Division of Fatality Review and Prevention July 2021

Indiana Maternal Mortality Review Committee

2021 Annual Report

Indiana Department of Health

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Section 1: Acknowledgments

This report was made possible through detailed review of maternal death cases by a volunteer review committee. We are deeply grateful to the members of this review committee for their insight, dedication, and generosity. We acknowledge the Indiana Department of Health Vital Records, Trauma and Injury Prevention, and Epidemiology Resource Center divisions for their collaboration in providing data analysis support in the identification of Indiana maternal deaths. We thank the health systems, healthcare providers, healthcare facilities, Indiana Hospital Association, Indiana Department of Child Services, Indiana Family and Social Services Administration, and coroners who provided the records that allowed meaningful review to occur.

Indiana has been the beneficiary of generous support from other states' maternal mortality review programs. With the support and guidance of Tennessee, Mississippi, and Georgia, we were able to properly prepare for the family narrative processes and ensure our work continues to be trauma-informed, sensitive, and respectful of the women and their families. Angelica Guzman donated her time to create the branding for the family interview documents. We extend our thanks to these gracious partners.

Our gratitude extends to the Centers for Disease Control and Prevention for its technical support in this work, as Indiana strives to honor Indiana mothers through expansion of our maternal mortality review program.

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Section 3: Dedication

Dedication

The Indiana Department of Health would like to acknowledge the Indiana women who died within one year of pregnancy during 2019, and their families and friends.

We hope that our efforts to learn from their stories will help us prevent this heartbreak in the future.

Section 5: Executive Summary

Dear Colleagues:

The Indiana Department of Health (IDOH) is pleased to share the second annual Indiana Maternal Mortality Report. This report shares the findings and recommendations of the Indiana Maternal Mortality Review Committee (MMRC) from its review and discussion of all 2019 maternal deaths in Indiana.

The Indiana MMRC comprises volunteers from several disciplines, working tirelessly to identify statewide trends in maternal mortality and offer recommendations to improve the health and safety of Indiana women. The committee honors the women who have died and understands the impact on their families and communities.

MMRC members shared their expertise and knowledge to identify opportunities for prevention, with the hope that fewer Indiana families will have to suffer the tragic losses associated with maternal mortality. IDOH is committed to learning from their review processes and partnering with other state and local agencies to implement recommendations detailed in this report.

Many efforts are already underway.

Through the America Rescue Plan Act, Indiana was able to extend post-partum Medicaid coverage to 12 months. This has become part of our state policy and will permanently take effect in January 2022. Allowing post-partum individuals to maintain their health coverage through the baby's first year will ensure they can access the medical care and medications they need to stay safe and healthy, even after they transition to preventive care.

The Office of Medicaid Policy and Planning (OMPP) has covered Community Health Worker services since 2018. In July 2019, doula services were added to the covered care. Doulas support pregnant and post-partum people through emotional support, education, and advocacy. OMPP is actively revising its current policy to reflect the coverage of doula services in Indiana.

The Indiana Perinatal Quality Improvement Collaborative (IPQIC) is working with prenatal care providers to implement screening for substance use disorder and interpersonal violence at the first prenatal appointment. IPQIC has developed a toolkit and will be improving clinicians' engagement with pregnant patients who may use alcohol or drugs or be in unsafe environments. IPQIC is also establishing a Women's Health Task Force to examine issues related to standardizing care provided to pregnant and post-partum people.

Section 5: Executive Summary

The Indiana Pregnancy Promise Program is a new statewide initiative implemented by the Family and Social Services Administration on July 1, 2021. The goal of the Pregnancy Promise Program is to achieve positive outcomes for parents and infants impacted by opioid use disorder (OUD) by offering services and support beginning in pregnancy and extending through 12 months postpartum. The free, voluntary program aims to identify pregnant Medicaid beneficiaries with OUD as early as possible in their pregnancy. The program offers comprehensive case management and care coordination services and connects participants with prenatal and postpartum care, mental health support, OUD treatment/recovery services and addresses issues such as housing, nutrition, transportation and other safety needs.

We have joined the Alliance for Innovation on Maternal Health and have adopted safety bundles, including the obstetric hemorrhage and maternal hypertension bundles, and will be adopting AIM's substance use disorder toolkit next. Our OB Navigator program, known as My Healthy Baby, provides local support to women during their pregnancy and through the first year of their babies' lives. The program launched in 22 counties in 2020 and is on track to expand into an additional 25 counties in 2021. And our Levels of Care system ensures that women deliver their babies at the hospital best equipped to meet their needs.

The impact of these programs will be reflected in the continued work of the Indiana MMRC, which is already identifying and reviewing maternal deaths that occurred in 2020. I fully believe that the cumulative data and recommendations that result from that review will benefit Indiana women.

I want to extend my sincere appreciation to the Indiana MMRC members and the leadership of Dr. Mary Pell-Abernathy, chair of the MMRC. This group has contributed countless hours of time as they lend their expertise to a careful examination of each of the maternal deaths reviewed. Together, we can prevent maternal mortality and improve the health of Indiana families.

Yours in health,

Kristina M. Box, MD, FACOG
State Health Commissioner

Section 5: Executive Summary

Executive Summary

Maternal mortality can be an indicator of the overall health of a community or state. In response to the increasing recognition of disparate maternal mortality rates across all racial and ethnic groups in the United States, Maternal Mortality Review Committees (MMRCs) are pertinent. These groups identify and examine pregnancy-associated deaths to understand their causes and contributing factors and ultimately put forth recommendations for preventing them in the future.

Indiana began developing its MMRC in 2017. Legislation mandating its formalization took effect in July 2018, and the State Health Commissioner appointed members who began reviewing all pregnancy-associated deaths in the fall of 2018. This multidisciplinary committee has completed the review of all pregnancy-associated deaths that occurred in 2018 and 2019. The goal of the work is to better understand the causes and preventability of these incidents.

Identification of all deaths of Indiana women during and within one year of pregnancy resulted in maternal mortality statistics that differ greatly from those traditionally reported by the National Vital Statistics System (NVSS) and the Pregnancy Mortality Surveillance System (PMSS), respectively. NVSS relies exclusively on death certificate coding and targets only women up to 42 days post-partum. PMSS data includes women through one year from the end of pregnancy and establishes pregnancy-relatedness through review by CDC epidemiologists. A significant number of false positives were identified in each dataset that were ultimately excluded, and an equally significant number of cases were identified by the Indiana MMRC through matching, facility reporting, and other means that were not identified in the NVSS dataset (false negatives). The MMRC-derived data presented in this report more accurately reflect the burden of maternal mortality in Indiana and cannot be compared to other datasets.

Key Findings

- In Indiana in 2019, a total of 60 pregnancy-associated deaths occurred during pregnancy or within one year of the end of pregnancy.
- 85% of pregnancy-associated deaths occurred postpartum, including 56% after 6 weeks.
- Substance use disorder was the most common contributing factor, likely contributing to just under half of all pregnancy-associated deaths in both 2018 and 2019.

- Overdose, both accidental and undetermined intent, was overwhelmingly the leading cause of death, accounting for 33.3% of all pregnancy-associated deaths in 2018-2019.
- The MMRC determined 80% of reviewed pregnancy-associated deaths in 2019 were preventable.

Key Recommendations

- *For the State of Indiana:*
  - *Reduce the risk of firearm-related injury through public health approaches to gun violence prevention.*
  - *Address the need for lower-cost, high-quality childcare for Indiana families.*
  - *Improve policies and services provided by government-funded health insurance programs:*
    - *Remove the risks of service disruption for women experiencing changes in life circumstances.*
    - *Increase case coordination services.*
  - *Improve and standardize quality of care for women in the criminal justice system:*
    - *Provide perinatal care that meets ACOG standards in all institutions.*
    - *Assess for and treat substance use and mental health disorders.*
    - *Provide case management for women upon their release to ensure continuity of social services and health care.*
- *For Systems of Care:*
  - *Reduce injury due to ectopic pregnancy and associated hemorrhage.*
  - *Address inter-generational trauma through systematic violence and crime prevention:*
    - *Screen for interpersonal violence at all women's health care services.*
    - *Provide trauma-informed services to victims, perpetrators, and families.*
  - *Increase harm reduction activities and make them more accessible to women and families.*
  - *Expand the resources and capacity for addressing acute mental health crises.*
  - *Increase services for families in the care of child protective services:*
    - *Standardize mental health referrals for all families in DCS care.*
    - *Increase the clinical capacity of DCS across the state.*
    - *Initiate plans of safe care for families prior to the delivery of their baby.*

- *For Facilities:*
  - *Reduce the risks associated with prescribed medication interactions.*
  - *Continue to educate on improved patient safety through implementation of standards of care for all pregnant and post-partum women:*
    - *Document all activities during patient's care, including lab results, vital signs, inputs/outputs, and weight checks.*
    - *All delivering hospitals should have access to blood products or a plan to quickly obtain them.*
    - *All emergency departments (EDs) should have and be trained on an OB triage tool.*
    - *Medication-assisted treatment should be initiated or maintained for all emergency department and inpatient encounters.*
  - *Require all post-partum discharges to include post-birth warning education and literature.*
  - *Increase the availability of resources for trauma and substance use and mental health disorder treatment and recovery:*
    - *Increase funding for certified peer recovery coaches.*
    - *Provide training for and encourage providers to screen for ACEs, social determinants of health, and trauma.*
    - *Implement universal screening policies for intimate partner violence at all hospital interactions.*
    - *All facilities should be trauma-informed.*
    - *Initiate plans of safe care for families prior to the delivery of their baby.*
- *For Communities:*
  - *Increase harm reduction activities and make them more accessible to women and families.*
  - *Improve suicide risk assessment and referral policies.*
  - *Increase community engagement in violence and crime prevention.*
  - *Identify families in need of assistance accessing resources, including those addressing the social determinants of health.*
  - *Coroners, pathologists, and death certifiers should include all resulting documentation in their reports and reduce errors in the completion of death certificates.*
- *For Providers:*
  - *Improve the recognition of, reduce the stigma of, and increase support for women with mental health and substance use disorders.*
  - *Reduce incidents of preventable maternal morbidity and mortality in healthcare settings.*

- *Initiate contact with patients within three weeks from the end of their pregnancy.*
- *Adhere to standardized policies aimed at addressing preventable maternal morbidities.*
- *Increase connectivity to navigation programs that assist with resources, such as home visiting.*
- *Reduce errors when completing death certificates.*

➢ *For Patients/Families:*

- *Emphasize the importance of routine medical and psychological care.*
- *Reduce the risk of preventable injuries by always wearing a seatbelt and not riding in a vehicle with an impaired driver.*

Section 6: Introduction

Introduction

The Indiana Maternal Mortality Review Committee (MMRC) was formalized in July 2018 following passage of IC 16-50, which required the multidisciplinary review of pregnancy-associated deaths in Indiana and secured protections for the confidentiality of the process. The MMRC was developed with guidance from the Centers for Disease Control and Prevention (CDC) Division of Reproductive Health's Building U.S. Capacity to Review and Prevent Maternal Deaths program and is modeled after other well-established MMRCs in the United States. Coordination for the MMRC and related activities is under the purview of the Indiana Department of Health (IDOH) in the Division of Fatality Review and Prevention.

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

The purpose of this report is to describe the state of maternal mortality in Indiana. Concrete recommendations about ways to prevent future negative outcomes for Indiana women were derived from the review of pregnancy-associated deaths that occurred among Indiana women during 2019. This includes an in-depth look at some of the social factors associated with poor maternal health outcomes and how data can inform effective actions toward improvement. When possible, data and findings from both 2018 and 2019 pregnancy-associated deaths are combined and presented.

Section 7: Background

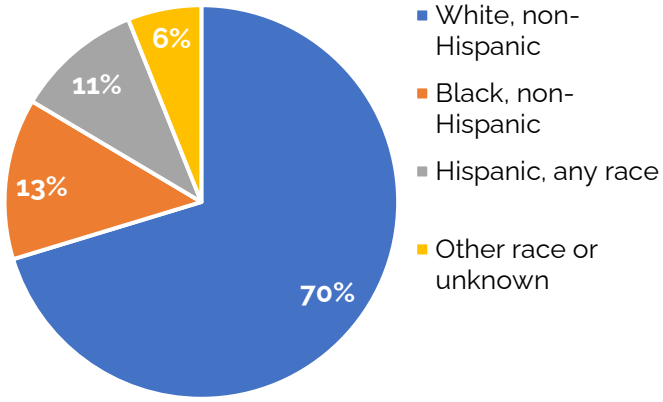
Background

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 6.7 million residents, including over 2.1 million women between the ages of 10 and 59 years. More than 80,000 live births occurred to Indiana women in 2019.

Figure 1: Indiana Live Births by Race of the Mother

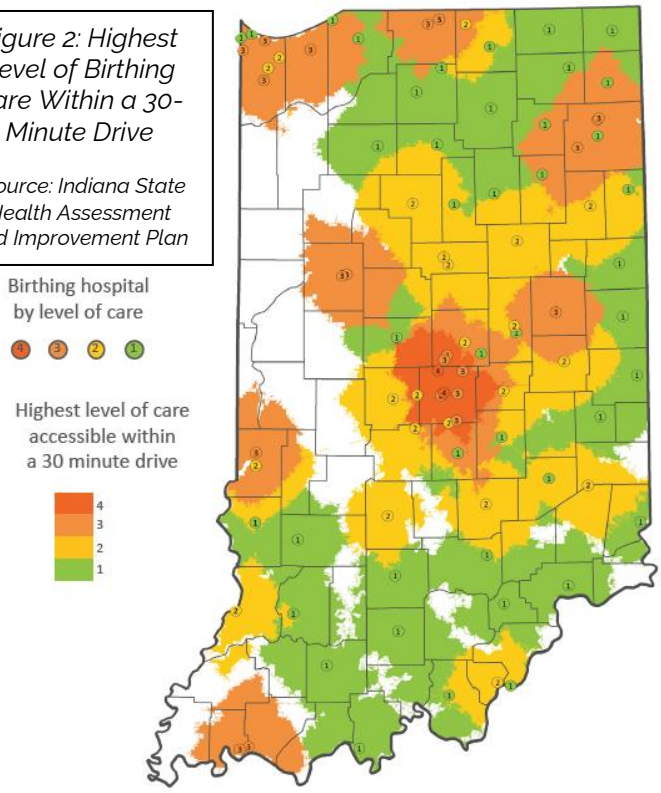
Indiana Department of Health, Vital Records (2019)



Among Indiana live births in 2019, the majority (70%) were to White, non-Hispanic women, followed by births to Black, non-Hispanic women (13%) and to Hispanic women of any race (11%) (Figure 1).

Figure 2: Highest Level of Birthing Care Within a 30-Minute Drive

*Source: Indiana State Health Assessment and Improvement Plan



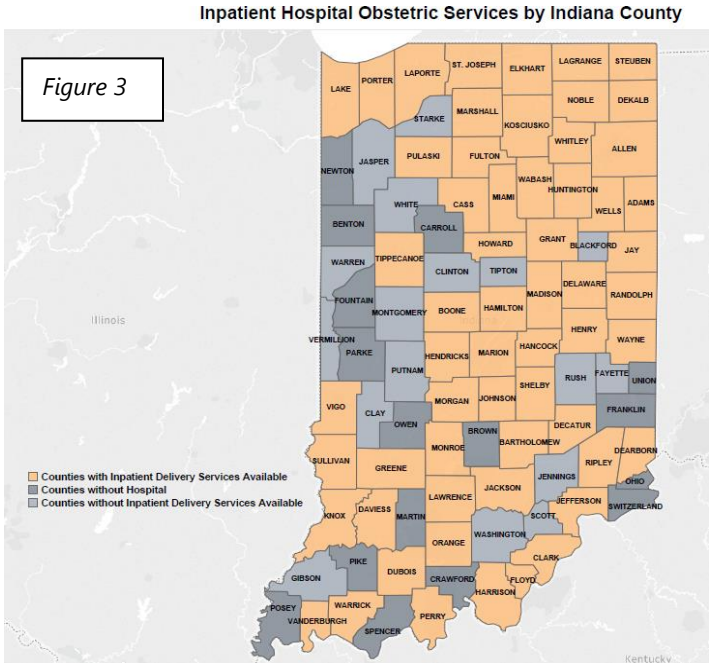
The other 6% of live births were to mothers of another race (including women identifying as Asian, Pacific Islander, American-Indian or Alaska Native and those who indicated multiple races on the birth certificate) or where race and ethnicity was unknown.

Indiana has geographic considerations that influence the availability of healthcare resources and impact health outcomes. The IDOH Division of Maternal and Child Health has mapped out distances from residence to birthing facilities (Figure 2), graphically displaying the geographic challenges associated with

accessing the appropriate level of obstetric care for some Indiana women.

In 2018, in cooperation with the Indiana Hospital Association, IDOH identified 34 counties in Indiana that lack a hospital with inpatient delivery services (Figure 3). Current initiatives, including My Healthy Baby, aim to connect pregnant women in these low-resource regions with prenatal and obstetric care.

Figure 3



Section 7: Background

MATERNAL MORTALITY REVIEW IN INDIANA

Maternal health is defined as the health of women during pregnancy, during childbirth, and in the postpartum period. Typically, women have more interaction with and access to healthcare services during pregnancy. It provides an opportunity to identify, treat, and manage conditions to improve a woman's overall health. New and expectant mothers are often keenly focused on the health of their infant, but healthcare services can and should equally emphasize the woman's health during this high-risk period.

Broadly defined, maternal mortality is the death of a woman during pregnancy or close in time to pregnancy. These deaths are considered sentinel events that highlight critical issues in women's health and healthcare systems. Thus, studying cases of maternal mortality and analyzing these data are essential to learning and identifying opportunities for improvement.

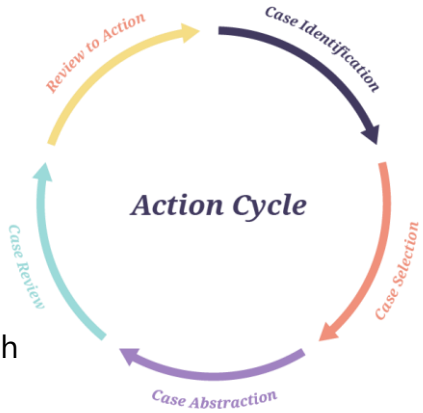
In July 2018, IC 16-50 was enacted and required IDOH to coordinate a multidisciplinary MMRC whose goal is to determine risk and protective factors contributing to pregnancy-associated deaths, including pregnancy-related deaths. Resulting data is used to identify interventions aimed at improving systems of care and preventing future maternal morbidity and mortality in Indiana. Improvements to IC 16-50 were enacted in 2021. Based on the review of the 2018 cohort of pregnancy-associated deaths, the Indiana MMRC noted the high incidences of substance use and mental health disorders as contributing factors to Indiana maternal mortality. The updated legislative language allows for easier access to mental health records for maternal mortality review. Adding the experiences of the women in the mental health and substance use treatment systems will provide the Indiana MMRC with a more robust narrative and allow more targeted recommendations.

Establishing an MMRC has been encouraged as a feasible strategy to reduce pregnancy-associated deaths, but initial attempts to conduct effective reviews in Indiana were impeded by inconsistencies in reporting and death classification practices, lack of collaboration between stakeholders, and other challenges. In 2019, the IDOH Division of Fatality Review and Prevention 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.

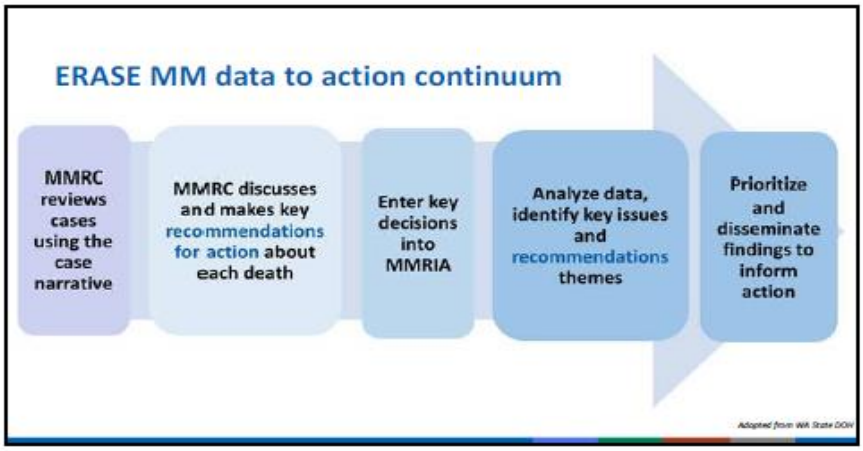
Section 7: Background

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, and policy makers; and
- Implementation of data-driven recommendations, such as evidence-based practices, screenings, and patient education by providers.



