of entry into prenatal care for pregnancy-associated deaths in Indiana in 2021 and across four-year aggregated data. For pregnancy-associated deaths in

2021, just under half (47%) of the women accessed prenatal care starting in the first trimester of their sentinel pregnancy. Similarly, aggregated 4-year data show just under half, or 46%, of all pregnancy-associated deaths over the four years entered prenatal care in the first trimester. Aggregated data show in 2018 through 2021, 69.5% of all live births in Indiana received early prenatal care.

**Table 7: Entry into Prenatal Care**  
 Indiana MMRC, 2018-2021 (N=295)  
 Indiana MMRC, 2021 (N=80)

	N	%	% of Live Births in Indiana
Early Prenatal Care (2021)	38	47%	72%
Early Prenatal Care (2018-2021)	137	46%	69%
Second Trimester Prenatal Care	19	24%	21%
Second Trimester Prenatal Care (2018-2021)	69	23%	23%
Late Prenatal Care (2021)	2	2.5%	5%
Late Prenatal Care (2018-2021)	8	3%	5%
Unknown Start Time for Prenatal Care (2021)	2	2.5%	--
Unknown Start Time for Prenatal Care (2018-2021)	10	3%	--
Unknown if Received Prenatal Care (2021)	0	0%	<1%
Unknown if Received Prenatal Care (2018-2021)	8	3%	<1%
No Prenatal Care (2021)	19	24%	2%
No Prenatal Care (2018-2021)	63	22%	2%

These data suggest inadequate prenatal care is a contributing factor to maternal mortality

in Indiana. The Indiana MMRC attempted to ascertain circumstances preventing women from entering prenatal care during the first trimester. All available records associated with each pregnancy-associated death were assessed, but reasoning for late entry to prenatal care or lack of prenatal care was often not available. The Indiana MMRC requests and receives records, but other records may exist that were not requested because the committee was not aware of them, or the records were unavailable at the time of fatality review.

It is challenging to document the absence of care, and it should be noted that there were instances among the four years of data in which known barriers existed that affected women's access to prenatal care. These barriers included unstable housing, incarceration during pregnancy or recent release from incarceration, a lack of reliable transportation, and challenges associated with insurance enrollment and eligibility.

Prenatal care is crucial to ensure that women have a healthy and safe pregnancy and childbirth experience. The American Congress of Obstetricians and Gynecologists (ACOG) recommends a first prenatal care visit at 8-10 weeks of pregnancy. By connecting with a prenatal care provider, pregnant women can monitor their health and become informed of steps they can take to protect their pregnancy and themselves. Additionally, early prenatal care can identify high-risk pregnancies that may require a higher level of care.

Timing of entry into prenatal care is critical, but quality of care is also an important factor. For a low-risk pregnancy, ACOG recommends visits with a provider every four weeks until 28 weeks gestation, every two to three weeks until 36 weeks gestation, and then every week after 36 weeks gestation. The optimal number of prenatal visits depends on gestation, but for a woman who gives birth at 40 weeks, the recommended number of prenatal care visits is between 12 and 14. This may vary depending on specific needs. Women with higher risk, previous poor outcomes, or known medical problems should be monitored more closely.

For women who did not die while pregnant and had a documented history of prenatal care visits in 2021, the average was 8.9 prenatal visits – fewer than recommended. Logically, the number of visits varied greatly by which point in their pregnancy they entered care. Women entering prenatal care in their first trimester averaged 10.9 visits. Entry into prenatal care during the second trimester resulted in an average 6.2 visits.

Table 8 shows a breakdown of insurance status for all pregnancy-associated deaths in Indiana in 2021 and across four-year aggregated data. Access to health insurance is often a factor in the healthcare decisions of many Americans. In Indiana, pregnant women under a certain income level qualify for Medicaid. The insurance status of women who died from pregnancy-associated deaths was assessed through a variety of means, including birth

certificates, prenatal care records, and medical records. Over three-quarters of all women who died from a pregnancy-associated death in Indiana in 2021 were Medicaid enrolled, and 16% had private insurance. Relatively similar insurance coverage proportions in the four-year data are shown, with two-thirds of all pregnancy-associated deaths occurring to women with Medicaid coverage.

**Table 8: Insurance Status**  
 Indiana MMRC, 2018-2021 (N=295)  
 Indiana MMRC, 2021 (N=80)

	N	%	% of live births in Indiana
Private Insurance (2021)	13	16%	52%
Private Insurance (2018-2021)	54	18%	52%
Medicaid (2021)	61	76%	40%
Medicaid (2018-2021)	197	67%	39%
Self-Pay/None (2021)	4	5%	5%
Self-Pay/None (2018-2021)	13	4%	5%
Other (2021)	1	1.5%	3%
Other (2018-2021)	3	1%	3%
Unknown (2021)	1	1.5%	<1%
Unknown (2018-2021)	28	10%	<1%

It is important to note that insurance coverage can change over the course of pregnancy and may not be equal to the woman’s coverage during her terminal event. Further, the Indiana MMR program was unable to determine insurance coverage in 27 cases between 2018 and 2019, and one case in 2021.

Figure 12 shows the percentage of pregnancy-associated deaths in 2021 (shown in blue) and four-year aggregated data (shown in gold) where women entered prenatal care in the first trimester of pregnancy-by insurance status.

**Figure 12: Percentage of Pregnancy-Associated Deaths Where Women Entered Prenatal Care in the First Trimester of Pregnancy, by Insurance Status**

Indiana MMRC, 2018-2021 (N=295)

Indiana MMRC, 2021 (N=80)

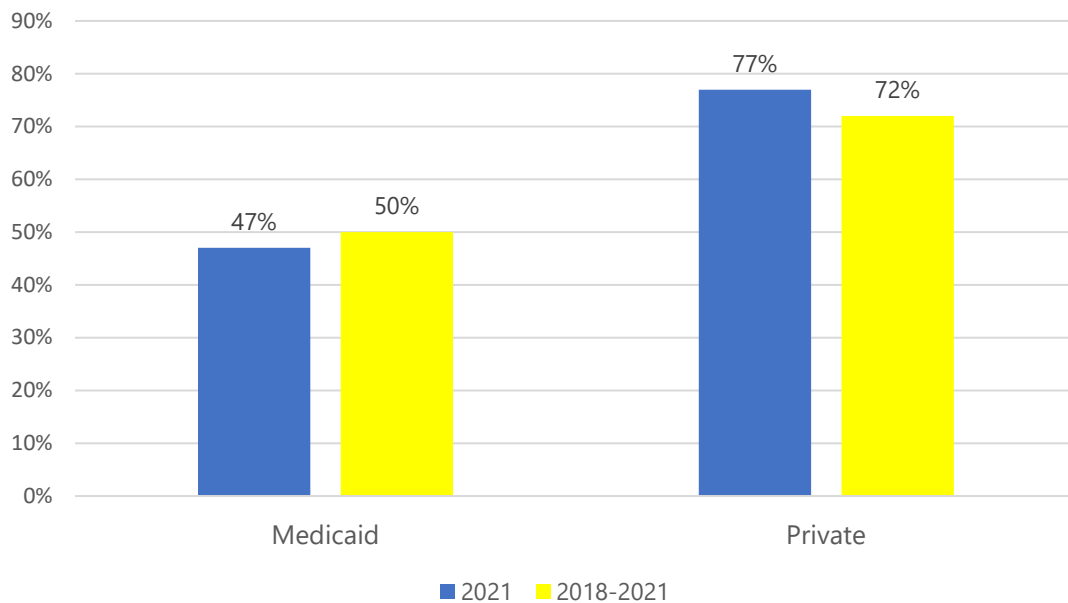


Table 9 shows the average number of prenatal care appointments kept among pregnancy-associated deaths, by insurance status. When examining types of care, as well as entry into prenatal services, stratified by the type of insurance coverage each woman had, there are some clear differences. Seventy-seven percent of women with private insurance entered prenatal care early, compared to only 47% with Medicaid. Similarly, women with private insurance had an average of 12 prenatal visits documented compared to 6.8 among women with Medicaid coverage.

In the aggregated data the same pattern holds true. Over the last four years, the majority of pregnancy-associated deaths have been among women insured by Medicaid. Women with

Medicaid insurance were less likely to have early prenatal care and had fewer appointments kept on average.

**Table 9: Average Number of Prenatal Care Appointments Kept Among Pregnancy-Associated Deaths, by Insurance Status**

Indiana MMRC, 2018-2021 (N=295)

Indiana MMRC, 2021 (N=80)

	Medicaid	Private
Appointments Kept (2021)	6.8	12.0
Appointments Kept (2018-2021)	7.1	10.8

When looking at data from all live births in Indiana in 2021, this continues to hold true. In 2021, 62.1% of live births to women on Medicaid started prenatal care in the first trimester, compared to 82.1% of women on private insurance, based on birth certificate data from Indiana Vital Records.

Figure 13 shows committee determination causes of death for all 2021 pregnancy-associated deaths. Among the 80 pregnancy-associated deaths in 2021, overdose (both accidental and undetermined intent) was the leading cause of death, accounting for 28% of all pregnancy-associated deaths in 2021. Also, among the top causes of death, based on those listed on death certificates and decisions made by the MMRC, are other injury-related deaths, including motor vehicle collisions, gunshot wounds, hanging/strangulation/suffocation, a stab wound, and drowning. Injuries overall, including overdoses, and intentional or unintentional injuries, accounted for a total of 55% of pregnancy-associated deaths in 2021. The most common medical-related cause of death was cancer, accounting for 9% of all pregnancy-associated deaths. COVID-19 was the second most common medical cause, causing 6% of pregnancy-associated deaths in 2021. Of note, the committee was unable to determine the cause of death for 8% of cases.

**Figure 13: Committee Determination Causes of Death  
for all 2021 Pregnancy-Associated Deaths**  
Indiana MMRC, 2021 (N=80)

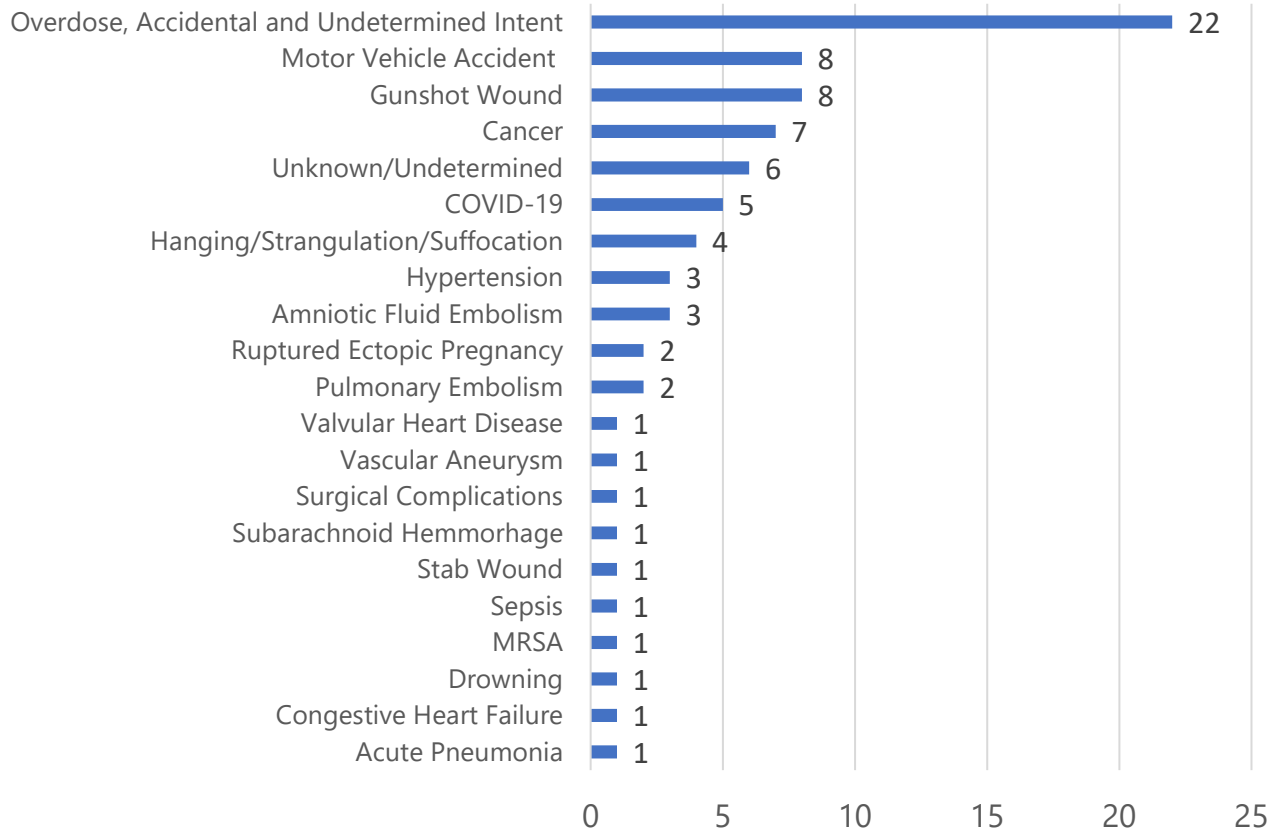


Figure 14 shows PMSS code causes of death for all 2021 pregnancy-related deaths. For deaths determined by the Indiana MMRC to be pregnancy-related, the MMRIA Committee Decisions Form (Appendix B) guided the assignment of cause of death. The CDC provides clear criteria for selecting each diagnosis code. Figure 26 shows the committee decisions for the 14 pregnancy-related deaths from 2021. Amniotic fluid embolisms were the most common cause of pregnancy-related deaths, followed by ruptured ectopic pregnancies, COVID-19, and thrombotic embolisms. The list of pregnancy-related causes and PMSS codes that the committee used for these determinations is available in Appendix C.



**Figure 14: PMSS Code Causes of Death for all 2021  
Pregnancy-Related Deaths**  
Indiana MMRC, 2021 (N=14)

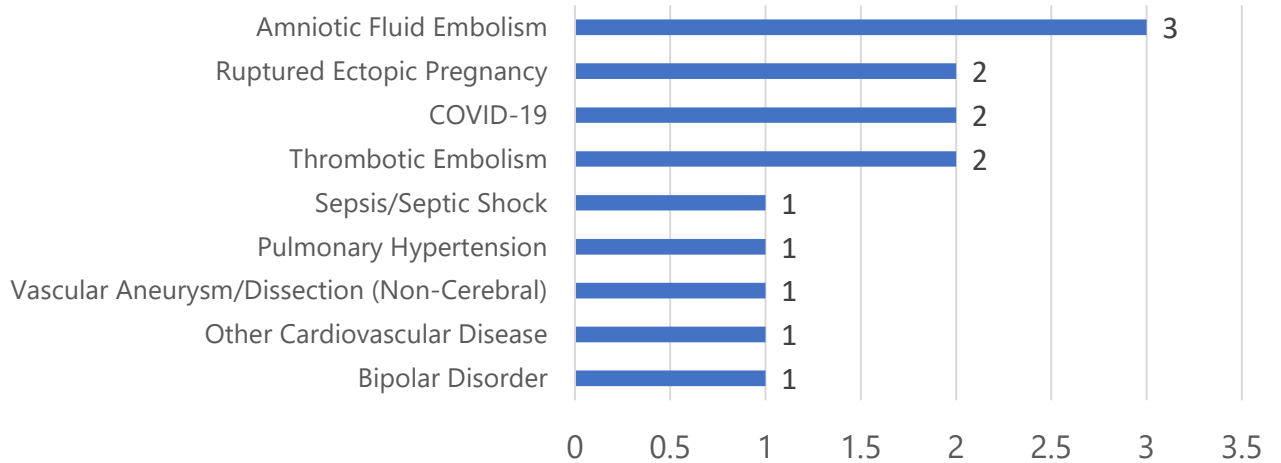


Figure 15 shows the overall top causes of death for pregnancy-associated deaths. Looking at all the review data collected to date, the top causes of death seen overall among the pregnancy-associated deaths were similar among all four cohort years. Overdoses accounted for the largest share (31%), with other injury causes also among the top causes (homicide, motor vehicle accident, and suicide). Overdoses, both accidental and undetermined intent, were the top cause of pregnancy-associated deaths in 2018, 2019, 2020, and 2021.