The CDC provided 25 funded jurisdictions a performance measurement framework in December 2020 to monitor achievement of core ERASE MM strategies. successes of and barriers to meeting the goals outlined above and answer the question, "How are we doing on the data to action continuum?"

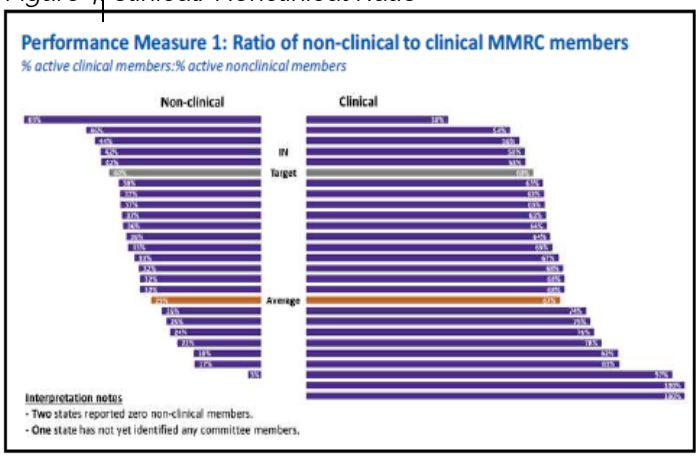


Indiana's program has consistently met CDC's suggested targets on ERASE MM priority performance measures and has stood out as a leader among national peers.

One critical need for all MMRCs is to maintain an appropriate multidisciplinary committee. For the Indiana MMRC, this means not only ensuring representation from geographic areas of the state, but also making certain the appropriate professional expertise is available for all reviews. The CDC monitors MMRCs on the ratio of nonclinical to clinical membership. For the first funded year, the Indiana MMR program met this APR (Figure 4).

Section 7: Background

Figure 4: Clinical/Nonclinical Ratio



The Indiana MMRC membership is continually reviewed by the Indiana MMR Program and the MMRC chairperson to ensure appropriate professional disciplines are represented, per IC 16-50 and the CDC's requirements. With mental health and substance use disorders revealed as a significant contributor to many 2018 pregnancy-associated deaths, social services, law enforcement, pharmacy, and experts in perinatal mood disorders, treatment, and recovery have been engaged and asked to provide insights to the landscape of behavioral health services in Indiana. The knowledge base of the medical clinicians contributes to the understanding of health conditions and their associated care, as they directly relate to maternal morbidities and mortalities. But those with nonclinical expertise benefit the committee in their abilities to define and identify social determinants of health and the impacts of substance use and mental health disorders.

The Indiana MMR program and IDOH continue to work closely with the project team at the CDC so that Indiana continues to meet the expectation of a high-quality MMRC, resulting in the most accurate maternal mortality data available.

The work of the Indiana MMRC aligns with Indiana's health improvement priorities. Improving birth outcomes and addressing the opioid epidemic are among the goals listed for the five priority topics in Indiana's 2018-2021 State Health Improvement Plan. In addition, Governor Eric J. Holcomb's agenda has included addressing substance use disorder, infant mortality, and maternal health. By ensuring access to treatment for substance use disorder and targeting interventions that strive to reduce the infant mortality rate in Indiana, cross-cutting measures are achieved in maternal health, as well.

Section 7: Background

Maternal Mortality

Maternal mortality is the death of a woman while pregnant or close in time to pregnancy. Maternal mortality serves as an indicator of the quality of health and healthcare in a community or state. Different categories of maternal mortality are used to track and analyze these deaths. Traditionally, some organizations, such as the World Health Organization, have measured only deaths that occur within 42 days of pregnancy to study maternal mortality. However, many groups, including the CDC, have begun using a broader definition, extending further into the postpartum period to capture longer-term effects of pregnancy and childbirth on women's health and survival.

As an ERASE MM state, Indiana uses the following standard definitions defined by the CDC:

Pregnancy-Associated Death = The death of a woman while pregnant or **within one year** of the end of a pregnancy, regardless of the cause.

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

Pregnancy-Related Death = The death of a woman 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.

Pregnancy-associated deaths, therefore, represent all women who die within one year of pregnancy. Pregnancy-associated deaths encompass three key subcategories: those related to pregnancy, those unrelated to pregnancy, and those for which the MMRC could not determine relatedness. Tracking pregnancy-associated deaths overall, as well as pregnancy-related deaths, is important for understanding maternal mortality.

These varying definitions can be a source of global debate and confusion. Throughout this report, deaths through one year of the end of pregnancy are included and referred to specifically as pregnancy-associated or pregnancy-related where

PREGNANCY-**ASSOCIATED** DEATH

The death of a woman while pregnant or within one year of the end of a pregnancy, regardless of cause.

PREGNANCY-**RELATED** DEATH

The death of a woman 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.

appropriate. In addition, the word "maternal" is used generally to refer to women during pregnancy, childbirth, and the postpartum periods. Use of this broad definition ensures that causes leading to maternal death beyond 42 days postpartum are neither missed nor neglected.

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 deaths.

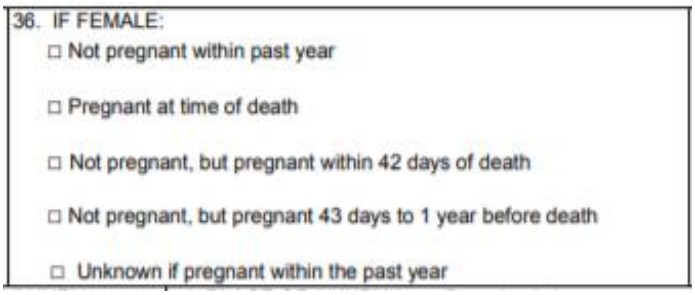
Indiana uses multiple methods simultaneously to ensure pregnancy-associated deaths are accurately identified and counted each year.

Figure 5: OB Diagnoses Coding with ICD-10

O00–O08. Pregnancy with abortive outcome
O09, Supervision of high-risk pregnancy
O10–O16. Edema, proteinuria, and hypertensive disorders in pregnancy, childbirth, and the puerperium
O20–O29, Other maternal disorders predominantly related to pregnancy
O30–O48, Maternal care related to the fetus and amniotic cavity and possible delivery problems
O60–O77, Complications of labor and delivery
O80-O82. Encounter for delivery
O85–O92, Complications predominantly related to the puerperium
O94-O95, O96, O98–O9A, Other obstetricconditions, not elsewhere classified
A34. Obstetrical tetanus

Traditionally, death certificates were the only way maternal deaths were counted, and they are still used as a first step for identifying deaths for MMRC. There is a checkbox on the death certificate that indicates whether a woman was pregnant at the time of death or pregnant within the last year. Additionally, there may be ICD-10 codes among the coded causes of death that indicate the death was pregnancy-associated ("O codes") (Figure 5). After these women are identified, the abstraction staff obtain any records necessary to confirm pregnancy status. These may include hospital records from death, birth, or prenatal care and autopsy reports, and even through communication with coroners. This process is critical to eliminate any false positives.

Section 7: Background


36. IF FEMALE:
- ☐ Not pregnant within past year
- ☐ Pregnant at time of death
- ☐ Not pregnant, but pregnant within 42 days of death
- ☐ Not pregnant, but pregnant 43 days to 1 year before death
- ☐ Unknown if pregnant within the past year

Another method for identifying pregnancy-associated deaths is to match women's death certificates to birth and fetal death records. Death certificates for any woman age 10 to 60 years are linked with vital records for all births and fetal deaths that occurred during the previous two years. Matching variables include mother's last name, mother's maiden name, mother's birthdate, and mother's Social Security number. Examining two complete years of records is essential to account for a full year before the woman's death. If a birth or fetal death record is discovered during the 12-month period prior to a woman's death, her death is flagged as pregnancy-associated and marked for abstraction and review. Without this matching process, Indiana would miss a significant number of pregnancy-associated deaths, as the death records did not include appropriate completion of the pregnancy checkbox.

In addition to the state public health data systems, pregnancy-associated deaths in Indiana are detected through multiple other means. The Indiana Hospital Association provides the Indiana MMRC with a list of all known pregnancy-associated deaths. For 2019, this method helped verify the final list of confirmed pregnancy-associated deaths.

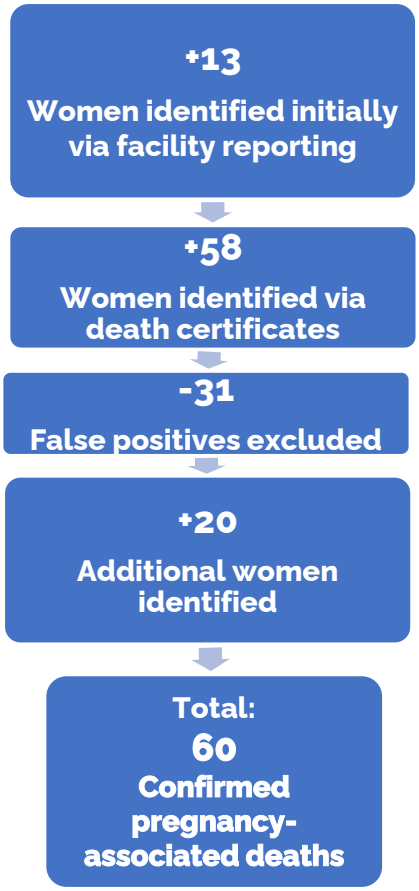
All Indiana hospitals are required by IC 16-50 to report any known pregnancy-associated deaths to IDOH, and a communication system exists for this purpose (Appendix A). Thirteen pregnancy-associated deaths that occurred in 2019 were reported by facilities for maternal mortality review.

Lastly, IDOH completes regular searches of major newspapers and social media outlets for articles or obituaries that indicate the death of a woman while pregnant or within one year of pregnancy. For example, if a woman's obituary mentions a surviving child who is less than one year old, she is flagged as a potential pregnancy-associated death for MMRC review.

Section 7: Background

2019 CASE IDENTIFICATION PROCESS (FIGURE 6)

Figure 6: 2019 Case Identification



1. Direct facility reporting to the Indiana MMR staff initially identified 13 deaths. All 13 of these women also had death certificates that were marked to indicate they had been pregnant or recently pregnant at the time of their death.
2. Subsequent case identification used the 2019 death certificates of women ages 10-60 years with a pregnancy checkbox on the death certificate indicating the woman was pregnant at the time of death or within one year of death. Also included were women with causes of death coded with ICD-10 codes starting with "O," as well as A34. Through this process an additional 58 women were identified.
3. The abstraction team acquired medical records and autopsies, spoke with death certifiers to confirm pregnancy status, and excluded 31 falsely identified cases.
4. The Indiana MMR program matched all 2019 women's deaths in Indiana (ages 10-60 years) to all birth and fetal death records in Indiana between 2018 and 2019 to identify women with a recent birth or fetal death (within year of death). An additional 20 pregnancy-associated deaths (not correctly marked on their death certificates) were identified.
5. The Indiana MMR epidemiologist verified the established list via a SAS matching program made together with IDOH's Epidemiology Resource Center Data Analysis team to validate the case identification process and confirm the number of positive identified cases. The list of deaths was also confirmed with the Indiana Hospital Association's known deaths.

Section 7: Background

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, social service records, law enforcement records) to support comprehensive review 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.

IDOH contacts hospitals and health centers where the women received care to request any relevant medical records, with specific focus on records from the time of the woman's most recent pregnancy to her death. This provides details about the woman's death and relevant medical history on the sentinel pregnancy. For instance, records are routinely requested from the hospital where the woman died, the hospital where she gave birth, and the physician's office or health center where she received prenatal care.

Often, as medical records are abstracted, additional care providers or referrals are detected within the charts. These supplemental records are also requested. The ability to compel all records required for death review is granted through IC 16-50, and hospitals and medical providers are encouraged to comply within 30 days of IDOH's requests.

When relevant, records are also obtained from the Indiana National Violent Death Reporting System (housed within the IDOH Division of Trauma and Injury), local police departments, sheriffs' offices, Indiana Prescription Drug Monitoring Program (INSPECT), Indiana Department of Child Services, mental health providers, coroners' offices, Indiana Hospital Association discharge data, and social media. Research on family criminal histories is also conducted to better ascertain the impact of generational trauma on the outcomes of a woman's pregnancy and health. Other programming coordinated within the Division of Fatality Review and Prevention, including fetal-infant mortality review and suicide and overdose fatality review, are instrumental in the collection of circumstantial information about many pregnancy-associated deaths.

As the Indiana MMR program has honed the process of identifying, requesting, and gathering necessary records for a comprehensive review of pregnancy-associated deaths, challenges have been noted and are being addressed. The updates to IC 16-50 in 2021 were a direct result of the difficulties obtaining mental health and substance use disorder treatment information. Some providers have been willing and able to share these records,

and the Indiana Division of Mental Health and Addiction (DMHA) has partnered to seek solutions for the current gaps. Unfortunately, for the 2019 pregnancy-associated deaths, the Indiana MMRC noted many missing records and data points the records consultants and abstraction team were simply unable to access. With the addition of language allowing IDOH to compel the mental health records through legislation, it is anticipated a more comprehensive fatality review of the 2020 pregnancy-associated death cohort will be facilitated.

Another significant challenge was attempting to obtain records from outside of Indiana. Several women from the 2019 cohort either received care in other states or died outside of Indiana. As the Indiana MMRC is mandated to review all deaths to Indiana residents, despite their place of death, accessing records from other jurisdictions is imperative. Among the avenues pursued to do this were 1) reaching out to MMRC coordinators in those states to request their assistance in facilitating records gathering; 2) directly approaching the agency from which records were required; and 3) coordinating with other states' vital records divisions to facilitate access and provide basic demographic information from birth and death records. In some instances, these strategies were successful, and the Indiana MMR program was able to procure the information requested. But as IC 16-50 does not compel records from outside Indiana, agencies from other states are not obligated to comply. The CDC is aware of this, as many other states have expressed similar challenges. The CDC is actively pursuing sustainable solutions, but until a plan is finalized, the Indiana MMR program may continue to face difficulty accessing records from other states.

A critical goal of the Indiana MMRC is reviewing the most complete set of records and information about the woman, her family, her experience, environmental and social factors, and care and assistance needed and obtained from medical and social services providers. As such, records from agencies such as the Women, Infants and Children (WIC) program and Indiana Medicaid claims data have been identified as necessary additions to the case narratives. The Division of Fatality Review and Prevention has been working toward implementing memorandums of understanding (MOUs) with each of these entities to allow for a more seamless information exchange. Both relationships come highly recommended by the CDC and can benefit the Indiana MMR program with more complete case narratives and benefit WIC and Medicaid with potential recommendations for program or policy improvements to better serve Indiana women and families. The MOUs with each are expected to be fully executed within the 2021 calendar year.

Section 7: Background

Once all available records are obtained for MMRC review, the abstraction staff examine and abstract all relevant information. They then present the anonymous case narrative and timeline to the full 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 the 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 woman's death. The factors may be related to the patient, healthcare providers,

IMPLEMENTING FAMILY INTERVIEWS IN MATERNAL MORTALITY REVIEW

In September 2020, the Division of Fatality Review and Prevention awarded Jack Turman, Jr., Ph.D. (Professor of Social and Behavioral Sciences, Indiana University (IU) Richard M. Fairbanks School of Public Health, Professor of Pediatrics, Indiana School of Medicine), funding to facilitate the process of creating a family narrative collection process to assist the Indiana MMRC in better understanding factors that contribute to maternal mortality. Dr. Turman brings many years of experience in a) community-based maternal and child health research and outreach, and b) facilitating the Marion County Fetal and Infant Mortality Review Community Action Team. Joining Dr. Turman in this funding is his research project manager, who oversees the research process for this project.

Dr. Turman's expertise in improving health outcomes through community input and targeted interventions made him uniquely qualified to guide the beginning of the family interview process in Indiana. The Grassroots Maternal and Child Health Leadership Training Initiative Project, which Dr. Turman developed, trains and mentors women to help their neighborhoods improve pregnancy and infant development outcomes. The grassroots leaders become proficient in community health promotion, causes and consequences of adverse birth outcomes, and surveying community needs regarding pregnancy and infant health. These trusted members of their neighborhoods act as agents for change for communicating with the women and families most at risk for poor birth or health outcomes (https://fsph.iupui.edu/research-centers/centers/cheer/grassroots/index.html).

A team was assembled to meet bi-weekly to develop the process and materials to support a high-quality, compassionate, and ethical family narrative collection process. In addition to Dr. Turman and his project manager, the team includes the Indiana MMR program and a grassroots leader. The team mapped out a timeline to create all the documents, receive approval by the IU Institutional Review Board (IRB), practice the recruitment and interview process, and complete the first interview by July 1, 2021.

The steps taken to create the family narrative collection process include:

1. Guided by the CDC's Informant Interview Guide for MMRCs, the team adapted materials to be created for Indiana's process. These documents included an informed consent, an introduction letter for potential participants, a pre-interview telephone script, and the interview script.

2. The team members worked together to create the above-mentioned documents, using information from the CDC's Informant Interview Guide for MMRCs, and receiving guidance and feedback from MMRC leaders in Georgia and Mississippi already conducting this valuable work.

3. When the document drafts were completed, each team member distributed it through their network of contacts to get feedback on the content and delivery of the documents. This was done to make certain this sensitive topic was being approached in a kind and understandable manner. Thirty-eight individuals (males, females, different ages, different occupations, different socioeconomic levels) provided the team with constructive feedback to improve the documents. Changes were incorporated and documents were prepared for submission to the IU IRB for approval.

4. Branding was graciously donated for the team's documents by Angelica Guzman. It was critical to create a more welcoming appearance for the reader. The final documents can be found in Appendix B.

5. Each team member completed CITI Training for Human Subjects Research so that they could be included in the IRB protocol associated with this work.

6. Teams of interviewers (one nurse and the grassroots MCH leader) began practicing each step of the family narrative collection process, from making the initial phone call to conducting the interview. These practice sessions were often coached and mentored by Dr. Turman's project manager. The interviewers began by practicing the process on each other and moved to practice the process with community members, making sure to include men in the process. The interviewers were provided with a digital recorder to record each interview.

7. Dr. Turman's project manager created the IRB submission package and worked alongside the IRB staff to address their concerns until the entire study received IRB approval. The team members were very helpful in this process, providing feedback regarding inclusion/exclusion criteria and data storage in secure servers at IDOH.

8. For analysis purposes, a secure, shared Microsoft OneDrive file was created that will contain each interview and associated analysis. nVivo transcription software will be used to transcribe each interview, and the product will be uploaded into nVivo analysis software for thematic analysis. Dr. Turman's team will oversee the analysis of the interviews and the aggregation of data in collaboration with the IDOH MCH staff.

Dr. Turman's project manager created an analysis template in nVivo software to extract themes from each interview. Interview results will be aggregated for sharing with the Indiana MMRC. These data will be used in conjunction with extracted medical records data to better understand the root and medical causes of Indiana maternal mortality.

9. The Indiana MMR program used vital records to identify next of kin, as well as social work and bereavement notes. From these, introductory letters were mailed to invite persons who lost a family member to pregnancy-associated death to participate in the family narrative collection process. Within the initial month of sending out invitations to participate, three families agreed to take part. One interview was completed and analyzed; another interview was completed with pending analysis; and third interview has been scheduled.

10. In respect of the IRB protocol, sharing points from the interview is not allowed, so thematic aggregate data across interviews will be provided.

Moving forward, themes across interviews will be complied and used to inform Indiana MMRC members. The creation of family narratives will help inform Indiana's work to significantly improve the experience of pregnant and post-partum women, and ultimately reduce the maternal mortality rate.