**Figure 15: Overall Top Causes of Death for Pregnancy-Associated Deaths**  
Indiana MMRC, 2018-2021 (N=295)

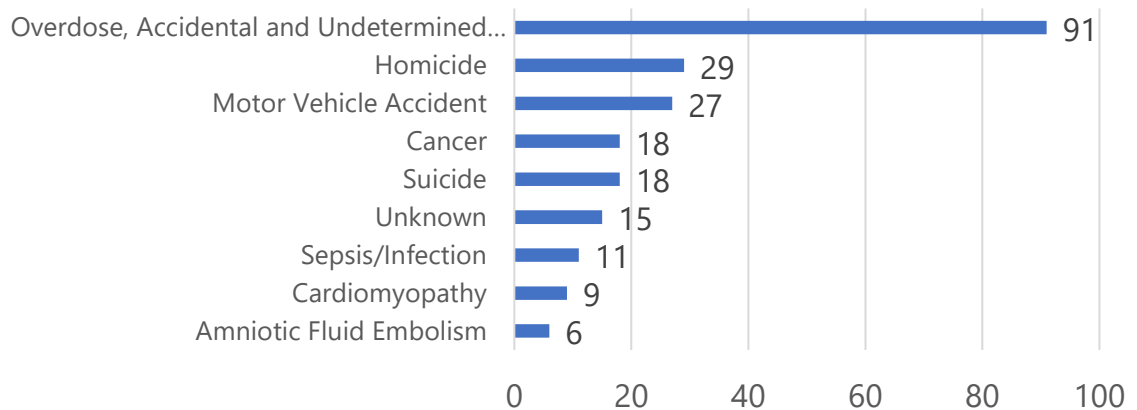


Figure 16 shows the PMSS Code Causes of Death for all Pregnancy-Related Deaths for aggregated 2018 through 2021 data. The four-year data for pregnancy-related causes of death provide a more detailed picture than what was available by looking at a single year. Cardiovascular conditions (e.g., cardiomyopathy, coronary artery disease) are the leading causes of pregnancy-related death over the four years, accounting for 21% of deaths. Hemorrhages of various etiologies account for another 19%. Notably, amniotic fluid embolisms are another one of the leading causes of pregnancy-related death, causing 11% of the deaths observed over the four years of data. These pregnancy-related health issues can be a focus on prevention and intervention work for maternal mortality and morbidities in Indiana.

**Figure 16: PMSS Code Causes of Death for all Pregnancy-Related Deaths**

Indiana MMRC, 2018-2021 (N=57)

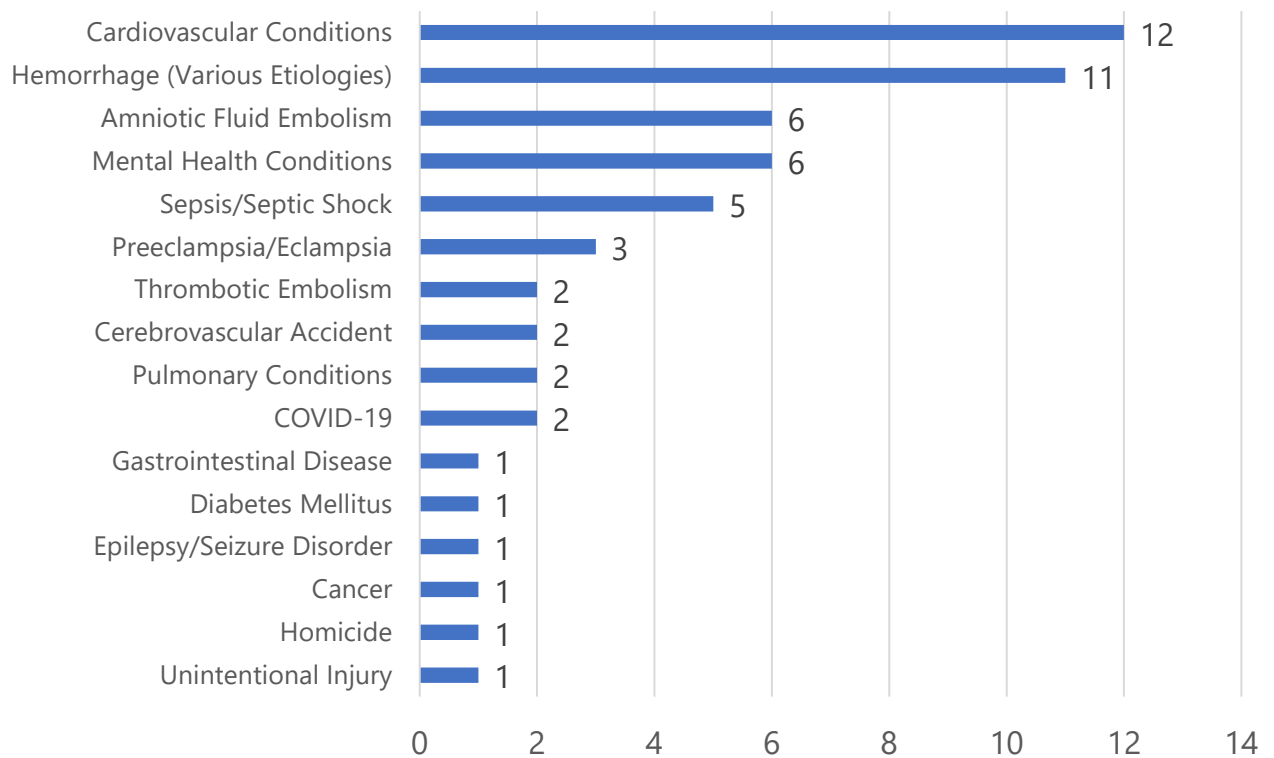


Figure 17 shows the distribution of pregnancy-associated deaths due to overdose by race and ethnicity during this four-year period. White, non-Hispanic women have accounted for the majority of these deaths. White, non-Hispanic women accounted for 71% of all live births in 2018 through 2021 in Indiana but made up 86% of the pregnancy-associated

overdose deaths. Black, non-Hispanic women, and Hispanic women accounted for 14% of the overdose deaths. Each accounted for 13% and 12% of all live births for 2018 through 2021 in Indiana, respectively. These findings suggest overdose deaths are occurring most often among the White, non-Hispanic pregnant and postpartum populations, compared to other races and ethnicities.

**Figure 17: Pregnancy-Associated Deaths due to Overdose by Race/Ethnicity**

Indiana MMRC, 2018-2021 (N=91)

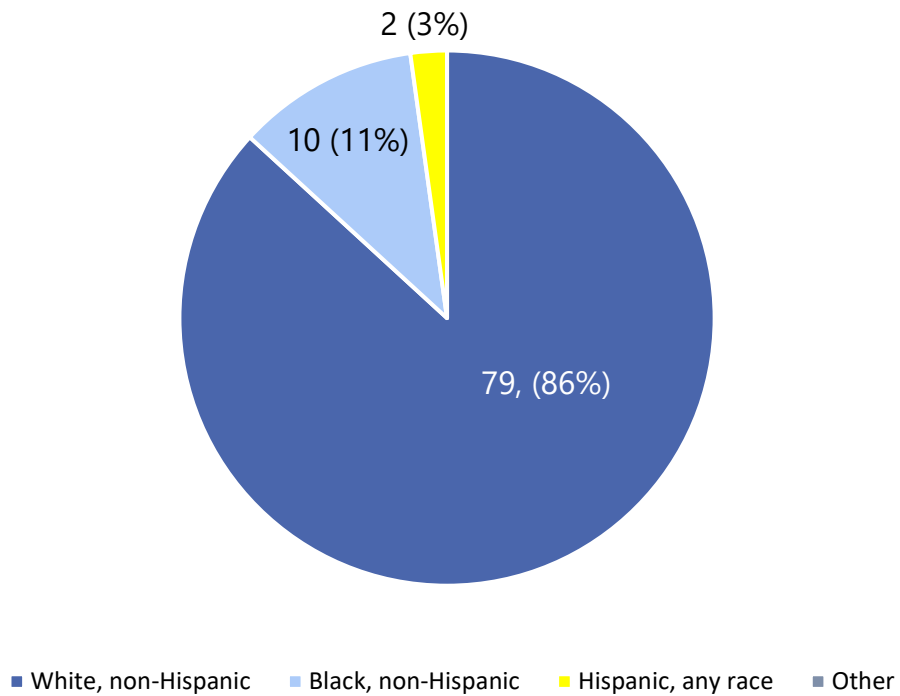


Table 10 shows the age of pregnancy-associated deaths due to overdose. The majority of pregnancy-associated overdose deaths occurred among women ages 20 through 34 years, and that age group accounted for 83% of deaths due to overdose. Similarly, the majority of Indiana births are occurring to women in this age group; between 2018, 2019, 2020, and 2021, 81% of all live births were among women between the ages of 20 and 34.

**Table 10: Pregnancy-Associated Deaths due to Overdose by Age**

Indiana MMRC, 2018-2021 (N=91)

	N	%
15-19 Years	0	0%
20-24 Years	19	21%
25-29 Years	34	38%
30-34 Years	22	24%
35-39 Years	13	14%
40+ Years	3	3%

Figure 18 shows the timing of pregnancy-associated deaths due to overdose relative to the pregnancy or childbirth. While some deaths occurred during pregnancy or on the day of delivery, the majority (74%) of pregnancy-associated overdose deaths occurred in the late postpartum period, between 43 days and one-year postpartum. Interventions that aim to lower pregnancy-associated deaths due to overdose should target women in the late postpartum period.

**Figure 18: Timing of Pregnancy-Associated Deaths due to Overdose**

Indiana MMRC, 2018-2021 (N=91)

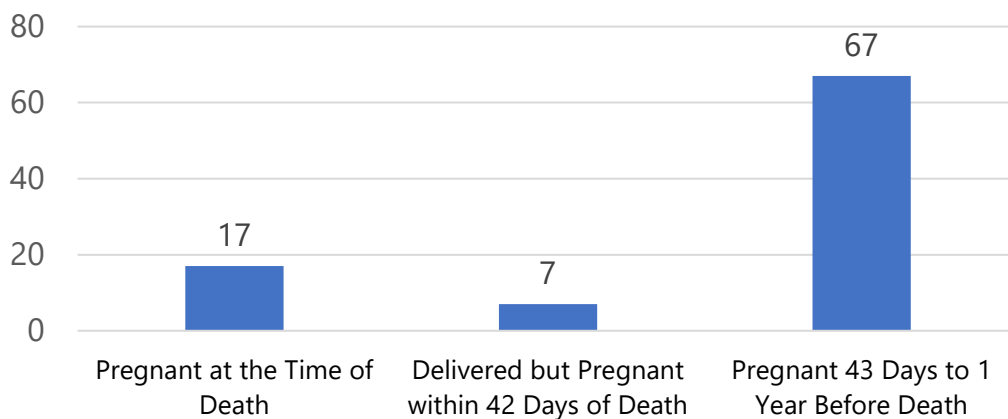


Table 11 shows the type of insurance held by the women who died from pregnancy-associated overdoses for aggregated 2018 through 2021 data. The majority of overdose deaths occurred to women insured by Medicaid (82%), which is 15% higher than what is seen in the four-year pregnancy-associated cohort. Private insurance was the second most common insurance status, accounting for 8% of pregnancy-associated overdose deaths, which is 10% lower than what is seen in the four-year pregnancy-associated cohort. The women’s insurance coverage was assessed through a variety of means, including prenatal care records, delivery records and birth certificates. In some cases, insurance coverage was unknown, especially in instances where there was no available prenatal record and no delivery. Additionally, insurance coverage is not a static measure and may not be the same during the prenatal period and the terminal event.

**Table 11: Insurance Status of Pregnancy-Associated Deaths due to Overdose**

Indiana MMRC, 2018-2021 (N=91)

	N	%
Private Insurance	7	8%
Medicaid	75	82%
Self-Pay/None	5	6%
Other	1	1%
Unknown	3	3%

While the underlying cause of death among pregnancy-associated and pregnancy-related deaths provides an answer to HOW Indiana mothers die, it does not address WHY. Assessing and measuring circumstantial factors that contributed to pregnancy-associated deaths can exemplify issues affecting pregnant and postpartum women in Indiana and present avenues for intervention.

During each review of a woman’s death, the Indiana MMRC determines whether SUD, mental health conditions (other than SUD), obesity, or discrimination contributed to the death. Other contributing factors may be identified when making prevention recommendations.

## Contributing Circumstances

Table 12 shows a summary of the four contributing circumstances listed on the MMRIA decisions form found in Appendix B. The MMRC requires a consensus on determination whether any or multiple circumstances were present and contributed to the chain of events leading to a death. Circumstances include obesity, discrimination, mental health conditions other than substance use disorder and substance use disorder. Multiple circumstances may be present in a case.

**Table 12: MMRIA Decisions Forms Contributing Factors**

Indiana MMRC, 2018-2021 (N=295)

Indiana MMRC, 2021 (N=80)

	Yes		No		Probably		Unknown	
	N	%	N	%	N	%	N	%
Substance Use (2021)	38	47%	39	49%	1	1%	2	3%
Substance Use (2018-2021)	135	46%	141	48%	6	2%	13	4%
Mental Health Conditions (2021)	18	22%	50	63%	4	5%	8	10%
Mental Health Conditions (2018-2021)	82	28%	164	56%	13	4%	36	12%
Obesity (2021)	6	7%	70	88%	1	1%	3	4%
Obesity (2018-2021)	23	8%	254	86%	7	2%	11	4%
Discrimination (2021)	7	9%	66	82%	1	1%	6	8%
Discrimination (2019-2021)	15	7%	202	87%	3	1%	12	5%

The contribution of SUD went beyond accidental overdoses, with SUD contributing to and exacerbating other conditions that led to the death of the pregnant or recently pregnant women. Interventions aimed at helping pregnant women, recently pregnant women, and even non-pregnant women of reproductive age access treatment resources could help prevent about half of all pregnancy-associated deaths in Indiana.

Discrimination was defined for the review process as “treating someone less or more favorably based on the group, class, or category they belong to resulting from biases, prejudices, and stereotyping.” Therefore, discrimination noted in was not limited to just racial discrimination, but also looked at discrimination due to a woman’s obesity, substance use or mental health history, or any other group or category.

The Indiana MMRC noted challenges in determining the effect of discrimination on pregnancy-associated deaths. Decisions about the contributory nature of discrimination are based on the review of all available records, but incidents or circumstances considered discriminatory are not often documented in records. In addition, discrimination through the absence of care is difficult to identify, as there is no documentation of these situations. The Indiana MMR program is continuing to evaluate sources of information that can inform this question.

### **Indiana Department of Child Services History**

The Indiana Department of Child Services (DCS) collaborated with the Indiana MMRC to ascertain relevant DCS histories for the 2021 pregnancy-associated deaths by making records available for individuals who had previous involvement with DCS.

In 2021, 66% of the pregnancy-associated deaths occurred to women with a DCS history, either during their childhoods or as adults. Of these, 26% had a DCS history as a victim during childhood, and 61% had histories with DCS as an adult. In comparison, 65% of pregnancy-associated deaths in 2020 had a DCS history as a child or adult, where 3% had history as a victim during childhood, and 53% had history as an adult. In 2019, 68% of the pregnancy-associated deaths occurred to women with a DCS history as a child or adult, 20% of these had a DCS history as a victim during childhood, and 58% had history with DCS as an adult. Comparable data are not available for the 2018 cohort of pregnancy-associated deaths, as the Indiana MMR Program began including all DCS histories for the women in the review process — rather than only recent DCS involvement — for the 2019 review. The value of these experiences as an indicator of adverse childhood experiences (ACEs) and intersections with social services helped the Indiana MMRC more fully understand the

upstream approach to creating recommendations that address generational trauma. The high prevalence of previous DCS involvement with women who died of pregnancy-associated causes suggests a possible avenue for connecting individuals and families with resources and referrals to services and has informed the creation of prevention recommendations.

## Preventability

After reviewing all relevant obstetric, medical, and social histories of a pregnancy-associated death, the Indiana MMRC collectively discusses whether the death was preventable. A death is considered preventable “if the committee determines there was at least some chance of the death being averted by one or more reasonable changes to patient, family, provider, facility, and/or community factors,” according to the MMRIA Committee Decisions Form.

The Indiana MMRC found the majority (71%) of all 2021 pregnancy-associated deaths reviewed were preventable.

Similarly, among just the deaths determined to be pregnancy-related, 77% were preventable. Both percentages are lower than what was seen in 2018 and 2020, while the pregnancy-related percentage was slightly higher than 2019’s 73%. However, the pregnancy-associated percentage was lower than the 80% seen in 2019. Based on these numbers, most of the pregnancy-associated deaths in Indiana could have been prevented. It is vital to acknowledge that preventability can occur at any point in a person’s life and is not only regarding medical care.