MMRIA SYSTEM

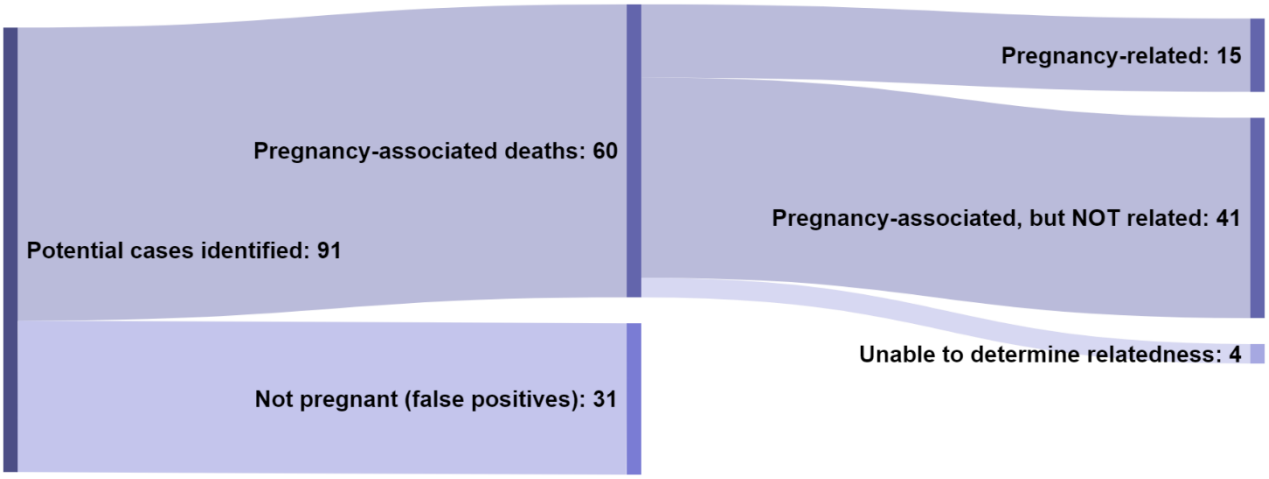
For its data analysis processes, the Indiana MMRC uses the Maternal Mortality Review Information Application (MMRIA, or "Maria"). MMRIA is a CDC-created and -hosted data entry system that serves a twofold purpose: 1) it supports the abstraction of medical and social records for case review; and 2) it provides standardized data for analysis and surveillance through the MMRIA Committee Decisions Form (v21) (Appendix B).

By using the MMRIA Committee Decisions Form and case abstraction data entry, the Indiana MMRC can function with a common language, critical to collaboration with and comparison to other MMRCs. Case definitions and definitions of other terms analyzed in this report come directly from their descriptions in the MMRIA Committee Decisions Form.

Section 8: MMRC Findings

2019 Indiana MMRC Findings

The Indiana MMRC identified 60 pregnancy-associated deaths among Indiana women in 2019 and convened seven times between October 2020 and May 2021 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.



The committee determined 15 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 cardiomyopathy, ruptured ectopic pregnancy, and hemorrhage.

Another 41 deaths were determined to be pregnancy-associated, but NOT related. For the remaining four deaths, the Indiana MMRC was unable to conclusively determine relatedness from the available records and case narrative.

Using the pregnancy-associated deaths identified and the Indiana MMRC's decisions on relatedness, pregnancy-associated and pregnancy-related mortality ratios were calculated for 2019.

Whenever possible, the data presented here will be both for the cohort of deaths that occurred in 2019 and the overall two-year analysis for 2018-2019. Single-year data can show how numbers and rates may be changing year to year, but the multi-year data provides a better idea of average rates or numbers and increases the ability to analyze contributing factors more accurately, as single-year data often includes very small numbers.

Section 8: MMRC Findings

The pregnancy-associated mortality ratio in 2019 was 74.2 per 100,000 live births. This is the overall ratio of death to live births* to Indiana women ages 10-60 who died either during or within one year of pregnancy *due to any cause*.

Maternal Mortality Ratios for 2019

- **74.2 per 100,000 live births: *pregnancy-associated mortality ratio*** in Indiana in 2019
- **18.6 per 100,000 live births: *pregnancy-related mortality ratio*** in Indiana in 2019

The pregnancy-related mortality ratio in 2019 was 18.6 per 100,000 live births*. This is the specific ratio of death to live births to Indiana women ages 10-60 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.

The overall pregnancy-associated mortality ratio decreased slightly from 77.2 in 2018 to 74.2 in 2019 (Figure 7), while the pregnancy-related mortality ratio increased from 12.2 in 2018 to 18.6 in 2019 (Figure 8). These changes reflect the overall fewer number of deaths in 2019 to women within one year of pregnancy or childbirth due to any cause. However, a larger number and proportion of those deaths were determined to be pregnancy-related.

Figure 7: Pregnancy-associated mortality ratio in Indiana, per 100,000 live births
Indiana MMRC 2018-19

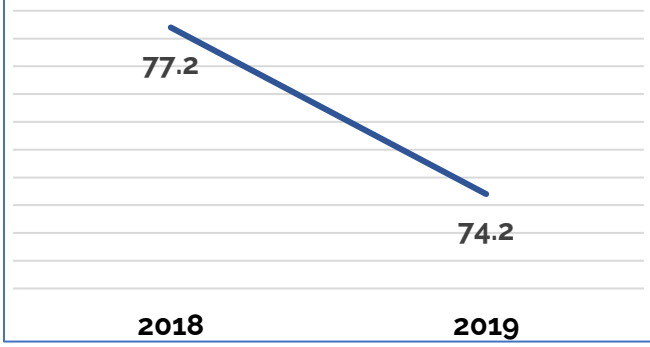
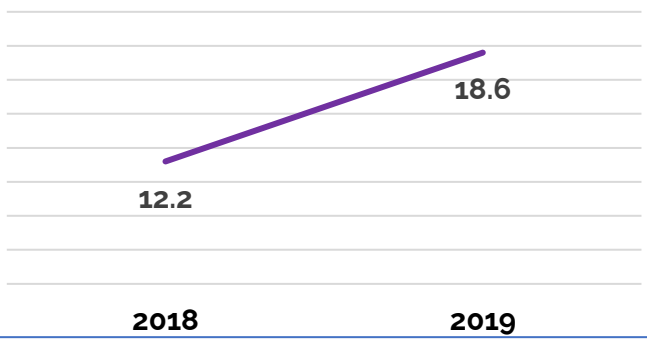


Figure 8: Pregnancy-related mortality ratio in Indiana,per 100,000 live births
Indiana MMRC 2018-19



While the differences noted are not significant with only two years of data, the Indiana MMR program will continue to evaluate the mortality ratios over time to identify trends.

**Live births to all Indiana women*

Section 8: MMRC Findings

The average two-year mortality ratio reflects pregnancy-associated and pregnancy-related deaths that occurred in both 2018 and 2019 and is a best estimate of the average rate of deaths per year.

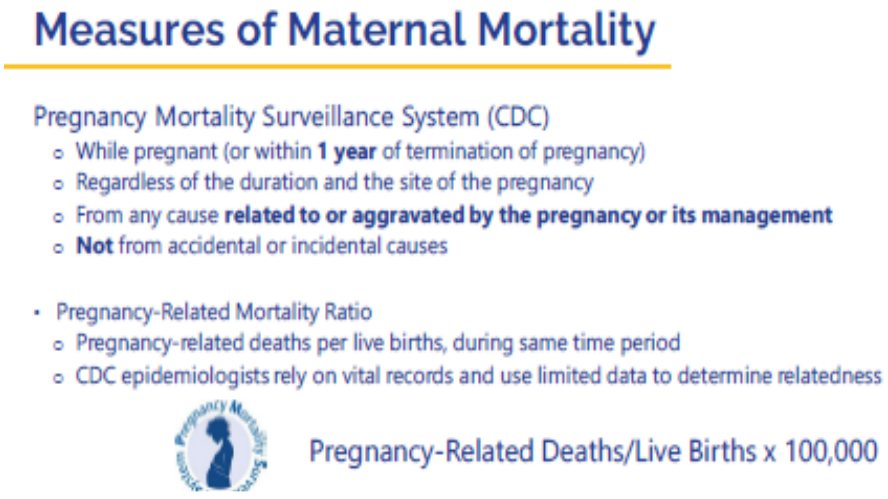
Average Two-Year Maternal Mortality Ratios (2018-2019)

- **75.7 per 100,000 live births: *pregnancy-associated mortality ratio*** in Indiana in 2018-2019
- **15.4 per 100,000 live births: *pregnancy-related mortality ratio*** in Indiana in 2018-2019

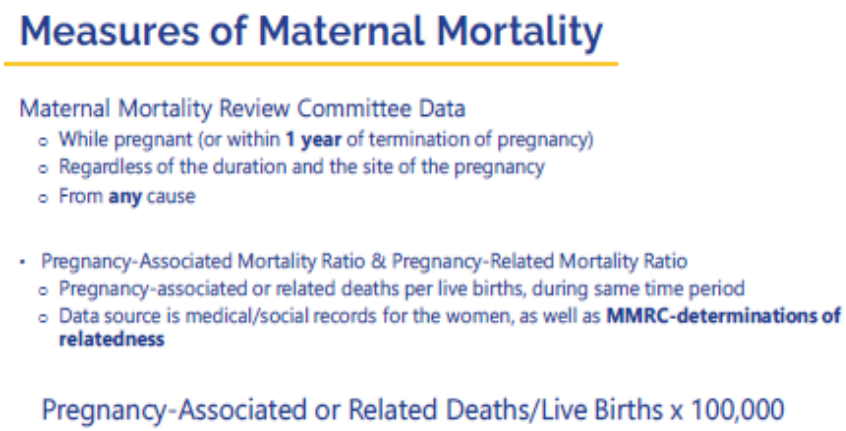
COMPARISON TO PREVIOUS MATERNAL MORTALITY RATES OR OTHER SOURCES

Historically, Indiana and other states have used maternal mortality rates determined by the United States National Vital Statistics System (NVSS) at the National Center for Health Statistics. These pregnancy-associated 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).

Like the MMRC process defined previously, PMSS data defines a pregnancy-related death as the death of any woman within one year of pregnancy or childbirth and links to birth and fetal death records. However, unless specifically requested by states, supplemental confirming documents (such as medical records) are not consulted to confirm pregnancy status.



Section 8: MMRC Findings



Through the Indiana MMRC case identification, linking, and abstracting processes, 31 false positives were discovered among the list provided through NVSS and PMSS for 2019. This means these identified pregnancy-associated deaths were not actually pregnant or recently pregnant. Additionally, facility reporting of pregnancy-associated deaths and the birth and death records matching process uncovered 20 pregnancy-associated deaths not included in the PMSS data. These were women who had died while pregnant or recently pregnant who were not captured in the NVSS or PMSS data or rates.

As a result, the maternal deaths traditionally represented in nationally presented data differ greatly from and **cannot be compared** to those reviewed by the Indiana MMRC. The calculated pregnancy-associated and pregnancy-related mortality ratios 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.

This distinction will present challenges when attempting to compare Indiana's maternal mortality ratios to the national average and those of other states. Currently, 43 states (and two cities) have MMRCs that identify, review, and analyze maternal deaths. Each has individually determined which subsets of maternal deaths they will identify and review. Some states report only on those deaths determined to be pregnancy-related, while other states report on all pregnancy-associated deaths. As such, there is currently no national MMRC dataset to determine a comparable national pregnancy-associated or pregnancy-related mortality ratio.

Comparisons of pregnancy-associated and pregnancy–related ratios can be made on a case-by-case basis. However, special care must be taken to ensure that only MMRC-reported rates or ratios are compared, and then only to correlating mortality ratios. For example, Indiana can compare its MMRC-determined pregnancy-related ratios to those originating from other MMRCs that analyze their pregnancy-related deaths, assuming the years of review are the same. Alternatively, Indiana can compare pregnancy-associated ratios with MMRCs that review all pregnancy-associated deaths that occurred during the same year.

Section 8: MMRC Findings

The 2019 mortality ratios presented in this report can be used for comparisons to the previously reported 2018 mortality ratios (Indiana MMRC 2020 Annual Report). However, any rates or numbers determined in this report (2019, two-year average rates from 2018-2019) ***should not be used for comparisons*** to any rates based on PMSS or other data.

Section 8: MMRC Findings

2019 Pregnancy-Associated Deaths: Case Characteristics

Through the review of birth and death certificates, prenatal records, delivery records, mental health and social histories, and any other records available, the abstraction team was able to identify and report to the Indiana MMRC any primary characteristics for 2019 pregnancy-associated deaths. These included demographics, geography, and some other possible contributing factors to maternal mortality in Indiana.

Data in this report is descriptive in nature and meant to illustrate the characteristics of the 2019 cohort of pregnancy-associated deaths. Because of the relatively low number of deaths (n=60) and having only a subset of those that were pregnancy-related (n=15), categorizing will result in small numbers and unstable rates. Numbers under five may be suppressed to ensure confidentiality in some situations. Unstable rates – or those under 20 – may not be accurate for comparisons, and they will be noted below.

The Indiana MMRC has reviewed a total of 123 pregnancy-associated deaths that occurred in 2018 or 2019. Where small numbers prohibit further analysis or create unstable rates, this two-year cumulative data will be 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 rates.

Figure 9: Race/Ethnicity (2019)	N	%
White, non-Hispanic	46	76.7%
Black, non-Hispanic	8	13.3%
Hispanic, any race	4	6.7%
Other	2	3.3%

White non-Hispanic women accounted for a majority of deaths in 2019, with 46 deaths reviewed by the Indiana MMRC (76.7%), followed by Black non-Hispanic women with 8 deaths (13.3%), Hispanic women of any race with four deaths (6.7%), and two for those listed as 'unknown' or 'other' on records (3.3%) (Figure 9). Because the proportion of births differs by race and ethnicity in Indiana, comparisons must be between mortality ratios. Figure 10 shows there appears to be some differences in the rate of death by race and ethnicity, with White, non-Hispanic women experiencing the highest rate of death and Hispanic women and those in the 'other' category experiencing the lowest in 2019.

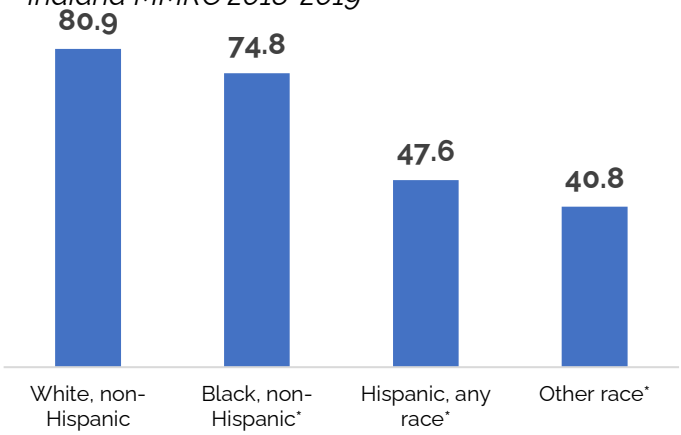
Section 8: MMRC Findings

The race-specific ratios differ between 2018 and 2019, with 2018 data showing about a 20% higher mortality ratio among Black, non-Hispanic women compared to White, non-Hispanic women, and 2019 data finding a slightly higher mortality ratio for White, non-Hispanic women. This large difference is likely due to ratios that are considered unstable because of small numbers in the one-year data. Because of small numbers and variations from year to year, disparity is best assessed using multiple years of data.

The average mortality ratios using the data from both years of review collected so far show slight disparity with Black, non-Hispanic women experiencing 88.9 pregnancy-associated deaths per 100,000 live births, compared to 83.5 for White, non-Hispanic women. The ratios for Hispanic women and women of other races are much lower (Figure 11). However, even these two-year ratios are still unstable for all but White, non-Hispanic women, so these ratios will need to be reevaluated when more years of review data are available.

Figure 10: Ratio of pregnancy-associated deaths by race and ethnicity, per 100,000 live births

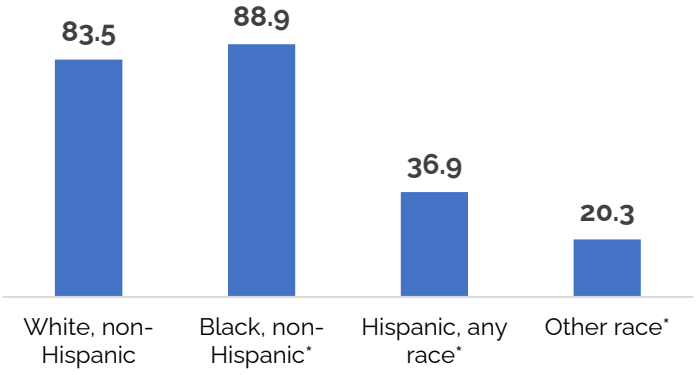
Indiana MMRC 2018-2019



*The rates above are considered unstable because they are based on small numbers. Comparisons using these rates may not represent long-term differences. As the Indiana MMRC continues to collect additional years of data, the stability of rates will improve.

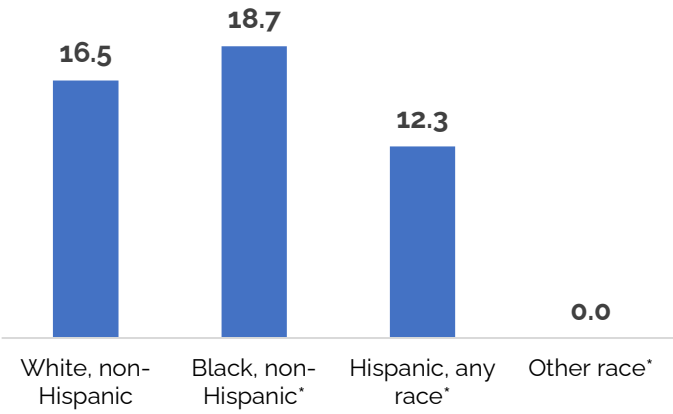
Figure 11: Average two-year ratio of pregnancy-associated deaths by race and ethnicity, per 100,000 live births

Indiana MMRC 2018-2019



*The rates above are considered unstable because they are based on small numbers. Comparisons using these rates may not represent long-term differences. As the Indiana MMRC continues to collect additional years of data, the stability of rates will improve.

Figure 12: Average two-year ratio of *pregnancy-related* deaths by race and ethnicity, per 100,000 live births
Indiana MMRC 2018-2019



*The rates above are considered unstable because they are based on small numbers. Comparisons using these rates may not represent long-term differences. As the Indiana MMRC continues to collect additional years of data, the stability of rates will improve.

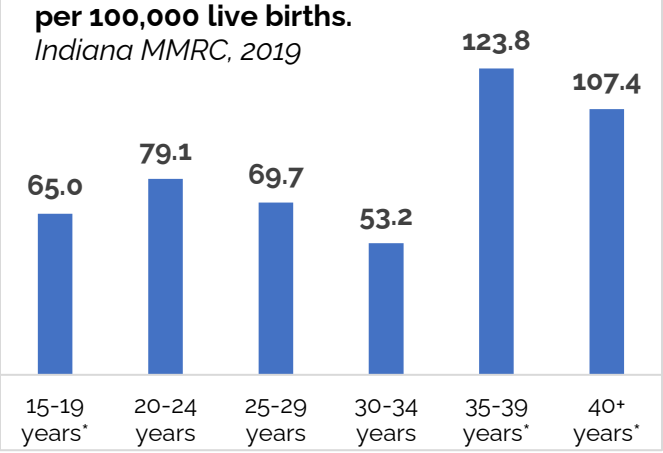
Figure 12 shows the average two-year ratio of just *pregnancy-related* deaths by race. Of the deaths that have been determined to be pregnancy-related by the committee in the two years of review (n=25), 76% have been White, non-Hispanic women, followed by 16% Black, non-Hispanic women, and 8% Hispanic women of any race. However, Black, non-Hispanic women had the highest ratio of pregnancy-related deaths to live births, about 13% higher than White, non-Hispanic women.

Only two-year data is being presented for the breakdown of pregnancy-related deaths as the total sample size is so small. Take caution when interpreting these ratios, as they are still based on quite small numbers and are all considered unstable ratios. These ratios may still fluctuate quite a bit from year to year, and the Indiana MMR program will continue to evaluate the average ratios as more review data is collected in the coming years.

In 2019, women 20-29 years of age accounted for 55% of all pregnancy-associated deaths and women 30-39 years of age accounted for another 36.6% (Figure 13). However, women in their 20s and 30s account 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 14.