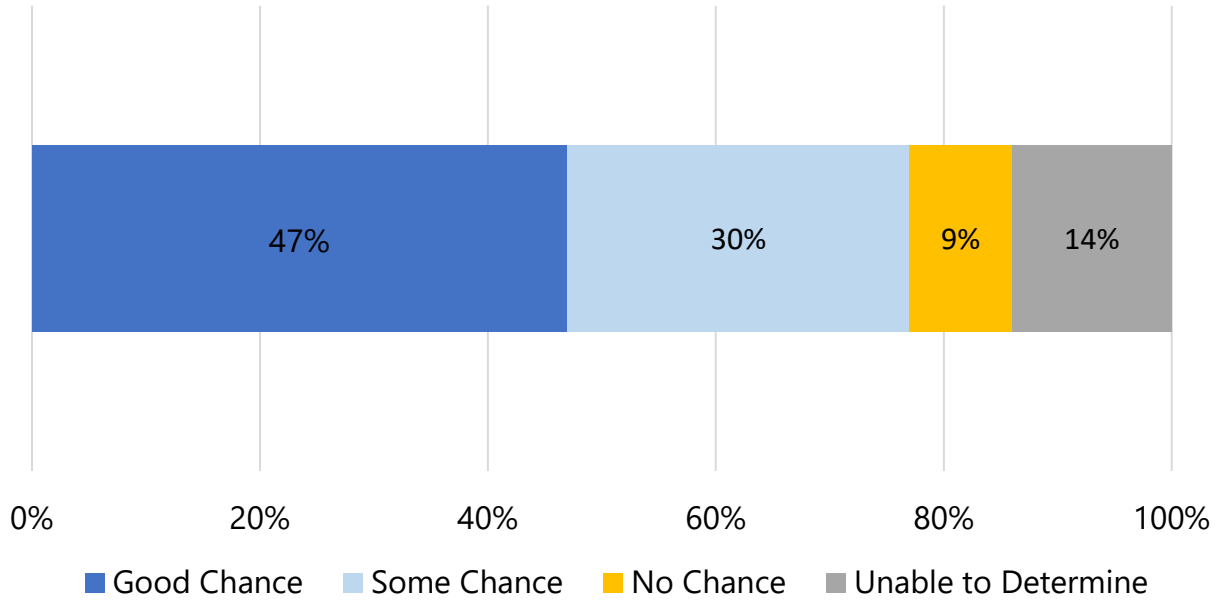
Figure 18 shows the MMRC determination of the chance to alter the outcome of pregnancy-associated deaths. Different pregnancy-associated death narratives present different opportunities for prevention, and some opportunities can be expected to have a larger chance to alter outcomes. Of the cases reviewed, 30% had some chance to alter the outcome, and 47% had a good chance to alter the outcome. Stated another way, the majority (77%) of cases reviewed had some chance or good chance to alter the outcome.

- **71% of pregnancy-associated deaths** were deemed preventable by the Indiana MMRC
- **77% of pregnancy-related deaths** were deemed preventable by the Indiana MMRC



**Figure 18: MMRC Determination of the Chance to Alter the Outcome of Pregnancy-Associated Deaths**

Indiana MMRC, 2021 (N=80)



# Section 7: Recommendations



The MMRIA Committee Decisions Form assists MMRCs in a standardized process for documentation of identified contributing factors and recommendations. As part of the review of each death, the committee identifies strategies and action steps that may address factors that contributed to the death. Organization of the recommendations by prevention level (primary, secondary, and tertiary), as well as the level in the continuum where the influence can be expected, guided the Indiana MMRC in producing impactful suggestions. It is critical for MMRCs to recognize that the levels of change will not often be at the provider/family level, but rather in larger systems and overarching policies.

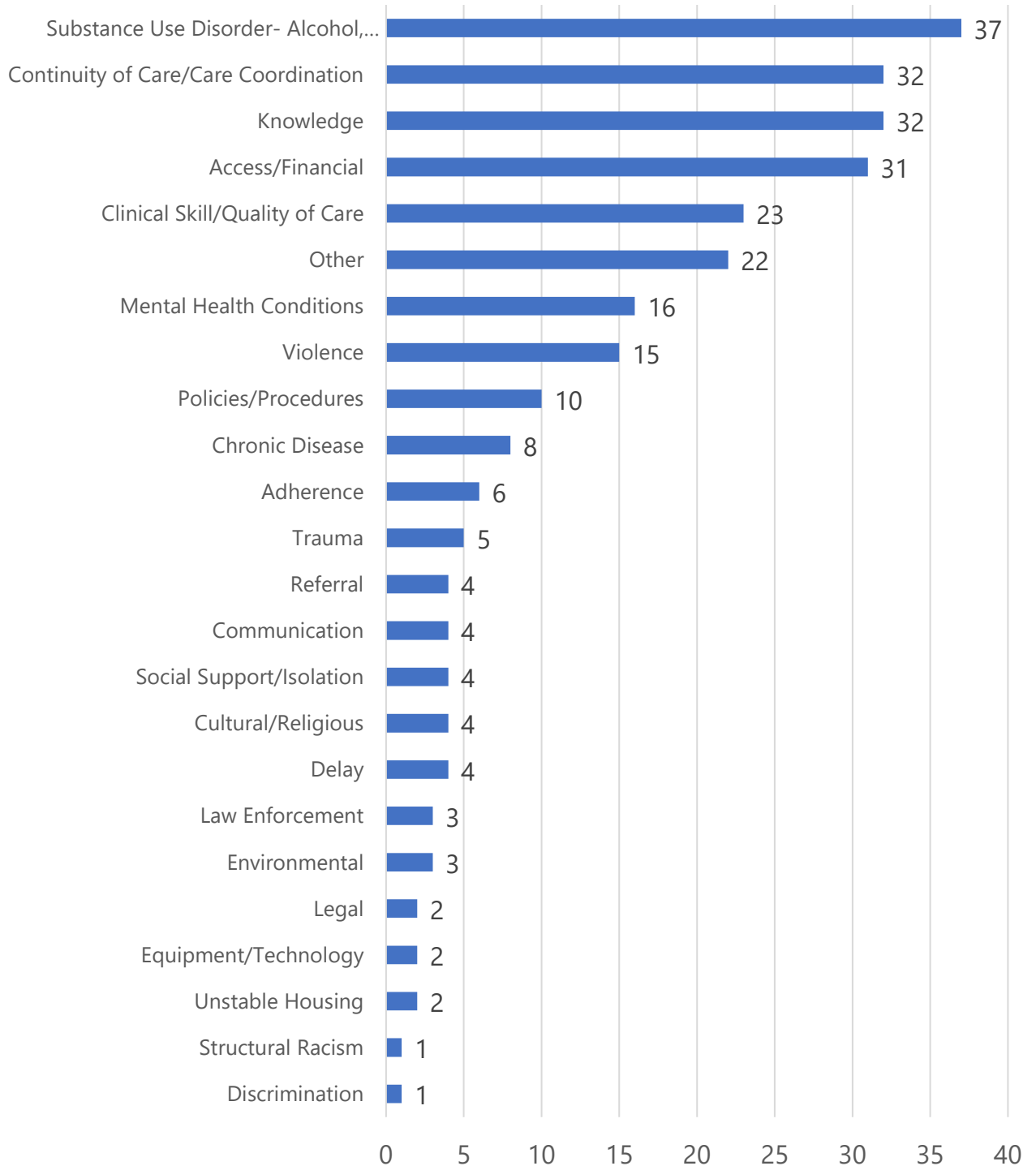
Among the 80 pregnancy-associated deaths that occurred in 2021, the Indiana MMRC recognized and documented a total of 271 unique circumstantial contributing factors and created recommendations in response to each. For each death reviewed, an average of 3.4 recommendations were created, with the guidance of the MMRIA Committee Decisions Form.

Figure 19 shows the top classes of contributing factors for pregnancy-associated deaths. SUD, including alcohol and all illicit and prescription drugs, was the most identified class of contributing factor, with continuity of care/care coordination and knowledge also among the most frequent.

**Figure 19: Top Classes of Contributing Factors for Pregnancy-Associated Deaths**

Indiana MMRC, 2021

MMRIA Decisions Form 2018-2021

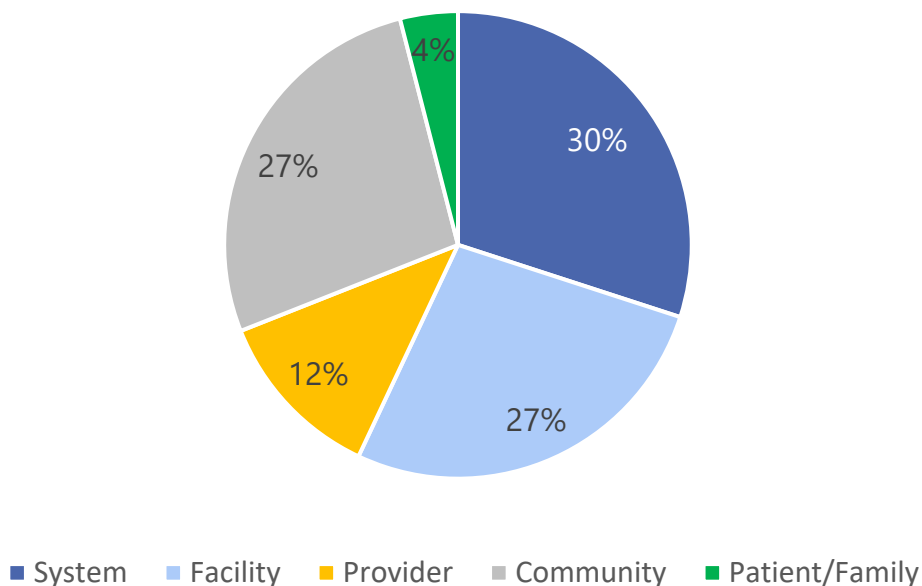


Looking specifically at the contributing factors, many contributing factors identified were at the patient/family level. System level recommendations accounted for 30% of recommendations. Community level and facility level were the second most common recommendation levels, accounting for 27% of recommendations each.

When creating recommendations to prevent future pregnancy-associated deaths, the MMRC assigns categories based on who could act on that recommendation. While patient/family level factors accounted for most contributing factors, the individual does not necessarily have control over the factors at that level. Often, external factors or systems must be addressed to improve the patient-level concerns.

Figure 20 shows the recommendation by level. The largest share of recommendations made were at the level of the system. Together, recommendations for action for facilities, providers and systems of care accounted for 69% of all recommendations. Note that providers and facilities are not limited to only medical providers or hospitals. Mental health providers and providers of social services can also fall into this category. Recommendations for the community accounted for 27% of recommendations, and those for the patient or family accounted for just 4% of recommendations put forth by the Indiana MMRC.

**Figure 20: Recommendation by Level**  
Indiana MMRC, 2021



All recommendations are developed in response to each pregnancy-associated death and

are documented in accordance with the MMRIA Committee Decisions Form. The full list of 271 recommendations for the 2021 cohort was then prioritized based on feasibility and impact. Based on the themes woven throughout these cases, the Indiana MMRC made recommendations that are specifically tailored toward systems of care, communities, facilities, providers, and the patient and their families. The Indiana MMRC would be remiss if it were not to mention the efforts already being made. We want to acknowledge that although we are providing recommendations, there are ongoing prevention efforts for maternal mortality. Indiana MMRC wishes to acknowledge those efforts and provide recommendations to continue to further prevention in Indiana.

### **RECOMMENDATIONS FOR SYSTEMS**

Preventing infant and maternal death is a priority for Indiana. Policymakers and healthcare systems should seek to provide system-level solutions and policy options. Health systems and social service networks have a significant opportunity to prevent maternal mortality. Integrating standardized practices, provider education, safe prescribing practices, and coordinated support for Indiana women during the pre-, ante, and post-partum periods can improve health outcomes and patient satisfaction and reduce costs for providers.

Indiana should ensure policies support data-driven, coordinated strategies that foster healthy families. Participating state and local agencies should be encouraged to play active, collaborative roles in Indiana's maternal mortality prevention and response efforts.

Indiana's MMRC discussions reflect the need for upstream policy improvements as they relate to current health outcomes and disparities, specifically those identified in the data analysis. The presence of persistent population-level disparities in maternal mortality suggests recommendations should include not only individual-level factors that distinguish "high risk" from "low risk" women, but also social contextual factors that systematically expose populations of women to higher- or lower-risk environments (Review to Action).

Among the pregnancy-associated deaths reviewed by the Indiana MMRC in 2021, many could be linked to circumstances that could have been avoided by increases in publicly funded improvements to maternal health. The recommendations provided by the MMRC that directly related to these were:

- Publicly funded childcare, beginning in infancy
- Universal access for long-acting reversible contraception
- Increased Medicaid and insurance coverage for medical procedures
- Access to public transportation

Indiana MMRC also found that public funding and funding related to behavioral health care could prevent many maternal deaths. These recommendations included:

- Funding for access to mental health providers, increase credentialed providers for mental health and substance abuse disorder
- Increase funding for social services, DCS, and other social service agencies that provide touchpoints where prevention of maternal mortality can be put in place
- Resources for those transitioning out of care with DCS
- Adequate funding and education on conducting death investigations, including complete and accurate autopsies
- Increased awareness on suicide screening and use of suicide screening in schools and clinical settings
- Evidence-based screening tools could be used in schools and clinical settings to help identify people at risk of suicide so steps could be taken to prevent suicide
- Increase public awareness of crisis hotlines and resources, such as TreatmentAtlas.org and 988

For the review of the 2021 cases, Indiana MMRC provided many recommendations that involved a focus on SUD and injury prevention, as well as broadening the focus on maternal care while working with patients. Recommendations focusing on SUD and injury prevention were:

- Implement standardized statewide guidelines for first responders on the administration of Naloxone
- Ensure all law enforcement officers are trained on and able to educate others on how to acquire and use Naloxone
- Prioritize the de-stigmatization of harm reduction strategies and intravenous drug use through properly educating Hoosiers that addiction is a disease
- Additional community-based programs to increase awareness and decrease stigma related to intimate partner violence or domestic violence
- Increased funding and access to acute services available when there is intimate partner violence or domestic violence

## **RECOMMENDATIONS FOR FACILITIES**

Many opportunities for preventing maternal morbidity and mortality exist within facilities.

Examples of facilities include hospitals, care centers, and other clinical sites. Delivering facilities and emergency departments were frequent points of interaction for the women who died from pregnancy-associated causes in 2021. By implementing standardized policies and education to address the social, emotional, and physical health needs of pregnant and postpartum women, care providers in facilities of all levels could reduce maternal mortality in Indiana.

Indiana MMRC again found that a focus on SUD and mental health was imperative when operating in facilities, as well as increasing clinical capacities for pregnancy and post-partum patients. Recommendations for facilities focused on SUD and mental health were:

- Hospitals, medical providers, and facilities should provide connections to the full continuum of treatment, including medication-assisted treatment along with peer coaching for all women reporting SUD and in need
- Consistent use of domestic violence screening tools during inpatient prenatal care visits, both in person and through technology screening tools
- Implementation of a system of medication oversight for all patients with mental health disorders to ensure adequate treatment and dosing of medications

Indiana MMRC recommendations focused on increasing clinical capacities for pregnant and post-partum individuals were:

- Increased support to emergency rooms for evaluating and treating patients with SUD through clinicians and staff, peer recovery coaches and an increase in both inpatient and outpatient care
- Increased resources at facilities to support patients with varying mental etiologies, conditions, and social standings—as an example, resources should be allocated to better assist patients who are unhoused and need social services
- Emergency personnel and first responders should receive grief and active listening training to better respond to high emotions on the scene of incident
- Advanced life support in obstetrics training for all providers
- Bedside caesarean kits attached to all clinical crash carts

## **RECOMMENDATIONS FOR COMMUNITIES**

Indiana MMRC found work within communities related to SUD, gun violence, and birth support were especially beneficial to pregnant and post-partum women. Recommendations created by the Indiana MMRC for communities were:

- All obstetric cases should be referred to OB case management and the My Healthy Baby Program through Medicaid
- Increased support for doula intervention in the late postpartum period and additional forms of birth support
- Increasing the availability of harm reduction strategies
- Increase access to peer recovery coaches
- Creating a system for support and rehabilitation for incarcerated individuals leaving prison
- State-funded expansion of housing programs and prioritization of pregnant individuals in these programs
- Child welfare organizations should increase trust, partnership, and transparency with community stakeholders and partners to ensure they can perform their jobs to the best of their abilities
- Increase in education surrounding vaccine uptake in underrepresented and underserved communities

### **RECOMMENDATIONS FOR PROVIDERS**

Healthcare and social services providers, particularly those in outpatient settings, are critical interaction points for women during and after pregnancy. By addressing women's health needs in a coordinated, holistic manner, providers can address chronic conditions that may contribute to poor maternal health. Adherence to best practice recommendations, standardized screening protocols, and appropriate referral and follow up can help minimize barriers to appropriate healthcare for pregnant and recently pregnant women.