Figure 13: Age at Death (2019)	N	%
15-19 years	3	5.0%
20-24 years	15	25.0%
25-29 years	18	30.0%
30-34 years	11	18.3%
35-39 years	11	18.3%
40+ years	2	3.3%

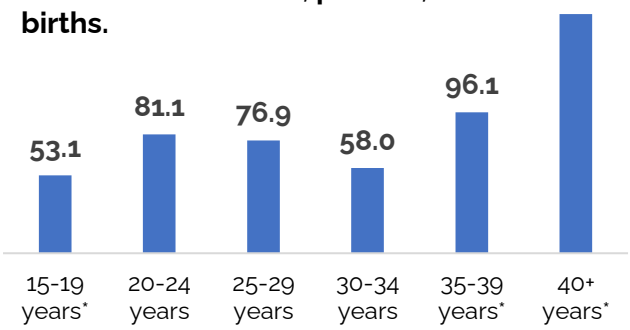
Figure 14: Ratio of pregnancy-associated deaths, by age of the mother at death, per 100,000 live births.
Indiana MMRC, 2019



*The rates above are considered unstable because they are based on small numbers. Comparisons using these rates may not represent long-term differences. As the Indiana MMRC continues to collect additional years of data, the stability of rates will improve.

The most notable difference between the age distributions of deaths in 2018 and 2019 data were the amount and ratio of deaths among women ages 35–39 years. Pregnancy-associated deaths in this age group accounted for 9.5% of deaths in 2018 and 18.3% in 2019. Figure 15 shows the average two-year ratios, with data collected from 2018 and 2019. These better represent the disparity in pregnancy-associated deaths by the age of the mother.

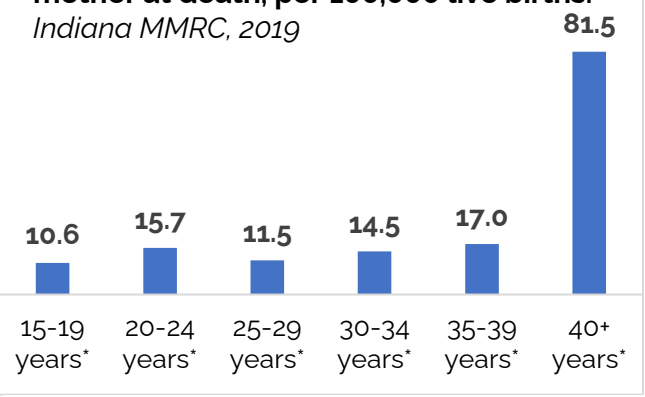
Figure 15: Average two-year ratio of pregnancy-associated deaths, by age of the mother at death, per 100,000 live births.



*The rates above are considered unstable because they are based on small numbers. Comparisons using these rates may not represent long-term differences. As the Indiana MMRC continues to collect additional years of data, the stability of rates will

Both the youngest and oldest age categories (15-19 years and 40 years+) accounted for the smallest percentage of deaths. However, the ratio of deaths to births among women in these age groups differs. Between 2018 and 2019, teen women had the lowest ratio of pregnancy-associated deaths and were a little over 30% less likely to die within a year of pregnancy or childbirth than women in their 20s. Women over the age of 40 had the highest pregnancy-associated mortality ratio and were approximately twice as likely to die within a year of pregnancy or childbirth as were women in their 20s.

Figure 16: Average two-year ratio of *pregnancy-related* deaths, by age of the mother at death, per 100,000 live births.
Indiana MMRC, 2019



*The rates above are considered unstable because they are based on small numbers. Comparisons using these rates may not represent long-term differences. As the Indiana MMRC continues to collect additional years of data, the stability of rates will improve.

Figure 16 shows the average two-year ratio of just *pregnancy-related* deaths by age of the mother. Of the deaths the Indiana MMRC determined to be pregnancy-related in the last two years of review (n=25), women 40 years or older had much higher ratios of pregnancy-related deaths than any other age group.

Because the total sample size of pregnancy-related deaths is so small, only two-year data is being presented and caution is urged when interpreting the results. The ratios are all considered unstable and may continue to fluctuate widely in the coming years. However, the data collected to date seems to suggest higher risk of pregnancy-related death for women over 40 years of age. The Indiana MMR program will continue to evaluate this potential risk factor and the average ratios as more review data is collected.

Figure 17: Number of 2019 Pregnancy-Associated Deaths by Timing *(n=60)*
Indiana MMRC 2019

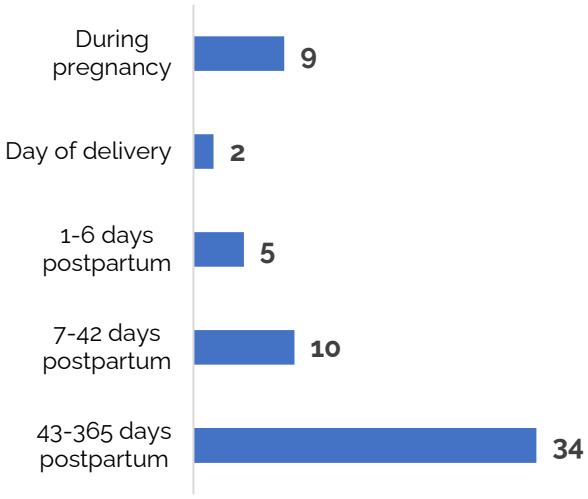
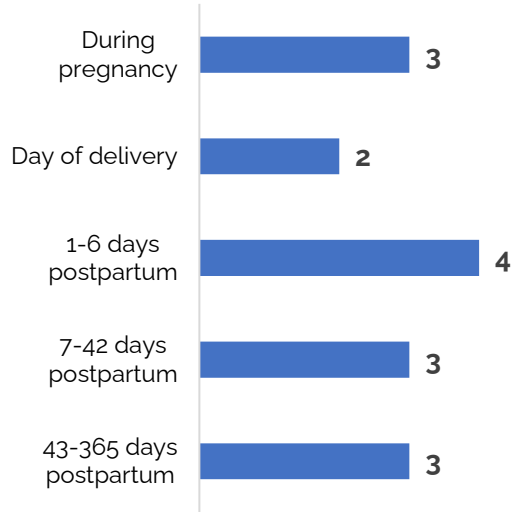


Figure 18: Timing of *Pregnancy-Related Deaths Only (n=15)*
Indiana MMRC 2019



Section 8: MMRC Findings

One of the main differences noted between overall pregnancy-associated deaths and the subset of pregnancy-related deaths in 2019 was the timing of death relative to pregnancy, as seen in Figures 17 and 18. While the majority of pregnancy-associated deaths (56.7%) occurred six weeks or more post-partum, 60% of the deaths determined to be pregnancy-related occurred either during pregnancy or within the first week 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 week following childbirth. However, their risk of dying from other causes, including injury or other medical conditions, is highest six or more weeks after childbirth.

Figure 19: Number of 2018-2019 Pregnancy-Associated Deaths by Timing *(n=123)*

Indiana MMRC 2018-2019

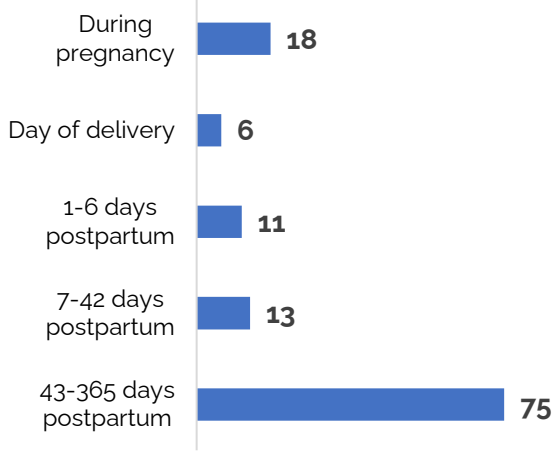
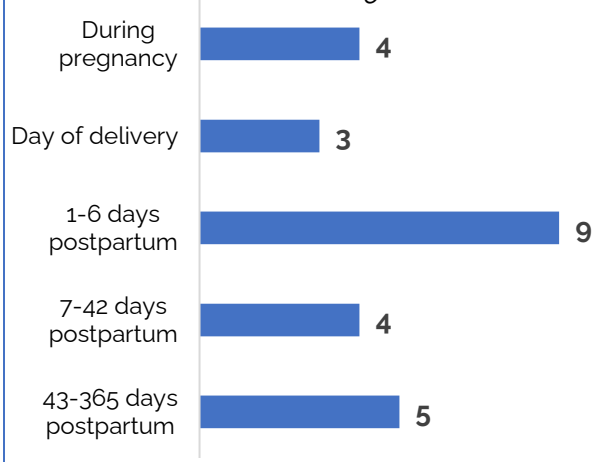


Figure 20: Number of 2018-2019 Pregnancy-Related Deaths by Timing *(n=25)*

Indiana MMRC 2018-2019

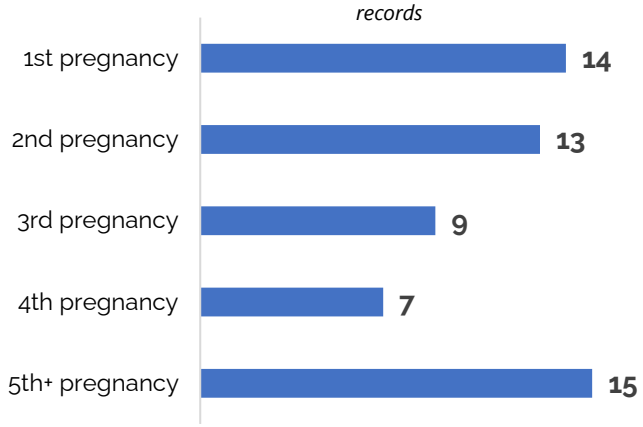


Similar trends are evident when examining the aggregate 2018-2019 Indiana MMRC data (Figures 19 and 20). While the majority of pregnancy-associated deaths are occurring from 43 days to one year postpartum, deaths that are directly related to pregnancy complications more often occurred either during pregnancy or within the first week of the end of the pregnancy. These findings suggest that prevention and maternal health initiatives should be targeted to the specific risks experienced by women during pregnancy and the postpartum period.

GRAVIDITY OF SENTINEL PREGNANCY

Gravidity indicates the number of times a woman has been pregnant, regardless of the outcome, and includes current pregnancies. The gravidity of the last pregnancy for the women whose deaths the Indiana MMRC reviewed were examined for trends. In the pregnancy-associated deaths from 2019, the majority of deaths occurred to women in their first or second pregnancy, with another significant portion occuring to women in their fifth pregnancy or later. However, women in their third or fourth pregnancies still made up over a quarter of the deaths (Figure 21).

Figure 21: Gravidity of Last Pregnancy
2019 Pregnancy-associated Deaths (n=58*)
**Gravidity could not be determined for two deaths due to limited records*



Looking at the overall distribution for 2018 and 2019 (Figure 22), the difference between gravidity is even less pronounced. There were about an equal number of pregnancy-associated deaths that occurred among women experiencing their first, second, or third pregnancy and some in their fourth or more. 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.

Figure 22: Gravidity of Last Pregnancy
All 2018-2019 Pregnancy-associated Deaths (n=121*)
**Gravidity could not be determined for two deaths that occurred in 2019 due to limited records*

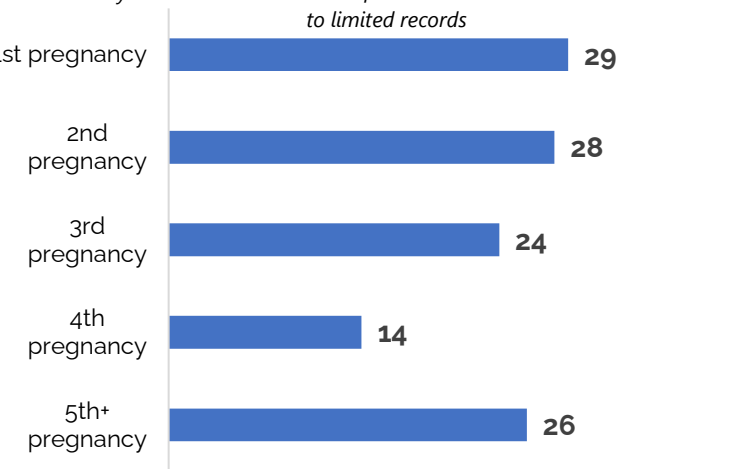
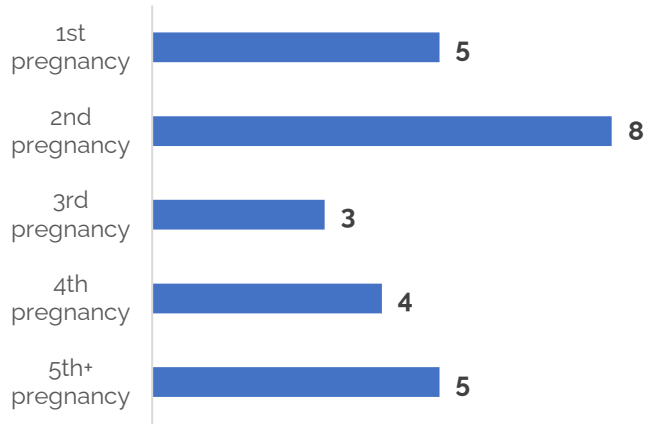


Figure 23: Gravidity of Last Pregnancy
All 2018-2019 *Pregnancy-Related* Deaths (n=25)



Examining the gravidity of the sentinel pregnancy for pregnancy-related deaths from 2018-2019 (Figure 23) suggests women in their first or second pregnancies have a higher risk of pregnancy-related death. This data is based on a small number of deaths, so it should be examined with caution. This trend will continue to be monitored in future years of MMRC work.

URBAN STATUS OF RESIDENCE

Figure 24: Urban status of last residence (2019)	N	%
Metropolitan	40	66.7%
Micropolitan	12	20.0%
Rural	4	6.7%
Unknown	4	6.7%

Figure 25: Urban status of last residence (2018-2019)	N	%
Metropolitan	85	69.1%
Micropolitan	21	17.1%
Rural	9	7.3%
Unknown	8	6.5%

Most pregnancy-associated deaths in 2019 (66.7%) occurred among women residing in metropolitan counties, followed by micropolitan counties (20.0%) and rural counties (6.7%) (Figure 24). 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. These definitions are standard, were set by the Office of Management and Budget, and are used to define counties by the U.S. Census Bureau.

The two-year data in Figure 25 show these geographic trends were consistent, with over two-thirds of deaths occurring to women in metropolitan counties. The smallest share of deaths occurred among women from rural counties. 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 pregnant women and new mothers. Examining maternal health outcomes related to identified "OB deserts" in Indiana (as determined by the Indiana Hospital Association) can show the impact of obstetric resource access for Hoosier women. Additionally, the IDOH Division of Maternal and Child Health Clinical Nurse Surveyor staff receives reports from hospitals describing the locations (by county) of obstetric providers (Figure 3).

Of all pregnancy-associated deaths in 2019, 15.0% of those women had last resided in an OB desert county. For *pregnancy-related deaths* in 2019 specifically, this percentage was slightly higher, with 20% of those deaths occurring to women living in OB desert counties. By comparison, in 2019, 9.4% of all births in Indiana occurred among women who resided in an OB desert county.

When aggregated with the Indiana MMRC review data from 2018, the two-year proportions are 13.0% for pregnancy-associated deaths and 16.0% for pregnancy-related deaths that occurred to women residing in OB desert counties, compared to the 9.4% of live births in Indiana occurring to women residing in those counties in 2018-2019. While these percentages are based on small numbers, this preliminary data shows that women residing in counties designated as OB deserts do 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 initiatives should consider women's access to obstetric care or other specialized care during their pregnancy in these counties. In the coming years, more data collected by the Indiana MMRC will reveal whether these trends remain true.

The address for the women's last residence, including the county, were accessed from vital records. However, it is important to note that a woman's place of residence at the time of her 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. Housing instability was a circumstance for a small number of pregnancy-associated deaths in 2019 (n=7, 11.7%) and was noted as affecting women's ability to regularly access care in each of those cases.

The ability to access regular prenatal or other medical care is not limited just by a woman's address or county or residence. Unstable housing can make it difficult to access and maintain care with one provider throughout a woman's care, 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.

SOCIOECONOMIC FACTORS

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 the individual or family income levels were not available for the women 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. When the Indiana MMR program obtains the MOUs for WIC client information and Medicaid claims data, even more detail about socioeconomic status will be available to the MMRC.

Figure 26: Education Level (2019)	N	%
Less than HS grad	15	25.0%
HS grad or GED	24	40.0%
Some college	11	18.3%
Associates or bachelor's	9	15.0%
Advanced degree	0	0.0%
Unknown	1	1.7%

Figure 27: Education Level (2018-2019)	N	%
Less than HS	23	18.7%
HS grad or GED	57	46.3%
Some college	22	17.9%
Associates or bachelor's	20	16.3%
Advanced degree	0	0.0%
Unknown	1	0.8%

Women with a high school degree/GED or less accounted for 65% of all pregnancy-associated deaths in 2019 (Figure 26). That proportion holds true when looking at the two-year data overall from 2018 and 2019, as well (Figure 27).

Census estimates (American Community Survey, 2019) found 44.6% of all women in Indiana aged 18-24 years and 42% of all Indiana women 25+ years had attained a high school degree/GED or less. This is not a direct comparison, as these are all women, not just

pregnant and post-partum women. However, these comparisons suggest differences in educational attainment exist for pregnancy-associated deaths in Indiana.

Employment status is another important social determinant of health, as it has significant influence not only on income level, but also on insurance access and eligibility. Women who were unemployed or listed as a homemaker accounted for 40% of all pregnancy-associated deaths in 2019. Women who had some occupation listed accounted for just over half (55%) of all pregnancy-associated deaths (Figure 28). The two-year data shows the same proportion of employed women (Figure 29).

Figure 28: Occupation at Death (2019)	N	%
Employed	33	55.0%
Unemployed or listed as homemaker	24	40.0%
Disabled	1	1.7%
Student	1	1.7%
Unknown	1	1.7%

Figure 29: Occupation at Death (2018-2019)	N	%
Employed	68	55.3%
Unemployed or listed as homemaker	45	36.6%
Disabled	2	1.6%
Student	3	2.4%
Unknown	5	4.1%

By comparison, Census estimates (American Community Survey, 2019) found that 67.9% of women ages 16-50 years who had given birth in the last 12 months were employed. This age range is not equivalent to that represented in the pregnancy-associated deaths reviewed by the Indiana MMRC but does show slightly higher levels of unemployment among the women who died of pregnancy-associated causes in 2019.

Additionally, while reviewing the deaths from 2019, the Indiana MMRC noted trends in the specific occupations of the women who had died. Using death certificate occupation and industry information, 15% of the women who died in 2019 were working in the food service industry and another 7% were working in healthcare. Death certificate data were retroactively pulled for the pregnancy-associated deaths from 2018 (n=63), and the food service and healthcare industries were also the most prevalent, each accounting for 15.9% of the women who died.

PRENATAL CARE

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 infant and themselves. Additionally, early prenatal care can identify high-risk pregnancies that may require a higher level of care.

For pregnancy-associated deaths in 2019 in Indiana, less than half (46.7%) of the women accessed prenatal care starting in the first trimester of their sentinel pregnancy (Figure 30). Another 25.0% of pregnancy-associated deaths in 2019 occurred among women who received prenatal care in the second trimester, and 25.0% received no prenatal care at all. It should be noted that, of the 15 women who had received no prenatal care, five women had not reached 10 weeks gestation (the recommendation for the first prenatal appointment) before their death or the end of the pregnancy. In comparison, early prenatal care was noted for 68.9% of all Indiana births in 2019. This disparity suggests inadequate prenatal care is a contributing factor to maternal mortality in Indiana.

Figure 30: Entry into prenatal care (PNC), 2019	N	%
1st trimester (early PNC)	28	46.7%
2nd trimester	15	25.0%
3rd trimester (late PNC)	0	0.0%
No prenatal care	15	25.0%
Unknown	2	3.3%

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. Additionally, it is challenging to document the absence of care, and it should be noted that there were instances among both 2018 and 2019 pregnancy-associated deaths where 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.

Section 8: MMRC Findings

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.

For women who did not die while pregnant and had a documented history of prenatal care in 2019, the average was 8.3 prenatal visits – fewer than recommended. Logically, the number of visits varied greatly by which point in their pregnancy they entered care. Women initiating prenatal care in their first trimester averaged 9.3 visits. Entry into prenatal care during the second trimester resulted in an average of 6.8 visits.

Narrowing down analysis for women who died in 2019 and resided in designated OB deserts prior to their death does not show a significant variation in prenatal care access or initiation. In fact, 85.7% of these women received at least some prenatal care (except for women who either died early in pregnancy or had pregnancy losses before 10 weeks gestation), and 71.4% entered prenatal care in their first trimester. Additionally, the women attended on average 9.8 prenatal care visits, slightly more than the average for all women reviewed. The percentages above are based on the small number of reviewed 2019 deaths among women who resided in OB deserts.