Recommendations created by Indiana MMRC for providers were:

- Providers should receive Screening, Brief Intervention, and Referral to Treatment (SBIRT) training
- Clinicians can utilize the 5Ps Prenatal Substance Abuse Screen to verbally assess for alcohol, drugs, and tobacco
- All providers should undergo trauma-informed care training
- All pregnant women in emergency rooms should receive a referral and phone number to an obstetric provider before discharge
- Increased use of high-risk obstetric case management and pregnancy promise



programs through Medicaid

- Increased use of maternal fetal medicine providers for complex cases
- Long-term contraceptive options for patients with high-risk comorbidities

### **RECOMMENDATIONS FOR PATIENTS AND FAMILIES**

The Indiana MMRC emphasized recommendations addressing resources and service delivery to pregnant and recently pregnant women. Many of the challenges or experiences of women and their support systems should be addressed upstream, removing the responsibility of systems improvements from the patients and clients entirely.

However, some opportunities can be communicated to pregnant women and families to increase their awareness of risks associated with maternal morbidity and mortality.

Recommendations for these were:

- Encourage preconception counseling and contraception access with all patients
- All women who may become pregnant should be educated on healthy birth spacing and long-term reversible birth control
- Any needed funding should be provided to patients and families utilizing the harm reduction approach to manage SUD
- Ensure all pregnant women are made aware of the Indiana Pregnancy Promise program
- Adequate resources and services should be provided to individuals with a known history of abuse as a victim
- Increase awareness and access to resources for families experiencing miscarriage and loss
- Seek early prenatal care, especially if the patient has an accompanying chronic condition
- Be aware of signs/symptoms of pre-eclampsia— seek medical care immediately if needed
- Avoid riding in vehicles with an impaired driver
- Always wear a seatbelt

# Section 8: Conclusion

The Indiana MMRC was established to comprehensively review pregnancy-associated deaths in Indiana, and based on an assessment of aggregate data, identify means and opportunities to reduce future preventable maternal loss. This process is time-intensive and can often be emotionally difficult. It remains the most comprehensive process to understand the true burden and impact of maternal mortality in Indiana.

The Indiana MMRC had multiple key takeaways from the data presented. These takeaways include:

- Aggregate data from pregnancy-associated deaths that occurred from 2018 through 2021 showed that women with Medicaid started prenatal care later and attended fewer appointments than women with private insurance
- Overdose, both accidental and undetermined intent, was the top cause of pregnancy-associated deaths in 2018, 2019, 2020, and 2021

There are recommendations that align directly with these findings. These recommendations include but are not limited to:

- Increased use of high-risk obstetric case management and the Indiana Pregnancy Promise Program through Medicaid
- Seek early prenatal care, especially if the patient has an accompanying chronic condition
- Increased Medicaid and insurance coverage for medical procedures
- Ensure all law enforcement officers are trained on and able to educate others on how to acquire and use Naloxone
- Increased support to emergency rooms for evaluating and treating patients with SUD through clinicians and staff, peer recovery coaches and an increase in both inpatient and outpatient care

IDOH and the Indiana MMRC determined an overwhelming majority of the pregnancy-associated deaths from 2021 were preventable and provided recommendations toward eliminating these deaths. As the committee continues its work into the 2022 cohort, it is imperative that Indiana learns from these findings and looks for actionable steps to improve the health of Hoosiers.

# Section 9: Appendices

## APPENDIX A - MATERNAL MORTALITY NOTICE OF DEATH FORM



### Maternal Mortality Notice of Death Form

Per [IC-16-50-1-6\(a\)](#) please send this report immediately after the death of a woman who was currently pregnant or was pregnant within 365 days of death. Report the event regardless of where the patient died with as much details as possible.

Name of Woman \_\_\_\_\_  
Last First Middle Maiden

Address \_\_\_\_\_  
Street City State ZIP

Date of Birth (MM/DD/YYYY) \_\_\_\_\_

Date of Death (MM/DD/YYYY) \_\_\_\_\_

Name of birth hospital (if known) \_\_\_\_\_

Name of Obstetric Provider (if known) \_\_\_\_\_

Place of death

Hospital (name of facility and city) \_\_\_\_\_

Residence  other (Please specify)

Medical Record number \_\_\_\_\_

- No Autopsy
- Autopsy Performed
  - Facility or address where autopsy was performed \_\_\_\_\_
  - Autopsy performed by: \_\_\_\_\_
- Autopsy pending

Cause of death

Primary \_\_\_\_\_

Contributing factors \_\_\_\_\_  
\_\_\_\_\_

Manner of Death \_\_\_\_\_

Report Prepared by \_\_\_\_\_ Date \_\_\_\_\_

Email \_\_\_\_\_ phone \_\_\_\_\_

Please send any questions and complete forms to [MMR@health.in.gov](mailto:MMR@health.in.gov)

# APPENDIX B – MATERNAL MORTALITY REVIEW COMMITTEE DECISIONS FORM

MMRCA		MATERNAL MORTALITY REVIEW COMMITTEE DECISIONS FORM v22		1																															
REVIEW DATE  Month/Day/Year	RECORD ID #	<b>COMMITTEE DETERMINATION OF CAUSE(S) OF DEATH</b>  <b>IF PREGNANCY-RELATED, COMMITTEE DETERMINATION OF UNDERLYING* CAUSE OF DEATH</b> Refer to page 3 for PMSS-MM cause of death list.																																	
<b>PREGNANCY-RELATEDNESS: SELECT ONE</b>  <b>PREGNANCY-RELATED</b> 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  <b>PREGNANCY-ASSOCIATED, BUT NOT-RELATED</b> A death during pregnancy or within one year of the end of pregnancy from a cause that is not related to pregnancy  <b>PREGNANCY-ASSOCIATED BUT UNABLE TO DETERMINE PREGNANCY-RELATEDNESS</b>		<table border="1"> <thead> <tr> <th>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		<b>COMMITTEE DETERMINATIONS ON CIRCUMSTANCES SURROUNDING DEATH</b>  <table border="1"> <tbody> <tr> <td>DID OBESITY CONTRIBUTE TO THE DEATH?</td> <td>YES</td> <td>PROBABLY</td> <td>NO</td> <td>UNKNOWN</td> </tr> <tr> <td>DID DISCRIMINATION** CONTRIBUTE TO THE DEATH?</td> <td>YES</td> <td>PROBABLY</td> <td>NO</td> <td>UNKNOWN</td> </tr> <tr> <td>DID MENTAL HEALTH CONDITIONS OTHER THAN SUBSTANCE USE DISORDER CONTRIBUTE TO THE DEATH?</td> <td>YES</td> <td>PROBABLY</td> <td>NO</td> <td>UNKNOWN</td> </tr> <tr> <td>DID SUBSTANCE USE DISORDER CONTRIBUTE TO THE DEATH?</td> <td>YES</td> <td>PROBABLY</td> <td>NO</td> <td>UNKNOWN</td> </tr> </tbody> </table>			DID OBESITY CONTRIBUTE TO THE DEATH?	YES	PROBABLY	NO	UNKNOWN	DID DISCRIMINATION** CONTRIBUTE TO THE DEATH?	YES	PROBABLY	NO	UNKNOWN	DID MENTAL HEALTH CONDITIONS OTHER THAN SUBSTANCE USE DISORDER CONTRIBUTE TO THE DEATH?	YES	PROBABLY	NO	UNKNOWN	DID SUBSTANCE USE DISORDER CONTRIBUTE TO THE DEATH?	YES	PROBABLY	NO	UNKNOWN
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<b>ESTIMATE THE DEGREE OF RELEVANT INFORMATION (RECORDS) AVAILABLE FOR THIS CASE:</b>  <table border="1"> <tbody> <tr> <td><b>COMPLETE</b> All records necessary for adequate review of the case were available</td> <td><b>SOMEWHAT COMPLETE</b> Major gaps (i.e., information that would have been crucial to the review of the case)</td> </tr> <tr> <td><b>MOSTLY COMPLETE</b> Minor gaps (i.e., information that would have been beneficial but was not essential to the review of the case)</td> <td><b>NOT COMPLETE</b> Minimal records available for review (i.e., death certificate and no additional records)</td> </tr> </tbody> </table>		<b>COMPLETE</b> All records necessary for adequate review of the case were available	<b>SOMEWHAT COMPLETE</b> Major gaps (i.e., information that would have been crucial to the review of the case)	<b>MOSTLY COMPLETE</b> Minor gaps (i.e., information that would have been beneficial but was not essential to the review of the case)	<b>NOT COMPLETE</b> Minimal records available for review (i.e., death certificate and no additional records)	<b>MANNER OF DEATH</b>  <table border="1"> <tbody> <tr> <td>WAS THIS DEATH A SUICIDE?</td> <td>YES</td> <td>PROBABLY</td> <td>NO</td> <td>UNKNOWN</td> </tr> <tr> <td>WAS THIS DEATH A HOMICIDE?</td> <td>YES</td> <td>PROBABLY</td> <td>NO</td> <td>UNKNOWN</td> </tr> <tr> <td>IF ACCIDENTAL DEATH, HOMICIDE, OR SUICIDE, LIST THE MEANS OF FATAL INJURY</td> <td>FIREARM SHARP INSTRUMENT BLUNT INSTRUMENT POISONING/ OVERDOSE HANGING/ STRANGULATION/ SUFFOCATION</td> <td>FALL PUNCHING/ KICKING/BEATING EXPLOSIVE DROWNING FIRE OR BURNS MOTOR VEHICLE</td> <td>INTENTIONAL NEGLECT OTHER, SPECIFY:</td> <td>UNKNOWN NOT APPLICABLE</td> </tr> <tr> <td>IF HOMICIDE, WHAT WAS THE RELATIONSHIP OF THE PERPETRATOR TO THE DECEDENT?</td> <td>NO RELATIONSHIP PARTNER EX-PARTNER OTHER RELATIVE</td> <td>OTHER ACQUAINTANCE OTHER, SPECIFY:</td> <td>UNKNOWN NOT APPLICABLE</td> <td></td> </tr> </tbody> </table>			WAS THIS DEATH A SUICIDE?	YES	PROBABLY	NO	UNKNOWN	WAS THIS DEATH A HOMICIDE?	YES	PROBABLY	NO	UNKNOWN	IF ACCIDENTAL DEATH, HOMICIDE, OR SUICIDE, LIST THE MEANS OF FATAL INJURY	FIREARM SHARP INSTRUMENT BLUNT INSTRUMENT POISONING/ OVERDOSE HANGING/ STRANGULATION/ SUFFOCATION	FALL PUNCHING/ KICKING/BEATING EXPLOSIVE DROWNING FIRE OR BURNS MOTOR VEHICLE	INTENTIONAL NEGLECT OTHER, SPECIFY:	UNKNOWN NOT APPLICABLE	IF HOMICIDE, WHAT WAS THE RELATIONSHIP OF THE PERPETRATOR TO THE DECEDENT?	NO RELATIONSHIP PARTNER EX-PARTNER OTHER RELATIVE	OTHER ACQUAINTANCE OTHER, SPECIFY:	UNKNOWN NOT APPLICABLE								
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<b>DOES THE COMMITTEE AGREE WITH THE UNDERLYING* CAUSE OF DEATH LISTED ON DEATH CERTIFICATE?</b>		YES	NO																																