Figure 31: Entry into prenatal care (PNC), 2018-2019	**N**	**%**
1st trimester (early PNC)	56	45.5%
2nd trimester	30	24.4%
3rd trimester (late PNC)	3	2.4%
No prenatal care	30	24.4%
Unknown	4	3.3%

Data aggregated for 2018 and 2019 has been consistent regarding entry into prenatal care, with very little variation. The overall percentage of pregnancy-associated deaths in 2018-2019 that entered prenatal care in the first trimester was 45.5%, still less than half (Figure 31).

For both 2018 and 2019, 85% of the pregnancy-associated deaths to women who resided in OB deserts had received some prenatal care and 71% had early prenatal care.

The only difference noted between 2018 and 2019 pregnancy-associated deaths regarding prenatal care was the average number of appointments. The women from the 2019 cohort had ~2.5 fewer prenatal care appointments on average than the 2018 cohort. However, as

both years averaged fewer prenatal care appointments than recommended, and over half of deaths occurred to women who did not have early prenatal care, prevention initiatives should be targeted at getting women to care early in their pregnancy, and regularly.

Indiana MMRC data collected over the next several years will clarify whether these data trends persist over time and can be generalized.

INSURANCE STATUS

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 and prenatal and medical records. Over half (51.7%) of all women who died from a pregnancy-associated death in Indiana in 2019 were Medicaid enrolled, and 15.0% had private insurance (Figure 32).

Figure 32: Insurance Status (2019)	N (n=60)	%
Private	9	15.0%
Medicaid	31	51.7%
Self-pay	3	5.0%
Unknown	16	26.7%
Other	1	1.7%

Figure 33 shows similar insurance coverage proportions in the two-year data collected so far, with over half of all pregnancy-associated deaths occurring to women with Medicaid coverage. It is important to note that insurance coverage can change over the course of pregnancy and the postpartum period, and a woman's coverage during pregnancy may not be equal to her coverage during her terminal event. Further, for a large percentage of deaths reviewed (22.0%), the Indiana MMR program was not able to determine a woman's insurance coverage. The completion of the MOU for Medicaid claims data will be integral for allowing the Indiana MMRC more complete benefits information and enrollment dates for all pregnancy-associated deaths reviewed.

Figure 33: Insurance Status (2018-2019)	N (n=123)	%
Private	22	17.9%
Medicaid	67	54.5%
Self-pay	6	4.9%
Unknown	27	22.0%
Other	1	0.8%

Section 8: MMRC Findings

When examining the 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 (Figures 34 and 35). Among the 2019 pregnancy-associated deaths for women with private insurance, 100% had prenatal care and 67% entered prenatal care in their first trimester and had on average 9.2 prenatal care visits.

Figure 34: Percentage of pregnancy-associated deaths where women entered prenatal care in the first trimester of pregnancy, by insurance status.
Indiana MMRC 2019

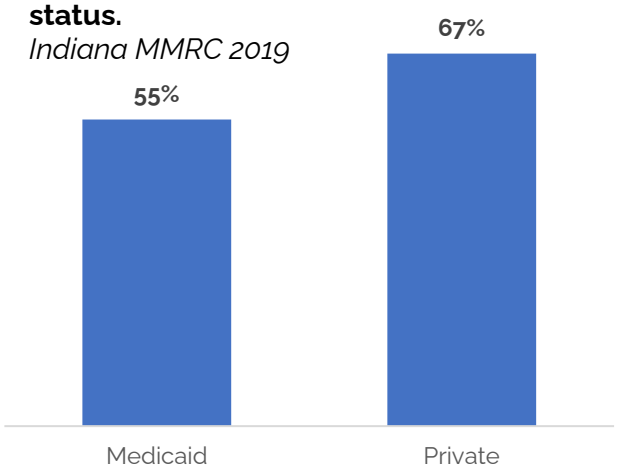


Figure 35: Average number of prenatal care appointments kept among pregnancy-associated deaths, by insurance status.
Indiana MMRC 2019

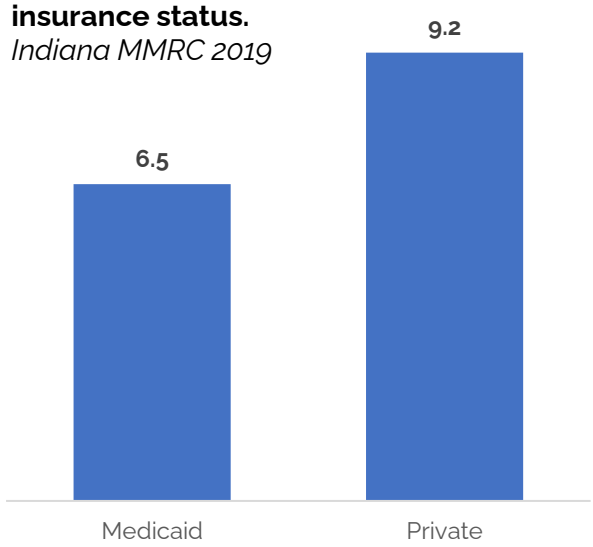


Figure 36: Percentage of pregnancy-associated deaths where women entered prenatal care in the first trimester of pregnancy, by insurance status.
Indiana MMRC 2018-2019

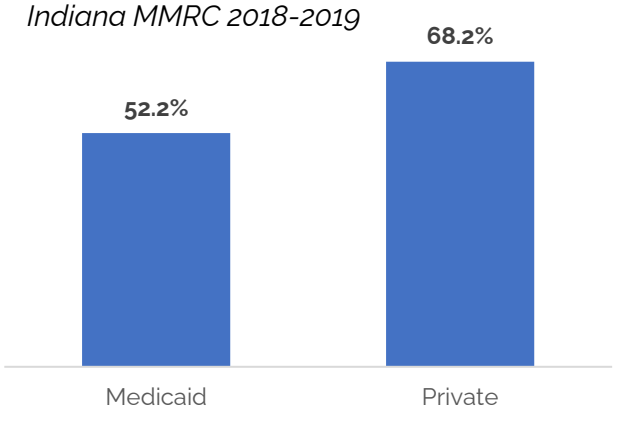
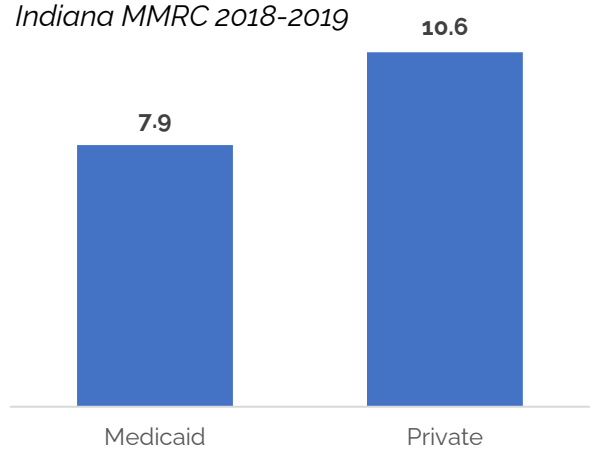


Figure 37: Two-Year average number of prenatal care appointments kept among pregnancy-associated deaths, by insurance status.
Indiana MMRC 2018-2019



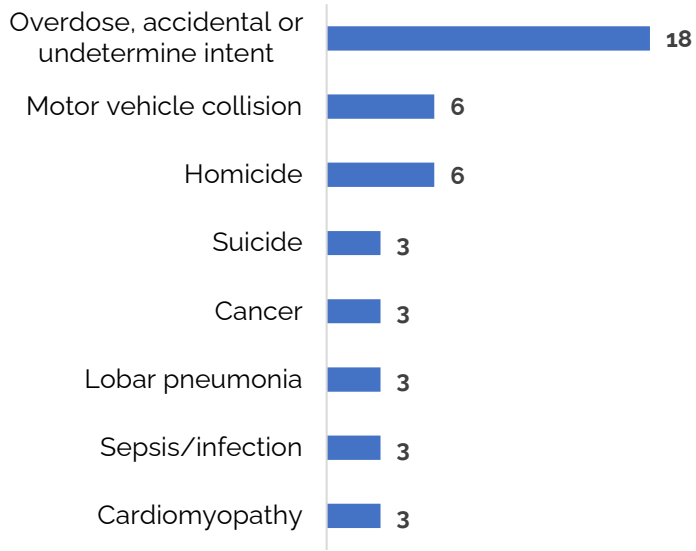
By comparison, of the women in the 2019 pregnancy-associated death cohort who were Medicaid-insured, 87.1% had prenatal care and 55% entered prenatal care in their first trimester and had on average 6.5 prenatal care visits. In the cumulative data (Figures 36 and 37), the same trends hold true. Over the last two years, the majority of pregnancy-associated deaths has been among women insured by Medicaid. Women with Medicaid insurance were less likely to have early prenatal care and had on average fewer appointments kept.

When looking at data from all live births in Indiana in 2019, these trends hold true. In 2019, 56.7% of live births to women on Medicaid had started prenatal care in the first trimester, compared to 81.0% of women on private insurance, based on birth certificate data (Indiana Vital Records, 2019).

CAUSE OF DEATH

Among the 60 pregnancy-associated deaths in 2019, overdose (both accidental and undetermined intent) was the leading cause of death, accounting for 30.0% of all pregnancy-associated deaths in 2019. Also, among the top causes of death, based on those listed on death certificates, are other injury-related deaths, including motor vehicle collisions, suicide, and homicide (Figure 38). Injuries overall, including overdoses, and intentional and unintentional injuries accounted for a total 55.0% of pregnancy-associated deaths in 2019. Cancer of various systems, usually a chronic condition, accounted for 5.0% of all pregnancy-associated deaths. Of the other medical conditions, sepsis and other complications of infection, lobar pneumonia, and cardiomyopathy each accounted for another 5.0% of pregnancy-associated deaths.

Figure 38: Top Causes of Death for all 2019
Pregnancy-Associated Deaths
Indiana Department of Health Vital Records, 2019 (n=60)

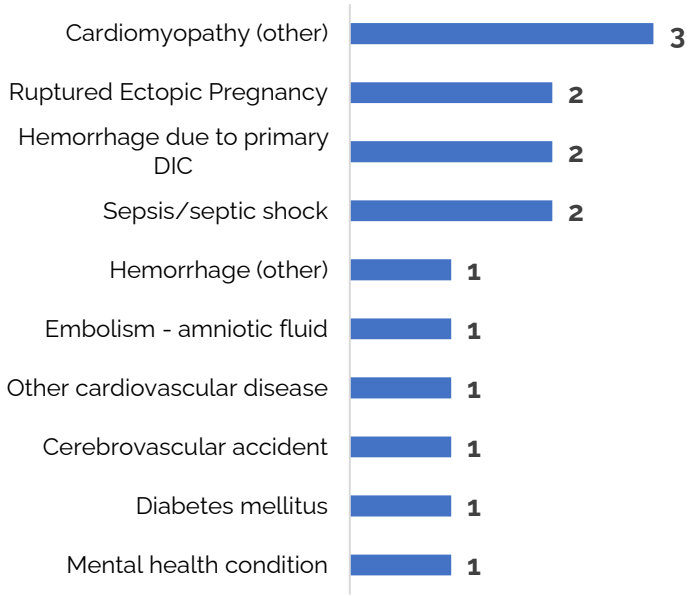


The remaining causes of death occurred in fewer than three cases in the 2019 cohort. These included:

- Diabetic ketoacidosis (DKA)
- Intracerebral hemorrhage
- Diffuse cerebellar edema and brain herniation
- Disseminated intravascular coagulation (DIC)
- Ruptured ectopic pregnancy
- Hemophagocytic lymphohistiocytosis
- Spontaneous coronary artery dissection
- Amniotic fluid embolism
- Lupus
- Hemorrhage

Figure 39: Causges of Death for 2019 Pregnancy-Related Deaths

Indiana MMRC decision based on PMSS-MM codes, 2019 (n=15)



For deaths determined by the Indiana MMRC to be pregnancy-related, the MMRIA Committee Decisions Form guided the assignation of cause of death. The CDC provides clear criteria for selecting each diagnosis code. Figure 37 shows the committee decisions for the 15 pregnancy-related deaths from 2019. Cardiomyopathies were the most common cause of pregnancy-related death, followed by ruptured ectopic pregnancy, hemorrhage due to primary DIC, and septic shock. The list of pregnancy-related causes and PMSS-MM codes that the committee used for these determinations is available in Appendix D.

Looking at all review data collected to date, the top causes of death seen overall among the pregnancy-associated deaths were similar in both the 2018 and 2019 cohorts. Overdoses accounted for the largest share (33.3%), with other injury causes also among the top causes (motor vehicle collisions, homicide, and suicide).

Figure 40: Overall Top Causes of Death for *Pregnancy-Associated Deaths* (Indiana MMRC, 2018-2019 [n=123])

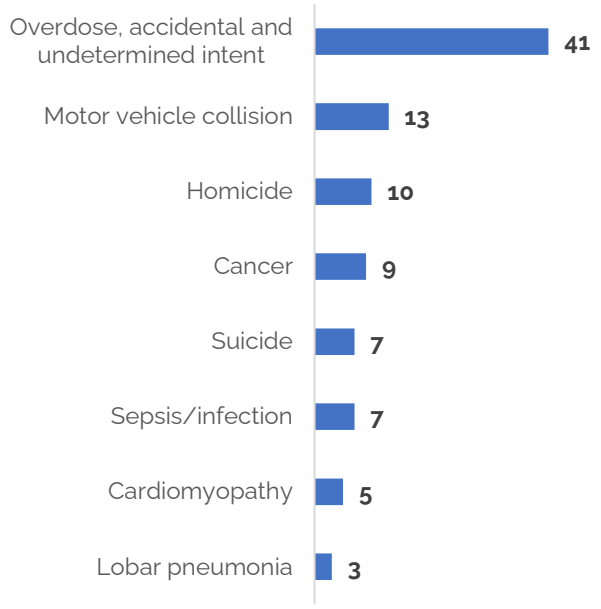
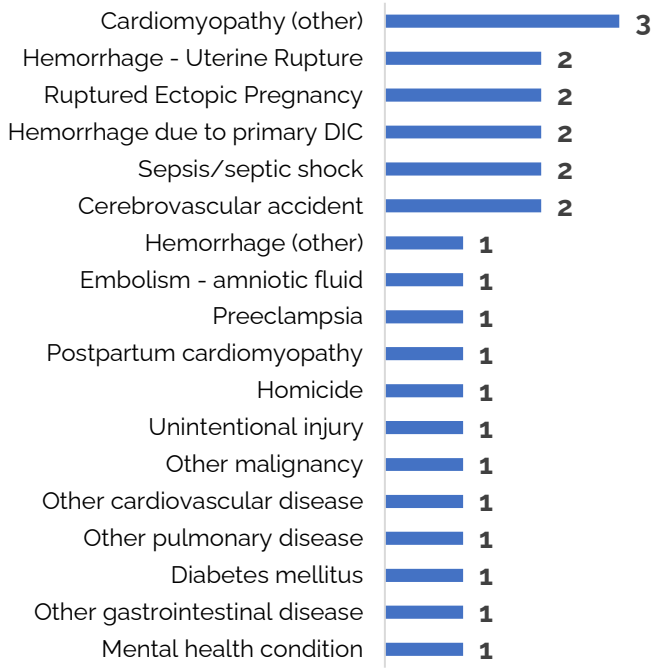


Figure 41: Overall Causes of *Pregnancy-Related* Deaths

Indiana MMRC, 2018-2019 (n=25)



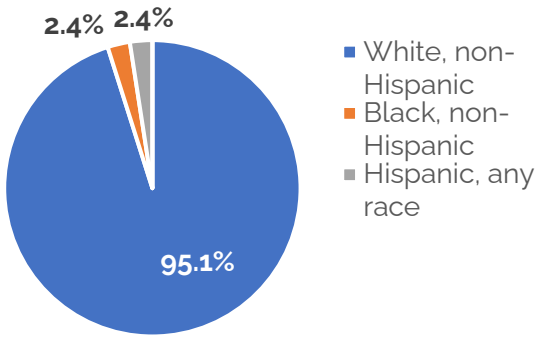
The two-year data for pregnancy- related causes of death provides a more detailed picture than was available by looking at a single year (Figures 40 and 41). These are still small numbers, and a variety of causes of death have been seen for pregnancy-related deaths, but some trends are beginning to appear. Taken together, hemorrhages of various causes and etiologies (uterine rupture, primary DIC, ruptured ectopic pregnancy, and others) have accounted for 28% of pregnancy-related deaths in the last two years. Cardiomyopathies (both postpartum and other or not specified) have accounted for another 16%. These pregnancy-related health issues can be a focus on prevention and intervention work for maternal mortality and morbidities in Indiana.

Overdoses, both accidental and undetermined intent, were the top cause of pregnancy-associated deaths in 2018 and 2019. Figures 42 and 43 show the breakdown by race and ethnicity of all pregnancy-associated overdoses deaths during this two-year period. White, non-Hispanic women have accounted for most of these deaths. White, non-Hispanic women accounted for 70% of all live births in Indiana (Figure 1) but made up 95% of the pregnancy-associated overdose deaths. Black, non-Hispanic women, and Hispanic

women accounted for just 2.4% of the overdose deaths each but accounted for 13% and 11% of all live births 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 42: Race/Ethnicity of Pregnancy-Associated Deaths due to Overdose (2018-2019)	N	%
White, non-Hispanic	39	95.1%
Black, non-Hispanic	1	2.4%
Hispanic, any race	1	2.4%
Other	0	0.0%

Figure 43: Distribution of Pregnancy-Associated Deaths due to Overdose by Race and Ethnicity
(Indiana MMRC, 2018-2019 [n=41])

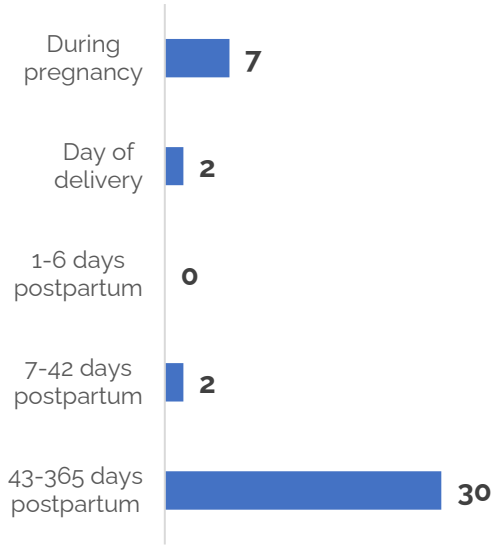


Most of the pregnancy-associated overdose deaths occurred to women ages 20-34 years, accounting for a total 85.4% of deaths (Figure 44). However, most Indiana births are occurring to women in this age group; between 2018 and 2019, 81% of all live births were to women between the ages of 20 and 34. Pregnancy-associated deaths due to overdose do not appear to be occurring to women particularly younger or older than average.

Figure 45 examines the timing of pregnancy-associated deaths due to overdose relative to the pregnancy or childbirth. While some deaths occurred during pregnancy or on the

Figure 44: Age of Pregnancy-Associated Deaths Due to Overdose (2018-2019)	N	%
15-19 years	0	0.0%
20-24 years	10	24.4%
25-29 years	15	36.6%
30-34 years	10	24.4%
35-39 years	4	9.8%
40+ years	2	4.9%

Figure 45: Timing of Pregnancy-Associated Deaths Due to Overdose
(Indiana MMRC 2018-2019)



day of delivery, the majority (73.2%) 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.

When analyzing the type of insurance held by the women who died from pregnancy-associated overdoses (n=41), Figure 46 shows the majority of overdose deaths occurred to women insured by Medicaid (63.4%), followed by those with private insurance (9.8%). A larger share of the women who died due to pregnancy-associated overdose were covered by Medicaid, compared to that proportion in the overall cohort of pregnancy-associated deaths (Figure 33).

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. The completion of the MOU for Medicaid claims data will be integral for allowing the Indiana MMRC more complete benefits information and enrollment dates for all pregnancy-associated deaths reviewed.

Figure 46: Insurance Status for Pregnancy-Associated Deaths due to Overdose (2018-2019)	N	%
Private	4	9.8%
Medicaid	31	63.4%
Self-pay	3	7.3%
Unknown	8	19.5%
Other	0	0.0%

PLACE OF DEATH

The location of the sentinel event was recorded on the death certificates for all the pregnancy-associated deaths reviewed by the Indiana MMRC. Many 2019 pregnancy-associated deaths (60%) occurred in a hospital, either in an inpatient or outpatient setting (including the emergency department). However, another 17% of pregnancy-associated deaths occurred in the women's own homes (Figure 47).

Figure 47: Place of Death for 2019 Pregnancy-Associated Deaths
Indiana MMRC 2019

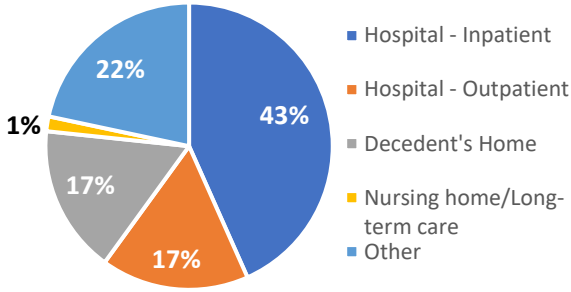
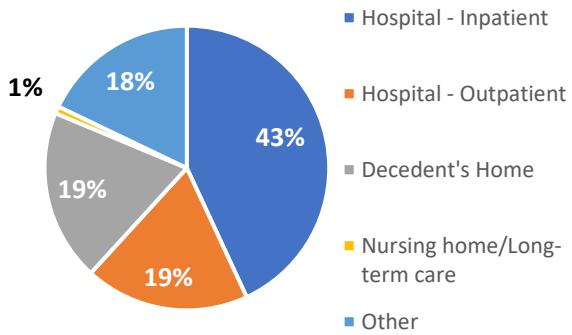


Figure 48: Place of Death for 2018-2019 Pregnancy-Associated Deaths
Indiana MMRC 2018-2019



Looking overall at review data collected from 2018-2019, the same trends seem to hold true (Figure 48). While most women are dying in hospitals, over one-third are dying at home or elsewhere. Examining the place of death as a possible intervention point is important for the Indiana MMRC. Although many recommendations and opportunities for prevention from the committee are targeted at providers, healthcare facilities, and healthcare systems, data shows many of the deaths that occurred in 2018 or 2019 did not take place in a healthcare facility or with other people on scene. Thus, the need to look beyond the events immediately preceding death is critical. The committee continues to try to address these upstream prevention opportunities in its recommendations.

CONTRIBUTING FACTORS

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 substance use disorder (SUD), mental health conditions (other than SUD), obesity, or discrimination contributed to the death. Other contributing factors may be identified when making prevention recommendations.

Figure 49: Did substance use disorder contribute to the death, 2019?
Indiana MMRC 2019

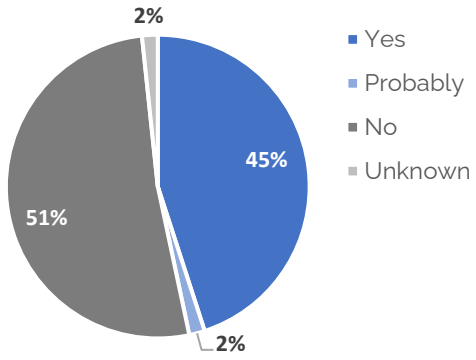
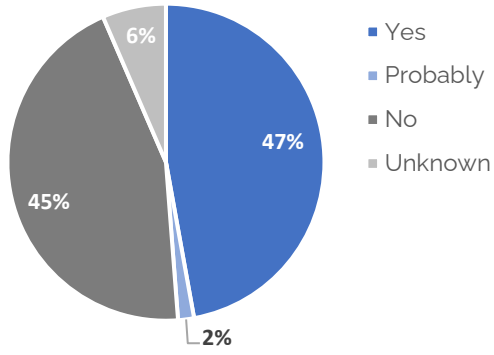


Figure 50: Did substance use disorder contribute to the death, 2018-2019?
Indiana MMRC 2018-2019



The Indiana MMRC examined all available records for the 60 pregnancy-associated deaths from 2019 to determine whether SUD contributed in any way to each (Figure 49). They determined that in 47% of pregnancy-associated deaths, SUD either **definitely** or **probably** contributed to the death. Looking at all review data collected so far (2018-2019), that percentage is slightly higher at 49%. SUD has been found to be the factor that has contributed to the most pregnancy-associated deaths in Indiana (Figure 50).

Note that the contribution of SUD went beyond accidental overdoses, with substance use contributing to and exacerbating other conditions that led to the death of 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 pregnancy-associated deaths in Indiana.

Figure 51: Did mental health conditions other than substance use disorder contribute to the death, 2019?
Indiana MMRC 2019

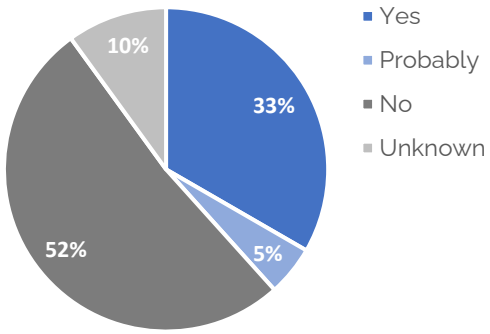
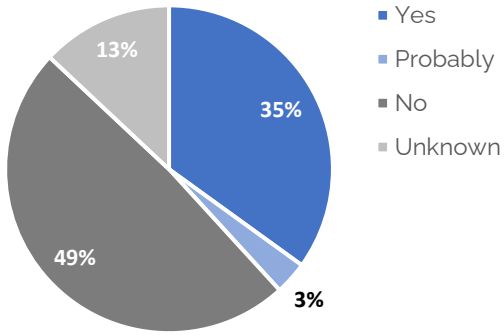


Figure 52: Did mental health conditions other than substance use disorder contribute to the death, 2018-2019?
Indiana MMRC 2018-2019



Mental health conditions other than substance use, such as depression, also contributed significantly to pregnancy-associated deaths. In 38% of the 2019 Indiana MMRC-reviewed deaths, mental health conditions (other than SUD) either **definitely** or **probably** contributed to the death (Figure 51). That percentage was consistent between 2018 and 2019, with the committee choosing 'probably' just slightly more often in 2019 (Figure 52).

There is heavy overlap between the presence of SUD and other mental health conditions. Of the total number of pregnancy-associated deaths from 2018-2019 where SUD was believed to be a contributing factor (n=60), 65% also had the presence of comorbid mental health conditions that contributed to death. The high comorbidity of SUD and other mental health conditions reflects a need for these two prevalent contributing factors to be addressed in a comprehensive manner.

Obesity was another notable contributing factor to Indiana pregnancy-associated deaths. In 7% of 2019 deaths, obesity either **definitely** or **probably** contributed to the death (Figure 53). In the cumulative data resulting from 2018 and 2019 reviews, the percentage was slightly higher at 11% (Figure 54)

Figure 53: Did obesity contribute to the death, 2019?
Indiana MMRC 2019

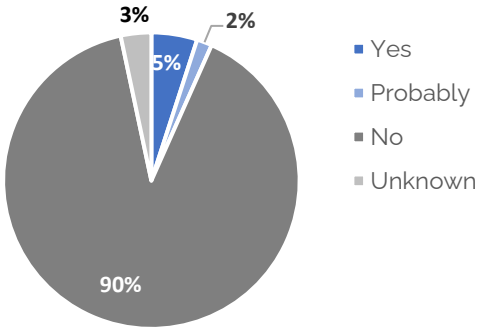
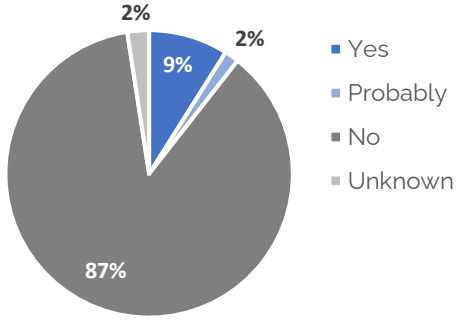
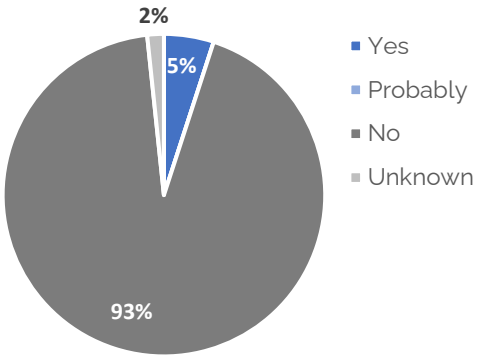


Figure 54: Did obesity contribute to the death, 2018-2019?
Indiana MMRC 2018-2019



In 2019, the Indiana MMRC committee determined that discrimination was either **definitely** or **probably** a contributing factor in 5% of pregnancy-associated deaths (Figure 55). 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 2019 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.

Figure 55: Did discrimination contribute to the death?
Indiana MMRC 2019



The Indiana MMRC did note challenges in determining the effect of discrimination on pregnancy-associated death. 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. As 2019 is the first cohort year for which

discrimination was considered as a contributing factor to each death, two-year data is not available.

The Indiana MMR program is continuing to evaluate sources of information that can inform this question. As the review process begins to incorporate family interviews in 2021, a more detailed description of each woman's lived experience during her pregnancy and leading up to her death will allow the Indiana MMRC to better determine whether discrimination may have been a contributing factor.

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 2019 pregnancy-associated deaths. Records were made available for women who had any previous involvement with DCS, including as victims in their childhood. These records not only provided a history of a woman's involvement with DCS as a parent, but also gave the context of her social history, childhood trauma, victimization, and previous social services accessed, where available.

In 2019, 67.7% of the pregnancy-associated deaths occurred to women with a DCS history, either during their childhood or as an adult, that offered significant context to her life course. Of these, 20% had a DCS history as a victim during childhood and 58.3% had histories with DCS as an adult, with overlap between these two data points. Comparable data is not available for the 2018 cohort of pregnancy-associated deaths, as the Indiana MMR program only began in 2019 including **all** DCS histories for all the women in the review process, rather than just recent DCS involvement. The value of these experiences as an indicator of adverse childhood experiences (ACEs) and intersections with social services helped the Indiana MMRC understand more completely 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 women and families with resources and referrals to services and has informed the creation of prevention recommendations.

Section 8: MMRC Findings

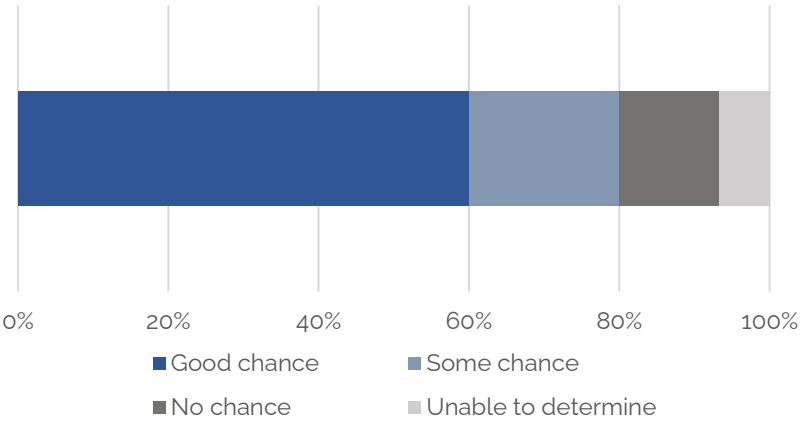
PREVENTABILITY

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 (80.0%) of all 2019 pregnancy-associated deaths reviewed were preventable. Similarly, among just the deaths determined to be pregnancy-related, 73.3% were preventable. Both percentages are slightly lower than in 2018 (87% and 90% for pregnancy-associated and pregnancy-related deaths, respectively), but most of the pregnancy-associated deaths in Indiana could have been prevented.

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, 20% had some chance to alter the outcome and 60% had a good chance to alter the outcome. Stated another way, the majority (80%) of cases reviewed had some chance or good chance to alter the outcome (Figure 56).

Figure 56: MMRC Determination of the Chance to Alter the Outcome for Pregnancy-Associated Deaths
Indiana MMRC, 2019



80.0%

of pregnancy-associated deaths were deemed preventable by the Indiana MMRC in 2019

and

73.3%

of pregnancy-related deaths were deemed preventable by the Indiana MMRC in 2019

When records associated with a woman's care or social history were incomplete or the Indiana MMRC had unanswered questions, there were occasional challenges to assessing the chance to alter outcomes. Regardless, the high level of preventability determined by the Indiana MMRC for the 2019 pregnancy-associated death cohort exemplifies the opportunity to prevent similar deaths in the future.

Section 8: MMRC Findings

The MMRIA Committee Decisions Form (Appendix E) 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 recommendations, including 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.

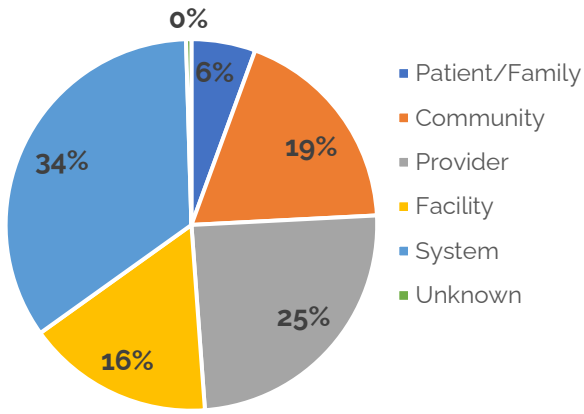
Among the 60 pregnancy-associated deaths that occurred in 2019, the Indiana MMRC recognized and documented a total of **214** unique circumstantial contributing factors and created recommendations in response to each. For each death reviewed, an average of **3.5** recommendations were created, with the guidance of the MMRIA Committee Decisions Form.

Figure 57: Top Classes of Contributing Factors Identified for Pregnancy-Associated Deaths
Indiana MMRC, 2019

Looking specifically at the contributing factors, many contributing factors identified were at the patient/family level. These contributing factors were classified into different classes, identified in Figure 57. Substance use disorder was the most identified class of contributing factor, with violence, mental health conditions, and trauma also among the most frequent, with all having an impact at the patient/family or community level. For contributing factors at the healthcare provider, facility, or system level classes, the Indiana MMRC documented examples such as quality of care, care coordination, access/financial (usually to medical care), and knowledge.

When creating recommendations to prevent future pregnancy-associated death, 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 58 shows that the largest share of recommendations made were at the level of Systems of Care. Together, recommendations for action for providers, facilities, and systems of care accounted for 75% 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 19% of recommendations, and those for the patient or family accounted for only 6%.

Figure 58: Category of Recommendations for Prevention of Pregnancy-Associated Deaths in Indiana,
Indiana MMRC, 2019



Section 9: Recommendations

Recommendations

Throughout Indiana MMRC review sessions, every recommendation developed in response to each pregnancy-associated death was documented in accordance with the MMRIA Committee Decisions Form. The full list of these recommendations for the year was then prioritized based on feasibility and impact.

Based on the themes that emerged from the 2019 pregnancy-associated deaths, the Indiana MMRC made recommendations that are specifically tailored toward the State of Indiana, communities, systems of care, facilities, providers, and women and their families. Some of the recommendations are similar to those from the 2020 Maternal Mortality Report, but many are original.

RECOMMENDATIONS FOR THE STATE OF INDIANA

Preventing infant and maternal death is a priority for Indiana. Policymakers should seek to provide state-level solutions and policy options. They have the unique authority to align resources and enact laws for statewide application. 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).

Section 9: Recommendations

REDUCE RISK OF FIREARM-RELATED INJURIES

Maria was a 31-year-old single mother of a 7-year-old girl. Her daughter's father had recently filed for permanent custody of their child, as he was aware of the abusive nature of Maria's relationship with her current boyfriend. Maria's mother also noted concerning injuries on Maria and convinced Maria to go to the emergency room, and a police report was filed. Police learned Maria's boyfriend had a criminal history of battery and intimidation on past partners.*

During that emergency room visit, Maria learned she was 14 weeks pregnant. She received treatment for her injuries and a consultation from a social worker and was discharged to home. She attended one prenatal appointment, received her anatomy scan at 19 weeks, and learned she was having a boy.

Police responded to the address Maria shared with the baby's father on two more occasions for domestic altercations. Maria disclosed to the female officer that her boyfriend had pushed her down and kicked her legs. She refused medical care.

Maria was 25 weeks pregnant when her boyfriend shot her in their home. He was subsequently charged for her murder.

**Maria is the pseudonym the Indiana MMRC uses for all pregnancy-associated deaths.*

Among the pregnancy-associated deaths reviewed by the Indiana MMRC in 2019, 8.3% could be directly linked to firearm injuries. These included incidents of self-harm and homicidal violence. ACOG issued a statement on Gun Violence and Safety. This statement is supported by direct recommendations of the committee and is based on an evidence-based, public health approach to gun violence. Recommendations include:

- Routine screening for intimate partner violence;
- Periodic injury prevention evaluation and counseling regarding firearms; and
- Regulations on limiting the purchase and ownership of firearms by individuals with emergency, temporary, or permanent protective restraining orders or those with intimate partner violence and/or stalking convictions.

ADDRESS THE NEED FOR LOWER-COST, HIGH-QUALITY CHILDCARE

Many of the women who died during 2019 of pregnancy-associated causes experienced financial difficulty, low wages, and challenges accessing health insurance. The stressors on the family impacted their physical health as well as their mental health and that of their children. Providing families with high-quality options for low- or no-cost childcare will not only improve outcomes for the children, but also narrow socioeconomic and racial/ethnic inequalities experienced by many Hoosier families. The immediate effects will also allow women and families to emphasize their housing, nutrition, and healthcare needs, thereby improving health outcomes for pregnant and parenting women.

Indiana Work Already Underway

The Indiana Child Care and Development Fund (CCDF) is a federal program that helps low-income families obtain childcare so that they may work, attend training, or continue their education. The purpose of CCDF is to increase the availability, affordability, and quality of childcare.

The CCDF program is administered through the Indiana Family and Social Services Administration in the Office of Early Childhood and Out-of-School Learning. The CCDF program helps families so that they may work, attend training, search for employment, or continue their education. It aims to increase the availability, affordability, and quality of childcare and support families in ensuring that their children are ready for school. Indiana currently supports around 35,000 children age birth to 13 in this program and offers services in multiple settings, such as childcare homes, centers, public/private schools, and faith-based programs.

IMPROVE POLICIES AND SERVICES PROVIDED BY GOVERNMENT-FUNDED HEALTH INSURANCE PROGRAMS

More than 51.7% of women who died from a pregnancy-associated cause in 2019 were Medicaid-insured. Further, 34 of the 60 pregnancy-associated deaths in 2019 occurred after 42 days post-partum. The potential lifesaving impact from extending the availability of Medicaid through one year postpartum, as well as expanding services to include behavioral health treatment and recovery resources, cannot be overstated. Ensuring that low-income women have continuous, comprehensive coverage could support improvements in infant and maternal outcomes.

Indiana Work Already Underway

Because of the COVID-19 public health emergency, no one has lost their Medicaid coverage to date; therefore, postpartum people have had extended coverage. Starting in April of 2022, Indiana Medicaid has been granted a plan amendment so that all women covered by Medicaid will have extended postpartum coverage for one year.

Government-funded health insurance plans should be improved to avoid service disruption for women of childbearing age, as well as provide case management services for all chronic conditions, including substance use and mental health disorders. Increased awareness within clients and providers about the available services provided by insurance plans should be emphasized.

Indiana Work Already Underway

In July 2019, Governor Holcomb signed new legislation making Indiana the third state in the nation to extend Medicaid coverage to include doulas. Doula services can provide additional support for pregnant and birthing people through emotional support, educational benefits, and advocacy.

The Office of Medicaid Policy and Planning (OMPP) has covered Community Health Worker services since 2018. Doula services may be billed under existing policy. To provide guidance and support to a pregnant woman, however, doula services are particularly needed pre-delivery, during delivery and post-delivery. OMPP is therefore revising its current policy to better reflect coverage of doula services

Coverage should ensure appropriate access to subspecialty care for all chronic conditions, including substance use and mental health disorders. Indiana should decrease barriers to medication access, including emergency medication for women with substance use disorder. Parity for these services should be comparable to that of pre-, ante-, and post-partum care received for physical health.

Clinical providers, including obstetrical, primary care, and emergency department, should be versed in and provide guidance on the availability of medical services in community health centers, particularly for those women and families for whom insurance is a barrier to healthcare access.

Finally, these insurance providers should provide grace periods for individuals who lose their coverage when their financial or employment circumstances change to avoid disruption in healthcare services.