\*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 NO CHANCE	SOME 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)
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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:** Intersecting 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 drivers of health (poverty, inequality, etc.)

# APPENDIX C – UNDERLYING CAUSE OF PREGNANCY-RELATED DEATH PREGNANCY MORTALITY SURVEILLANCE SYSTEM CODE

MMRIA		MATERNAL MORTALITY REVIEW COMMITTEE DECISIONS FORM v22		3
<b>IF PREGNANCY-RELATED, COMMITTEE DETERMINATION OF UNDERLYING CAUSE OF DEATH* PMSS-MM</b>				
* PREGNANCY-RELATED DEATH: 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.				
<b>Hemorrhage (Excludes Aneurysms or CVA)</b> 101 - Hemorrhage – Uterine Rupture 10.2 - Placental Abruptio 10.3 - Placenta Previa 10.4 - Ruptured Ectopic Pregnancy 10.5 - Hemorrhage – Uterine Atony/Postpartum Hemorrhage 10.6 - Placenta Accreta/Increta/Percreta 10.7 - Hemorrhage due to Retained Placenta 10.10 - Hemorrhage – Laceration/Intra-Abdominal Bleeding 10.9 - Other Hemorrhage/NOS	<b>Hematologic</b> 821 - Sickle Cell Anemia 82.9 - Other Hematologic Conditions including Thrombophilias/TTP/HUS/NOS	<b>Neurologic/Neurovascular Conditions (Excluding CVA)</b> 92.1 - Epilepsy/Seizure Disorder 92.9 - Other Neurologic Diseases/NOS	<b>Renal Disease</b> 931 - Chronic Renal Failure/End-Stage Renal Disease (ESRD) 93.9 - Other Renal Disease/NOS	
<b>Infection</b> 20.1 - Postpartum Genital Tract (e.g., of the Uterus/ Pelvis/Perineum/Necrotizing Fasciitis) 20.2 - Sepsis/Septic Shock 20.4 - Chorioamnionitis/Antepartum Infection 20.6 - Urinary Tract Infection 20.7 - Influenza 20.8 - COVID-19 20.10 - Pneumonia 20.11 - Other Non-Pelvic Infection (e.g., TB, Meningitis, HIV) 20.9 - Other Infection/NOS	<b>Collagen Vascular/Autoimmune Diseases</b> 831 - Systemic Lupus Erythematosus (SLE) 83.9 - Other Collagen Vascular Diseases/NOS	<b>Cerebrovascular Accident (CVA) not Secondary to HDP</b> 951 - Cerebrovascular Accident (Hemorrhage/Thrombosis/Aneurysm/Malformation) not Secondary to Hypertensive Disorders of Pregnancy	<b>Metabolic/Endocrine</b> 96.2 - Diabetes Mellitus 96.9 - Other Metabolic/Endocrine Disorders/NOS	
<b>Embolism - Thrombotic (Non-Cerebral)</b> 301 - Embolism – Thrombotic (Non-Cerebral) 309 - Other Embolism (Excludes Amniotic Fluid Embolism)/NOS	<b>Conditions Unique to Pregnancy</b> 851 - Conditions Unique to Pregnancy (e.g., Gestational Diabetes, Hyperemesis, Liver Disease of Pregnancy)	<b>Gastrointestinal Disorders</b> 971 - Crohn's Disease/Ulcerative Colitis 97.2 - Liver Disease/Failure/Transplant 97.9 - Other Gastrointestinal Diseases/NOS	<b>Mental Health Conditions</b> 100.1 - Depressive Disorder 100.2 - Anxiety Disorder (including Post-Traumatic Stress Disorder) 100.3 - Bipolar Disorder 100.4 - Psychotic Disorder 100.5 - Substance Use Disorder 100.9 - Other Psychiatric Conditions/NOS	
<b>Amniotic Fluid Embolism</b> 311 - Embolism - Amniotic Fluid	<b>Injury</b> 881 - Intentional (Homicide) 88.2 - Unintentional 88.9 - Unknown Intent/NOS	<b>Unknown COD</b> 9991 - Unknown COD		
<b>Hypertensive Disorders of Pregnancy (HDP)</b> 401 - Preeclampsia 501 - Eclampsia 601 - Chronic Hypertension with Superimposed Preeclampsia	<b>Cancer</b> 891 - Gestational Trophoblastic Disease (GTD) 893 - Malignant Melanoma 899 - Other Malignancies/NOS			
<b>Anesthesia Complications</b> 701 - Anesthesia Complications	<b>Cardiovascular Conditions (excluding cardiomyopathy, HDP, and CVA)</b> 901 - Coronary Artery Disease/Myocardial Infarction (MI)/Atherosclerotic Cardiovascular Disease 90.2 - Pulmonary Hypertension 90.3 - Valvular Heart Disease Congenital and Acquired 90.4 - Vascular Aneurysm/Dissection (Non-Cerebral) 90.5 - Hypertensive Cardiovascular Disease 90.6 - Marfan Syndrome 90.7 - Conduction Defects/Arrhythmias 90.8 - Vascular Malformations Outside Head and Coronary Arteries 90.9 - Other Cardiovascular Disease, including CHF, Cardiomegaly, Cardiac Hypertrophy, Cardiac Fibrosis, Non-Acute Myocarditis/NOS			
<b>Cardiomyopathy</b> 801 - Postpartum/Peripartum Cardiomyopathy 80.2 - Hypertrophic Cardiomyopathy 80.9 - Other Cardiomyopathy/NOS	<b>Pulmonary Conditions (Excludes ARDS-Adult Respiratory Distress Syndrome)</b> 911 - Chronic Lung Disease 91.2 - Cystic Fibrosis 91.3 - Asthma 91.9 - Other Pulmonary Disease/NOS			