IMPROVE AND STANDARDIZE QUALITY OF CARE FOR WOMEN IN THE CRIMINAL JUSTICE SYSTEM

The Indiana MMRC encountered multiple cases during review this year in which a woman's health care was affected by her stay in a criminal justice institution. For women in jail, pregnancies can be high risk, often due to several factors existing prior to arrest. These factors can include substance use, domestic violence, mental illness, poor nutrition, and a lack of prenatal care.

Section 9: Recommendations

Indiana Work Already Underway

The Officer Breann Leath Memorial Maternal & Child Health Unit allows eligible incarcerated and pregnant mothers to keep their infants with them until their release. The nursery welcomed its first infant into the program on April 16, 2008, with the sole mission of maintaining the bond between mother and child. The child health unit encourages the preservation of family by providing incarcerated mothers and their children a meaningful transition into the community.

The criminal justice system and DCS are urged to increase partnerships to improve outcomes for pregnant and parenting women with substance use disorder. When possible, the emphasis should be on recovery and family support, rather than punitive activities. This can be done through expansion of the drug court system and its collaboration with social services and case coordination. Indiana policies should include standard protocols and regular evaluations regarding the care provided to pregnant and recently pregnant women in correctional facilities, including the initiation and maintenance of treatment for substance use disorder. Further, when Indiana women are released from these facilities, the reentry process should include direct referrals to clinical and social services, home visiting, stable housing, peer recovery, and guidance on obtaining Medicaid insurance, if appropriate.

Indiana Work Already Underway

The Indiana Department of Correction (IDOC) refers all pregnant women to inpatient or outpatient substance use treatment or MAT upon intake to the Indiana Women's Prison. Services also include IPV education through the Marion County Public Health Department and mental health treatment provided by a medical vendor.

Pregnant, post-partum, and breastfeeding women within IDOC receive targeted diet options determined by a nutritionist. Their pre-natal and post-partum care is overseen by medical providers, local hospitals, on-site obstetric nurse practitioners and a prenatal care coordination nurse.

IDOC's Transitional Healthcare processes include extensive individualized release planning, which includes:

- Referrals to community providers with appointment set before release
- Completion of application for Medicaid, WIC/SNAP
- Resume building
- Completion of application for quality childcare vouchers
- Connection to the Mothers on the Rise program

RECOMMENDATIONS FOR SYSTEMS OF CARE

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.

REDUCE INJURY DUE TO ECTOPIC PREGNANCY AND ASSOCIATED HEMORRHAGE

Maria was a 33-year-old single woman who was unemployed at the time of her death. Her medical history was significant for anxiety, asthma, migraines, and obesity. She presented to the emergency department with vaginal bleeding and reported she believed she was approximately 6 weeks pregnant. No labs or ultrasound were completed at that time. She was discharged to home on pelvic rest, an order for a repeat bHCG in two days, and a referral for a local OB/GYN. She entered prenatal care the following week with another OB/GYN, and no labs or ultrasound were completed. She was instructed to return in 2 weeks for those procedures.

Maria presented to the emergency department the following day with abdominal pain and constant cramping. She received a urine culture, tests for sexually transmitted infections, a repeat bHCG, and a transvaginal ultrasound. The ultrasound report stated the uterine body, fundus, and ovaries were not visualized due to the body habitus. She was discharged home with instructions to call the OB/GYN if symptoms worsened.

The following day, Maria was found unresponsive at home by her boyfriend. She was transported via ambulance to the emergency department in full arrest. During surgery, she was found to have copious amounts of blood in her abdomen with a ruptured ectopic pregnancy. She was transferred to ICU but continued to deteriorate and died the same day.

**Maria is the pseudonym the Indiana MMRC uses for all pregnancy-associated deaths.*

All clinical providers should be trained in and adopt standardized protocols for management of pregnancies with unknown or unvisualized locations. This should include radiologists and emergency department staff. "A pregnant woman without a definitive finding of an intrauterine or ectopic pregnancy on ultrasound examination has a 'pregnancy of unknown location." A pregnancy of unknown location should not be considered a diagnosis; rather it should be treated as a transient state, and efforts should be made to establish a definitive diagnosis when possible" (*ACOG Practice Bulletin No. 191: Tubal Ectopic Pregnancy Obstetrics & Gynecology: February 2018 - Volume 131 - Issue 2 - p e65-e77*).

ADDRESS INTERGENERATIONAL TRAUMA THROUGH SYSTEMATIC VIOLENCE AND CRIME PREVENTION

"Although women of all ages may experience interpersonal violence (IPV), it is most prevalent among women of reproductive age and contributes to gynecologic disorders, pregnancy complications, unintended pregnancy, and sexually transmitted infections, including human immunodeficiency virus (HIV)" *(ACOG - Intimate Partner Violence, Committee Opinion Number 518 February 2012*).

Screening and counseling for IPV should be a core part of women's preventive health visits. Physicians should screen all women for IPV at periodic intervals, including during obstetric care (at the first prenatal visit, at least once per trimester, and at the postpartum checkup), offer ongoing support, and review available prevention and referral options. All sectors, including education, healthcare, criminal justice, and child protective services, should adopt standardized screening policies and collaborative practices.

When law enforcement and/or DCS respond to incidents of IPV, trauma-informed services and referrals should be offered to the victims and other nonperpetrating members of the household whenever possible. Further, violence prevention programs aimed at reducing risk factors and improving protective factors for Indiana children should be expanded.

Indiana Work Already Underway

IPQIC is working with prenatal care providers to implement screening at the first prenatal visit for all Indiana women. The recommended screening tool is the 5Ps, which is an effective tool of engagement for use with pregnant women who may use alcohol or drugs. This screening tool poses questions related to substance use by women's parents, peers, partner, during her pregnancy and in her past. IPQIC has developed a toolkit for this work, aimed at standardizing care, providing guided interview questions, and resources for providers and patients for substance use and mental health treatment options.

INDIANA SHOULD WORK TO INCREASE HARM REDUCTION ACTIVITIES AND MAKE THEM MORE ACCESSIBLE TO HOOSIER WOMEN AND FAMILIES

Harm reduction is a set of interventions to reduce the harms associated with drug use. Fentanyl test strip distribution should be added to syringe service programs, along with training of appropriate use. Naloxone should be widely available across Indiana and free to all Hoosiers. Clinicians, home visitors, and social service providers should all be aware of and refer to harm reduction programs and naloxone in their communities.

Indiana Work Already Underway

The Indiana Pregnancy Promise Program is a new statewide initiative implemented by the Family and Social Services Administration on July 1, 2021. The goal of the Pregnancy Promise Program is to achieve positive outcomes for parents and infants impacted by opioid use disorder (OUD) by offering services and support beginning in pregnancy and extending through 12 months postpartum. Indiana was one of only 10 states to receive this grant award, and the program is fully funded by the Centers for Medicare and Medicaid Services (CMS) and the U.S. Department of Health and Human Services (HHS). The Pregnancy Promise Program is a free, voluntary program that aims to identify pregnant Medicaid beneficiaries with OUD as early as possible in their pregnancy. The program offers comprehensive case management and care coordination services and connects participants with prenatal and postpartum care, mental health support, OUD treatment/recovery services and addresses health-related social needs, such as housing, nutrition, transportation, and other safety needs. To be eligible for the Pregnancy Promise Program, an individual must be pregnant or within 90 days of the end of the pregnancy, have current or past opioid use, and must be eligible for Medicaid health coverage. Anyone can make a referral to the Pregnancy Promise Program at any time by visiting www.pregnancypromise.in.gov and completing the brief online referral form or by calling the toll-free number at 888-467-2717 or locally at 317-234-5336.

EXPAND THE RESOURCES AND CAPACITY FOR ADDRESSING ACUTE MENTAL HEALTH CRISES

The availability of inpatient mental health care and suicide risk and prevention resources must increase, as well as universal depression screenings, in the clinical and home-visiting settings. Care coordination between community mental health centers and obstetrical providers should occur throughout the pregnancy, as well as up to one year postpartum.

INCREASE INDIANA'S CAPACITY TO SERVE FAMILIES IN THE CARE OF CHILD PROTECTION SERVICES

DCS should add mental health referrals as standard protocol for family reunification programs. In instances where children are removed from custodial caregivers, therapists should be available in all court proceedings to mitigate the traumatic effects on the families.

The clinical capacity of DCS should be expanded across the state, including the addition of nurse consultants and the ability to access records from the Indiana prescription drug monitoring program (INSPECT).

Plans of safe care should be initiated for families prior to the delivery of their baby. These plans should include DCS, social service providers, recovery and treatment services, pediatricians, delivering facilities, obstetrical teams, and primary care providers.

Indiana Work Already Underway

IPQIC is piloting a Plans of Safe Care (PoSC) program for pregnant individuals. The PoSC program will work with DCS and DMHA to develop coordinated care plans throughout the pregnancy and into the baby's first year.

RECOMMENDATIONS FOR FACILITIES

There are many opportunities for preventing maternal morbidity and mortality within facilities. This includes 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 2019. 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.

REDUCE RISKS ASSOCIATED WITH PRESCRIBED MEDICATION INTERACTIONS

Create and enforce health systems practices guidelines for simultaneous prescriptions of benzodiazepine and suboxone. These patients should be staffed by a medical officer, as benzodiazepine can increase the lethality of the medication-assisted treatments (MAT). Prescribers and pharmacies should be given education about co-prescribing medication, including the possible risks. These risks should also be communicated with the patients in clear, simple language.

IMPROVE PATIENT SAFETY BY IMPLEMENTING STANDARDS OF CARE FOR ALL PREGNANT AND POSTPARTUM WOMEN

When a patient is pregnant, in labor, or newly postpartum, written policies on minimum standards of care should be available and implemented at all levels of care. These protocols should be utilized in the ED, OB-ED, and labor and delivery units. Documentation of all activities, lab results, and vital signs resulting from this improved monitoring should be available in her chart for all clinical staff to review, as necessary:

- Patient inputs and outputs should be monitored throughout the duration of her hospital stays.
- For patients with chronic hypertension and preeclampsia, daily weight checks should be conducted, and the patient should be fluid negative before discharge.
- If the postpartum patient is at elevated risk for preeclampsia when she is discharged, hospitals can provide her with a wristband or other notification device that will allow other providers, emergency medical services, or ED staff to readily recognize this, in the event she must return to the hospital or doctor's office. Blood pressure cuffs and instructions for home-based monitoring should also be provided.
- If the pregnant or postpartum patient is suspicious for cerebrovascular accident, she should receive transfer to a facility equipped to provide appropriate care.

- For pregnant and postpartum patients with cardiomyopathy, a cardiologist consult should be completed upon admission.
- Standard utilization of telehealth consultations with specialists should be implemented, particularly for lower-level or critical access hospitals, for whom these specialties are not on staff.
- All delivering hospitals should follow the requirements of their assigned Level of Care regarding blood products, including red blood cells, fresh frozen plasma, and platelets. For other birth centers, protocols should be in place to obtain timely access to blood products, if needed. Delivering hospitals should also partner with critical access hospitals and birth centers to provide ongoing simulation and training for the treatment of active hemorrhage and ectopic pregnancies.
- All ED facilities (including critical access hospitals) should have, be trained on, and utilize an obstetric triage tool for all women of reproductive age. For patients who present unresponsive, they should assume pregnant until proven otherwise. All facilities should enable immediate and accurate communication between ED and obstetric providers.
- For patients with substance use disorder, MAT should be initiated and/or maintained in the ED and for inpatient stays. Discharge of patients should include direct connection to peer recovery and treatment programs.

REQUIRE ALL POSTPARTUM DISCHARGES TO INCLUDE POST-BIRTH WARNING EDUCATION AND LITERATURE

For pregnancy-related and pregnancy-associated causes of death, educating patients and families about warning signs and potential complications could help them recognize and respond appropriately and in a timely manner. By improving and standardizing post-partum education, Indiana facilities can ensure all women receive consistent messaging and guidance on self-advocacy when symptoms arise. This can apply not only to hemorrhagic and hypertensive symptoms, but also to social and behavioral indicators, such as that of postpartum depression.

Additionally, educating facility staff and providers on the early warning signs and putting universal responses into policy can decrease the inconsistencies in clinical reasoning, thereby improving the facilities' ability to advocate for their patients.

Early warning systems should include staff education, patient education and literature, and tools for providers to monitor and document care provided for sudden health declines.

Maria was a 40-year-old married woman who worked in the healthcare industry. Her medical history was significant for chronic hepatitis C, seizures, anemia, opioid use disorder, migraines, major depressive disorder, and anxiety. She had two young children and a pregnancy that had ended in a 17-week spontaneous abortion. She had attempted suicide in her 20s but had not been in the care of a psychiatrist for several years. During the sentinel pregnancy, Maria entered prenatal care with an OB/GYN at 10 weeks. She had five visits in his office, as well as an anatomy scan at 20 weeks. She received referrals for psychiatry, Healthy Families, and NA.

During her intake appointment with the psychiatrist, Maria expressed suicidal ideations with no plan. She was offered voluntary hospitalization but declined. She was prescribed antidepressants and told to follow up in 3 weeks.

Maria arrived at the emergency department two weeks later and reported intentionally overdosing on heroin. She stayed in the hospital for two days for observation and was discharged to home with instructions to follow up with her OB/GYN and psychiatrist.

Maria received no further medical care and missed several scheduled appointments with her OB/GYN. During this time, DCS as actively involved with the family, as reports of neglect of her two children were being investigated. Maria was cooperating with all programs and instructions provided by DCS.

Three months after the emergency department visit, Maria was found in her bathroom unresponsive. Despite resuscitative efforts, Maria and her fetus died at the scene. The cause of death was listed as accidental fentanyl intoxication.

**Maria is the pseudonym the Indiana MMRC uses for all pregnancy-associated deaths.*

INCREASE AVAILABILITY OF RESOURCES FOR TRAUMA, SUBSTANCE USE, AND MENTAL HEALTH DISORDERS TREATMENT AND RECOVERY

The Indiana MMRC does not just view pregnancy-associated deaths through a clinical lens. Social records and histories are also carefully considered to determine any events during the women's life course that could contribute to generational trauma or a high stress load. With mental health and substance use disorders significantly contributing to the 2019 cohort, educating providers about appropriate person-centered messaging, biases, and the impact of compassion fatigue is critical. Improving message delivery and reducing stigma can increase the patient quality of care and satisfaction, while simultaneously allowing providers to address both the physical and social needs of their patients.

Facilities should increase the identification of and treatment for women with mental health and substance use disorders during the pre-, ante-, and post-natal periods. Social determinants of health and ACEs screenings should be assessed throughout the prenatal

period and through the first-year postpartum, and findings should be included in records available to all treating clinicians. Training should be provided to increase the capacity of Indiana's social and health systems to respond to families with identified need:

- Funding should be increased for certified peer recovery specialists, as this should be integrated into standard protocols for treatment of substance use disorder. If appropriate, services can be provided via telehealth.
- Trauma-informed systems of care need to be in place in all health systems in Indiana. Standard suicide and depression screenings should be conducted and documented. If assessments reveal high risks, inpatient treatment should be made available immediately.
- All facilities should implement universal screening policies for IPV in pre-, ante-, and postpartum care and at all hospital interactions, and document their completion.
- Obstetrical providers' awareness of the services available to victims of IPV should be increased.
- Hospitals should initiate plans of safe care for families prior to the delivery of their baby. These plans should include DCS, social service providers, recovery and treatment services, pediatricians, and primary care providers.

Indiana Work Already Underway

IPQIC is establishing a Women's Health Task Force, which will examine issues related to standardizing care provided to pregnant and post-partum individuals with processes recommended by national professional associations. The first efforts undertaken toward this work included developing an algorithm within the AIM Hypertension Bundle for emergency departments to more accurately recognize and treat pregnancy-related hypertensive crises.

The Perinatal Center and Affiliate Structure will be operational in November 2021 and is specifically designed to improve outcomes for both parent and baby. The requisite provider education, quality improvement initiatives, and care standardization will improve health equity by partnering higher level birthing hospitals with small rural critical access facilities.

RECOMMENDATIONS FOR COMMUNITIES

COMMUNITIES SHOULD INCREASE HARM REDUCTION ACTIVITIES AND MAKE THEM MORE ACCESSIBLE TO WOMEN AND FAMILIES

Harm reduction is a set of interventions to reduce the harms associated with drug use:

- Communities are encouraged to introduce SSPs if not already available and include fentanyl test strip distribution in the services provided.
- Naloxone should be widely available in all communities for persons with substance use disorders and their families, and specifically placed in association with all public automatic external defibrillators and provided to extended stay hotel staff.
- Social media outlets, print distribution, clinicians, home visitors, and social service providers should all be aware of and refer to harm reduction programs and naloxone in their communities.
- Communities should add peer recovery coaches and programs to connect women in substance use disorder treatment and recovery to appropriate services.
- Replicate the utilization of community paramedicine models to provide home-based MAT.

IMPROVE SUICIDE RISK ASSESSMENT AND REFERRAL POLICIES

Reduce suicidal behaviors by offering regular opportunities for community members to learn crisis intervention techniques:

- Offer free Question, Persuade, Refer (QPR) suicide prevention training. Teach family and friends to take all threats of suicide seriously and respond appropriately.
- Increase the number of and funding for Local Outreach to Suicide Survivors (LOSS) teams in local communities.
- Address generational trauma by referring to bereavement and emotional support programming, particularly for children.

INCREASE COMMUNITY ENGAGEMENT IN VIOLENCE AND CRIME PREVENTION

Communities should invest in the health and safety of their members by increasing funding for violence prevention programming, including but not limited to, after-school clubs and activities for youth, mentorship programs, and other community resource centers:

- Increased engagement with community leaders, such as faith-based and local business owners, can help provide alternative resources for youth and families at risk for gang violence. Target resources specific to minors who are home insecure.
- Cultivate trauma-informed, culturally sensitive school systems to ensure all students feel connected to their school communities, which may mitigate the effects of trauma and provide positive interactions.
- For individuals with a history of perpetrating IPV, restricted access to firearms should be enforced by local law enforcement (IC 35-47-64-6).

IDENTIFY FAMILIES IN NEED OF ASSISTANCE ACCESSING RESOURCES, INCLUDING THOSE ADDRESSING THE SOCIAL DETERMINANTS OF HEALTH

DCS, Community Partners for Child Safety, home-visiting programs, and other family support services should actively cooperate to identify families in need of assistance and collaborate to provide comprehensive holistic care. When possible, this care should include warm handoffs, rather than simple referrals:

- Increase community support for pregnant and parenting women, particularly those working in the service or restaurant industries.
- Increase availability of and referral to transitional housing, particularly for postpartum women in substance use treatment and recovery services.
- Increase community access to healthy foods. Educate pregnant and postpartum women on nutrition and physical activity and refer them to locations where they can access resources to meet their needs.
- Enact reasonable pregnancy workplace accommodations.

CORONERS AND PATHOLOGSTS SHOULD INCLUDE TOXICOLOGY AND MICROSCOPIC FINDINGS IN ALL REPORTS

The Indiana MMRC reviewed several case narratives with incomplete medical and social records. Information was often missing from coroner and autopsy reports. To examine circumstances surrounding the pregnancy-associated deaths more accurately in Indiana, coroners, pathologists, and death certifiers are encouraged to include the results of all testing provided during their investigations.

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.

IMPROVE RECOGNITION OF, REDUCE STIGMA AROUND, AND INCREASE SUPPORT FOR WOMEN WITH MENTAL HEALTH AND SUBSTANCE USE DISORDERS

All providers should understand the challenges faced by women with substance use and mental health disorders, particularly during and after pregnancy. These health conditions are among the most stigmatized circumstances, and providers' attitudes toward them can impact the care received by the patient or client. When seeking or accessing care is limited by providers' attitudes, other chronic conditions or those needs associated with pregnancy may also go unaddressed.

Ongoing, targeted training may help providers more easily recognize and address chronic conditions in their patients and clients. Increased awareness in the effects of stigma can also improve treatment and recovery responses, as well as drive coordinated referral and follow-up protocols. Universal screening for ACEs, SDOH, post-traumatic stress disorder, suicide ideation, IPV, and other social and emotional stressors can reduce biases associated with these factors and improve detection rates. Training should be provided to increase the capacity of Indiana's social and health systems to respond to families with identified need.

Providers should provide more intentional and consistent follow up for patients with postpartum depression, suicide ideation, and other mental health or substance use disorders to ensure referrals and follow-up visits are completed.

REDUCE INCIDENCE OF PREVENTABLE MATERNAL MORBIDITY AND MORTALITY IN HEALTHCARE SETTINGS

Chronic health conditions are a leading cause of maternal mortality and morbidity, and related problems can occur during pregnancy or into the postpartum period. The Indiana MMRC noted instances where pregnant and postpartum women presented to emergency departments or clinicians with symptoms indicative of severe complications yet were undertreated or not offered appropriate referrals or follow-up care.

Section 9: Recommendations

Providers should adhere to ACOG's recommendation on optimizing postpartum care, specifically contact with their patients within three weeks of the end of the pregnancy (ACOG Presidential Task Force on Redefining the Postpartum Visit, Number 736).

"It is recommended that all women have contact with their obstetrician–gynecologists or other obstetric care providers within the first 3 weeks postpartum. This initial assessment should be followed up with ongoing care as needed, concluding with a comprehensive postpartum visit no later than 12 weeks after birth. The comprehensive postpartum visit should include a full assessment of physical, social, and psychological well-being, including the following domains: mood and emotional well-being; infant care and feeding; sexuality, contraception, and birth spacing; sleep and fatigue; physical recovery from birth; chronic disease management; and health maintenance. Women with chronic medical conditions such as hypertensive disorders, obesity, diabetes, thyroid disorders, renal disease, and mood disorders should be counseled regarding the importance of timely follow-up with their obstetrician–gynecologists or primary care providers for ongoing coordination of care."

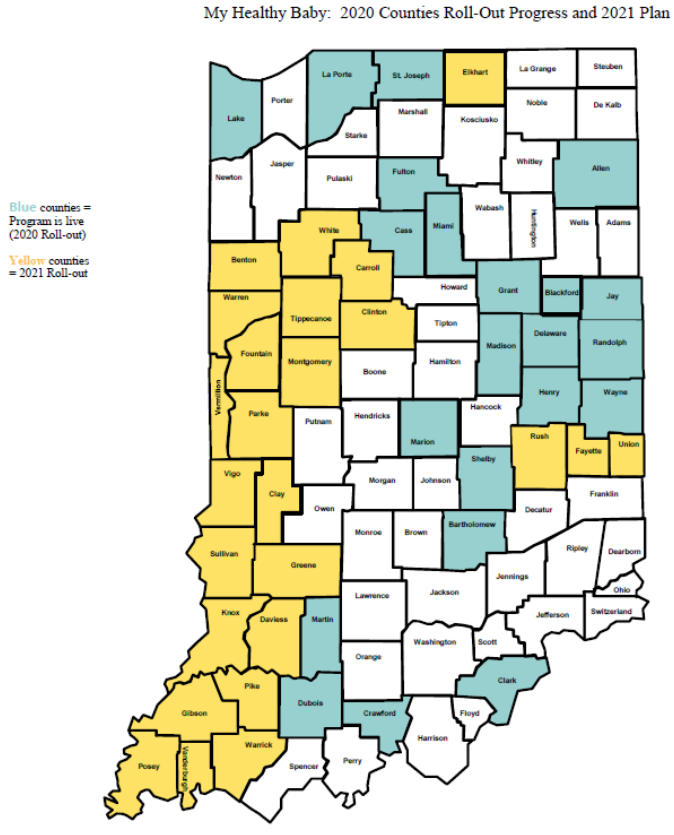
Based on the Indiana MMRC's review of the 2019 pregnancy-associated deaths, recommendations were created for providers to adopt and adhere to standardized policies aimed at addressing preventable maternal morbidities:

- When challenges arise visualizing pregnancy via ultrasound, particularly in patients with morbid obesity, providers should elevate the expertise and/or utilize an alternative method to confirm the location of the pregnancy.
- Offer more aggressive management options to patients with high-risk unmanaged diabetes, when available.
- Provide standard preconception education to patients with chronic conditions and their families. Risks should be discussed, and preconception health counseling offered.
- Identify pregnant patients in need of referral to cardiology and/or maternal-fetal medicine and provide referrals early in the pregnancy.
- For patients who refuse blood products, review consent forms and discuss with the patient the options of using an autologous blood salvage device. Hemoglobin levels in pregnant patients with religious objections to blood products should be monitored closely.
- Providers should be up to date on training for recognizing sepsis, with particular emphasis on how it may present among abnormal maternal vital signs.
- Providers should receive ongoing education on low-frequency, high-acuity events in pregnancy, such as cerebrovascular accident, and the appropriate therapy.

- Breast exams should be performed during lactation consulting, particularly for women not regularly seeing a primary care provider.
- Offer long-acting reversible contraception (LARC) immediately postpartum or during the post-partum visit.
- Educate patients on risks and possible adverse reactions when prescribing multiple co-acting medications.
- Dental providers, including oral surgeons, need to be aware of medication-seeking behaviors. When these providers do prescribe pain medication, documentation about the risks of addiction and overdose need to be provided to the patient.
- All clinicians should have frequent, non-judgmental, trauma-informed conversations with their patients about the risks of substance use disorder and treat addiction as the chronic condition it is.

INCREASE CONNECTIVITY TO NAVIGATION PROGRAMS THAT ASSIST WITH RESOURCES, SUCH AS HOME VISITING

One approach to improving health outcomesfor Indiana families is home visiting, which provides support to pregnant women and families who have young children. These programs meet the clients where they are, whether that be in their homes or other places in the community, to provide resources, education, referrals, and, in some cases, clinical care. These programs can be critical partners in the coordinated delivery of mental health, primary care, substance use, recovery, and pre-, ante-, and post-partum care.



Indiana's My Healthy Baby program has begun in counties identified by their high infant mortality rates. The goal of the program is to identify women early in their pregnancies and provide personalized referrals into local networks. While the

program is currently being rolled out in 47 Indiana counties, more counties will be added in the coming years. Local programs are available to serve Indiana families in all 92 counties, and providers should be aware of all possible resources within their network and community to offer all patients referrals to appropriate services.

REDUCE ERRORS WHEN COMPLETING DEATH CERTIFICATES

Traditionally, death certificates were the only way maternal deaths were counted, and they are still used as a first step for identifying deaths for MMRC. Indiana uses multiple methods simultaneously to ensure pregnancy-associated deaths are accurately identified and counted each year. Based on death certificates alone, Indiana reported 58 pregnancy-associated deaths. However, 31 of these were excluded as false positives, and the death certificate error was noted. Many of these inaccurate death records were completed by medical death certifiers. Providers should take special care when completing paperwork associated with the death of a woman and emphasize correctness in recordkeeping. This will assist Indiana with more accurate data reporting, as well as ensure the family members receive correct documentation.

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 system should be addressed upstream, removing the responsibility of systems improvements from the patients and clients entirely.

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

EMPHASIZE THE IMPORTANCE OF ROUTINE MEDICAL AND PSYCHOLOGICAL CARE

Families should seek immediate care, as well as maintain routine healthcare throughout the life course:

- Pediatric patients should be provided routine care, including that which addresses mental health concerns and trauma, to help reduce chronic conditions in adulthood.
- When patients are provided referrals for recommended providers, they should seek care as soon as possible.
- Pregnant people should seek pre-natal care in the first trimester.
- Families should understand the signs for and risks of miscarriage and ectopic pregnancy and when to seek immediate medical attention.

REDUCE THE RISKS OF PREVENTABLE INJURIES BY ALWAYS WEARING A SEATBELT AND NOT RIDING IN A VEHICLE WITH AN IMPAIRED DRIVER

To reduce preventable injuries associated with motor vehicle collisions, all women should be encouraged to wear a seatbelt and avoid riding in vehicles with impaired drivers. The Indiana MMRC reviewed deaths from 2019 where either or both risk factors were noted.

Future of Indiana MMR Program

The technical assistance offered by the CDC through the ERASE MM project has allowed IDOH to evaluate opportunities to strengthen Indiana's process for reviewing maternal deaths. Indiana MMR program staff worked with the CDC for guidance on best practices for MMR, including procedures and processes, from case identification through data quality assurance measures.

Several key opportunities for improving Indiana's MMR processes were identified and will be addressed as the MMRC begins its review of pregnancy-associated deaths from 2020.

The MMRC membership is regularly evaluated by the Indiana MMR program and the committee chairperson to ensure appropriate professional disciplines are represented, per IC 16-50, as well as to structure a team with a racial and geographic representation of the Indiana population. As it became increasingly clear that mental health and substance use disorders were a significant contributor to many 2018 and 2019 pregnancy-associated deaths, social services, law enforcement, and experts in treatment and recovery were engaged and asked to provide insights to the landscape of behavioral health services in Indiana. Other experts added to the committee include pharmacy and emergency department staff.

Additionally, many MMRCs are identifying implicit biases within the MMRC membership and program staff that could be impacting the review process and discussions therein. ERASE MM technical assistance has strongly encouraged the adoption of implicit bias training as part of the continuing education of the committee. Activities aimed at reducing bias and introducing a trauma-informed lens to the review included education on person-first language, the addition of an equity statement prior to each review meeting, and an emphasis on relationship-building and equality among the committee members.

With the addition of the family narratives as part of the Indiana MMR program, qualitative data around discrimination, bias, and the experiences of the women and their families will be available to the committee members. This 'community voice' will be critical to informing the providers, clinicians, social services networks, and state agencies how the services offered could be improved. IDOH is also pursuing the addition of a community member on the Indiana MMRC, so her lived experience may offer some insights into the challenges faced by women and families at risk for pregnancy-associated death.

The Indiana MMR program will continue to build relationships with neighboring states and local jurisdictions within each. Kentucky, Michigan, Illinois, and Ohio all have MMRCs and

the coordinators of each have been gracious collaborators in record sharing. Unfortunately, ongoing challenges still exist, and creative solutions will need to be sought, as Indiana resident women whose deaths are being reviewed by the Indiana MMRC receive care, services, or die out of state.

Identifying opportunities for process improvement is essential for the Indiana MMRC to meet the everchanging needs of childbearing women. Technical support from CDC, as well as other states' MMRC staff, will ultimately help Indiana most effectively operate its maternal mortality review program.

Section 10: Conclusion

Conclusion

The Indiana Maternal Mortality Review Committee was established to comprehensively review pregnancy-associated deaths in Indiana and, based on an assessment of the compiled data, identify means and opportunities to reduce or eliminate future preventable maternal loss. This process is resource-intensive and often emotionally challenging work. But it remains the most comprehensive process to understand the true burden and impact of maternal mortality in Indiana.

The Indiana Department of Health and the Indiana MMRC determined an overwhelming majority of the pregnancy-associated deaths from 2019 were preventable and provided recommendations toward eliminating these. As the committee continues its work into the 2020 cohort, it is imperative that Indiana learns from these findings and looks for actionable steps to improve the health of Indiana women.

Appendix A: Maternal Death Reporting Form

Indiana State Department of Health

Maternal Death Report
Indiana State Department of Health

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 _____

When complete, please scan and email to MMR@ISDH.in.gov

For any questions please call ISDH Maternal Mortality Review Coordinator 317-232-4300

Appendix B - Family Interview Documents

Indiana's Maternal Mortality Review Committee

INDIANA UNIVERSITY INFORMED CONSENT STATEMENT FOR RESEARCH

Maternal Mortality Review Narrative Collection
Sponsor Name: Centers for Disease Control and Prevention

About this study
You are being asked to participate in a research study by Indiana's Maternal Mortality Review Committee. The study's goal is to find out what causes maternal-related deaths in Indiana and how we can work together to prevent them. The study consists of an interview with a research member of the Maternal Mortality Review Committee. This consent form will give you information about the study to help you decide whether you want to participate. Please read this form, and ask any questions you have, before agreeing to be in the study.

Taking part is this interview is voluntary
Participation is completely voluntary, and you are not required to be interviewed. If you choose to participate, you do not have to answer any questions you do not wish to answer. You may also end the interview at any time.

The purpose of this study
In accordance with Indiana Code 16-50, Indiana is reviewing all deaths of women during pregnancy or within one year of the end of a pregnancy to help understand why maternal deaths happen and how to prevent them. We wish to interview family members and friends who experienced a loss of a loved one from a pregnancy-associated death. You were identified through information we got from next of kin or emergency health contacts after the death of [decedent name]. Please note, if you are taking legal action because of [decedent's name]'s death, we will not ask you to participate in an interview until all legal matters have settled.

What will happen during the study?
If there is no current legal action and you voluntarily agree to participate, a trained interviewer will ask you questions about [decedent name], including questions about her health, family, and use of health care and social services. The interview will take place by phone, in your home, or in a quiet place that you choose where you are comfortable, and it can be scheduled at a time that is convenient for you. This interview may take about an hour to an hour and a half. With your permission, the interview will be audio-recorded so we can capture your full story. Your participation will help us understand why maternal deaths happen and how to prevent them.

How long will I participate?

You will participate in a one-time interview that may take about an hour to an hour and a half.

Will I benefit from the study?
There may not be any benefits to participating in the interview because the interview may be emotional. However, you may find comfort knowing that the information you provide during this interview may result in recommendations to prevent other maternal deaths. You may also find that talking about the death of your loved one can help with your grief. The interviewer can provide you or your family with information on available services to help you.

Will taking part expose me to risk?
Talking about the death of your loved one is difficult and may bring up strong emotions for you. The interviewers are not professional counselors, but if you wish, she or he can provide you with names of professional counselors who can help you cope with your feelings about your loss.

Will it cost me anything to participate?
There is no cost to you for being interviewed, other than your time and effort.

Will I be paid to participate?
You will not be paid for participating in this study.

How will my information be protected?
We will not let anyone know your name or contact information. All information that identifies you, the family, or the health providers will be kept confidential outside of the review process staff and consultants. Per Indiana Code 16-50-1-5, Indiana's maternal mortality review process staff and consultants are held to strict confidentiality. All records, including audio recordings, will be kept in a secure, locked location. Confidentiality and privacy will be protected by law. The interviewer may not release protected records information to you, such as medical history and medical test results.

Information collected in this study may be used for other research studies or shared with other researchers for future research. If this happens, information that could identify you, such as your name and other identifiers, will be removed before any information is shared. Since identifying information will be removed, we will not ask for your additional consent.

Who should I call with questions or problems?
If you have questions about the study or encounter a problem with the research, contact the researcher, Jack Turman, Jr., Ph.D., at, jaturman@iu.edu or 317-278-0354.

For questions about your rights as a research participant; to discuss problems, complaints, or concerns about a research study; or to obtain information or offer input, please contact the IU Human Research Protection Program office at 800-696-2949 or at irb@iu.edu.

Can I withdraw from the study?
If you decide to participate in the interview, you can change your mind and decide to not participate in the interview at any time. There are no consequences if you decide to not participate or end the interview early.

PARTICIPANT'S CONSENT
In consideration of all of the above, I agree to participate in this research study. I will be given a copy of this informed consent document to keep for my records.

Participant's Printed Name:_____

Participant's Signature:_____**Date:**_____

Printed Name of Person Obtaining Consent:_____

Signature of Person Obtaining Consent:_____**Date:**_____

Appendix C – MMRIA Committee Decisions Form (v21)

MMRIA MATERNAL MORTALITY REVIEW COMMITTEE DECISIONS FORM v21 1

REVIEW DATE ____ Month/Day/Year

RECORD ID # ____

COMMITTEE DETERMINATION OF CAUSE(S) OF DEATH

IF PREGNANCY-RELATED, COMMITTEE DETERMINATION OF UNDERLYING* CAUSE OF DEATH
Refer to page 3 for PMSS-MM cause of death list.

TYPE	OPTIONAL: CAUSE (DESCRIPTIVE)
UNDERLYING*	
CONTRIBUTING	
IMMEDIATE	
OTHER SIGNIFICANT	

PREGNANCY-RELATEDNESS: SELECT ONE

- ☐ **PREGNANCY-RELATED** — 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
- ☐ **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-ASSOCIATED BUT UNABLE TO DETERMINE PREGNANCY-RELATEDNESS**

ESTIMATE THE DEGREE OF RELEVANT INFORMATION (RECORDS) AVAILABLE FOR THIS CASE:

- ☐ **COMPLETE** — All records necessary for adequate review of the case were available
- ☐ **SOMEWHAT COMPLETE** — Major gaps (i.e, information that would have been crucial to the review of the case)
- ☐ **MOSTLY COMPLETE** — Minor gaps (i.e, information that would have been beneficial but was not essential to the review of the case)
- ☐ **NOT COMPLETE** — Minimal records available for review (i.e, death certificate and no additional records)
- ☐ **N/A**

DOES THE COMMITTEE AGREE WITH THE UNDERLYING* CAUSE OF DEATH LISTED ON DEATH CERTIFICATE? ☐ YES ☐ NO

COMMITTEE DETERMINATIONS ON CIRCUMSTANCES SURROUNDING DEATH

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

MANNER OF DEATH

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
- ☐ ACQUAINTANCE
- ☐ OTHER, SPECIFY: ____
- ☐ UNKNOWN
- ☐ NOT APPLICABLE

*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.

Appendix D – PMSS-MM Decisions Form

MMRIA

MATERNAL MORTALITY REVIEW COMMITTEE DECISIONS FORM v21 3

IF PREGNANCY-RELATED, COMMITTEE DETERMINATION OF UNDERLYING CAUSE OF DEATH* PMSS-MM

* 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.

Hemorrhage (Excludes Aneurysms or CVA)
10.1 - Hemorrhage – Uterine Rupture
10.2 - Placental Abruption
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

Infection
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

Embolism - Thrombotic (Non-Cerebral)
30.1 - Embolism – Thrombotic (Non-Cerebral)
30.9 - Other Embolism (Excludes Amniotic Fluid Embolism)/NOS

Amniotic Fluid Embolism
31.1 - Embolism - Amniotic Fluid

Hypertensive Disorders of Pregnancy
40.1 - Preeclampsia
50.1 - Eclampsia
60.1 - Chronic Hypertension with Superimposed Preeclampsia

Anesthesia Complications
70.1 - Anesthesia Complications

Cardiomyopathy
80.1 - Postpartum/Peripartum Cardiomyopathy
80.2 - Hypertrophic Cardiomyopathy
80.9 - Other Cardiomyopathy/NOS

Hematologic
82.1 - Sickle Cell Anemia
82.9 - Other Hematologic Conditions including Thrombophilias/TTP/HUS/NOS

Collagen Vascular/Autoimmune Diseases
83.1 - Systemic Lupus Erythematosus (SLE)
83.9 - Other Collagen Vascular Diseases/NOS

Conditions Unique to Pregnancy
85.1 - Conditions Unique to Pregnancy (e.g, Gestational Diabetes, Hyperemesis, Liver Disease of Pregnancy)

Injury
88.1 - Intentional (Homicide)
88.2 - Unintentional
88.9 - Unknown Intent/NOS

Cancer
89.1 - Gestational Trophoblastic Disease (GTD)
89.3 - Malignant Melanoma
89.9 - Other Malignancy/NOS

Cardiovascular Conditions
90.1 - 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

Pulmonary Conditions (Excludes ARDS-Adult Respiratory Distress Syndrome)
91.1 - Chronic Lung Disease
91.2 - Cystic Fibrosis
91.3 - Asthma
91.9 - Other Pulmonary Disease/NOS

Neurologic/Neurovascular Conditions (Excluding CVA)
92.1 - Epilepsy/Seizure Disorder
92.9 - Other Neurologic Disease/NOS

Renal Disease
93.1 - Chronic Renal Failure/End-Stage Renal Disease (ESRD)
93.9 - Other Renal Disease/NOS

Cerebrovascular Accident not Secondary to Hypertensive Disorders of Pregnancy
95.1 - Cerebrovascular Accident (Hemorrhage/Thrombosis/Aneurysm/Malformation) not Secondary to Hypertensive Disorders of Pregnancy

Metabolic/Endocrine
96.2 - Diabetes Mellitus
96.9 - Other Metabolic/Endocrine Disorder/NOS

Gastrointestinal Disorders
97.1 - Crohn's Disease/Ulcerative Colitis
97.2 - Liver Disease/Failure/Transplant
97.9 - Other Gastrointestinal Disease/NOS

Mental Health Conditions
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 Condition/NOS

Unknown COD
999.1 - Unknown COD

Appendix E – MMRIA Decisions Form (Contributing Factors and Recommendations)

MMRIA — MATERNAL MORTALITY REVIEW COMMITTEE DECISIONS FORM v21 — 5

CONTRIBUTING FACTORS AND RECOMMENDATIONS FOR ACTION (Continued from page 2)

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)