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MISSISSIPPI MATERNAL MORTALITY REPORT

2016-2020

The determination as to whether a maternal death was directly related to pregnancy and the recommendations contained in this report were provided by the Mississippi Maternal Mortality Review Committee (MMRC) Members. Statistical analyses and data visualization support was provided by the Mississippi State Department of Health.

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STATE HEALTH OFFICER'S MESSAGE

MISSISSIPPI STATE DEPARTMENT OF HEALTH

Dear Colleagues,

The Mississippi State Department of Health (MSDH) is honored to share the 2023 Maternal Mortality and Morbidity Report. This report builds on the important work of the Maternal Mortality Review Committee (MMRC) and includes findings for maternal deaths which occurred from 2016-2020. Since its inaugural work starting in 2017, the MMRC, consisting of professionals from various organizations, disciplines, and backgrounds, has met no less than quarterly to review maternal deaths throughout the state. The goal of this report is to identify statewide patterns in maternal health and to provide actionable recommendations directed at key stakeholders to prevent maternal mortality and morbidity. Further, this report highlights factors and social determinants of health that play a role in maternal health and contribute to the health disparities and inequities observed in Mississippi's maternal health outcomes.

MSDH has been humbled at the response to this report and appreciates that it serves as an important vehicle to inform elected officials, policy advocates, community leaders, medical providers, foundations, and the public on approaches that can collectively impact change in the maternal health space.

This work, as difficult as it may be, is critical if we aim to improve health outcomes for all women, children, and families. We must be deliberate, collaborative, and partner in a focused way to improve health outcomes in Mississippi, especially those for pregnant and post-partum women.

I want to acknowledge the work of the Maternal and Infant Health Bureau (MIHB) staff, who provide the administrative and operational support for the MMRC, and I want to extend my warmest gratitude to the leadership and volunteer members of the MMRC who tirelessly leave no question unasked and no stone unturned in exploring what happened and how these deaths might have been prevented. Most importantly, I want to acknowledge the Mississippi women who lost their lives in 2016-2020 while pregnant or within a year of pregnancy. I extend my heartfelt condolences to their surviving loved ones and am optimistic that once we know better, we will do better.

Sincerely,

Daniel P. Edney, MD, FACP, FASAM
State Health Officer
Mississippi State Department of Health

MMRC CHAIR AND CO-CHAIR MESSAGE

In this report, the Mississippi Maternal Mortality Review Committee (MMRC) provides summary data on maternal deaths from 2016 through 2020 and multi-level recommendations to reduce maternal mortality in the state of Mississippi. This updated report highlights the increasing rate in maternal deaths in Mississippi and explores the demographics and contributing factors to maternal death during this epoch.

In addition to the trend of increasing rates of maternal death overall, we continue to note the unacceptable racial disparities among Black and White pregnant patients with non-Hispanic, Black women having a pregnancy-related mortality rate 4 times higher than non-Hispanic, White women in 2020. It is imperative that this racial inequity is not only recognized, but that concerted efforts are made at the institutional, community, and state levels to reduce these disparate outcomes. With 80 percent of these deaths determined to be preventable, there is ample opportunity for specific strategies aimed at eliminating these disparities.

In this report, we also demonstrate that cardiovascular disease and hypertension remain top contributors to maternal mortality. This finding illustrates the need for comprehensive primary care for women prior to pregnancy, during pregnancy, and extending after the postpartum period. Reducing maternal mortality is dependent not only on access to quality care during pregnancy, but access to care through the continuum of a woman's life. This represents a unique challenge within our state, with many birthing people living in maternal deserts. A substantial portion of this care is being shouldered by smaller hospitals with limited resources, many of whom are facing possible closure and limiting or discontinuing the provision of obstetrical services, further increasing the burdens borne by the individuals and their communities.

Data in this report also illuminates a troubling trend of pregnancy-associated death related to mental illness, substance abuse, homicide, and suicide. It is imperative to ensure timely identification, referral, and treatment for those with mental health needs.
Thoughtful integrative strategies to lower the burden of mental health, substance abuse, and gun violence will be key to reducing to maternal death from these causes.

We would like to thank the committee members who volunteer their time and energy to review these cases. Without their contributions, this report would not be possible. We would also like to thank the staff at the Mississippi State Department of Health for their integral support in identifying, collecting, and abstracting case information.

Finally, we acknowledge and remember the lives of the women lost and the families left behind. Our work to review these cases and provide recommendations to prevent future maternal deaths, in part, honors the legacy of these patients and gives us an opportunity to improve pregnancy outcomes in the state of Mississippi. We are hopeful that this report will be instrumental in understanding the epidemic of maternal mortality in Mississippi and provide key partners with the information needed to make meaningful changes to improve pregnancy outcomes and reduce maternal mortality.

DEFINITIONS & ACRONYMS

DEFINITIONS

1. **Immediate Cause of Death:** Final disease or condition resulting in death.
2. **Maternal Mortality:** Deaths of women that occur due to complications from pregnancy or childbirth (UNICEF, 2023).
3. **Maternal Mortality Ratio:** Proportion that represents maternal deaths occurring during pregnancy and childbirth, or within 42 days of the end of pregnancy from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes. (WHO, 2023).
4. **Pregnancy Associated Deaths:** Deaths that occur during pregnancy OR within one year of the end of pregnancy from a cause that is not related to pregnancy.
5. **Pregnancy-Related Deaths:** Deaths occurring during pregnancy or within one year of the end of pregnancy from a chain of events initiated by pregnancy, or the aggravation of an unrelated condition by the physiologic effects of pregnancy.
6. **Pregnancy-Related Mortality Rate:** Rate that measures the number of deaths that occurred during pregnancy or within one year after pregnancy.
7. **Underlying Cause of Death:** Disease or injury that initiated events resulting in death.

ACRONYMS

1. **MMRC:** Maternal Mortality Review Committee
2. **MMRIA:** Maternal Mortality Review Information Application

EXECUTIVE SUMMARY

Across the state and the globe, maternal mortality is considered an important indicator of the quality of health during pregnancy and postpartum period. Maternal deaths impact families, communities, and the entire state. Nationally, the maternal mortality rate has continued to increase. Between 2018 and 2019, the rate increased from 17.4 maternal deaths per 100,000 live births to 20.1. The rate continued to increase in 2020 to 23.8 and again in 2021 to 32.9 per 100,000 live births (Harris, 2023).

The Mississippi Maternal Mortality Review Committee (MMRC) is tasked with reviewing maternal deaths to identify opportunities for improvement and make recommendations to prevent future deaths. Probable maternal deaths (also known as pregnancy-associated deaths) are identified through a surveillance process and referred to the MMRC for extensive case review, follow-up, and analysis. During the review, the MMRC determines whether the death was directly related to the pregnancy (pregnancy-related), not pregnancy related (pregnancy-associated, but not related), or unable to determine (pregnancy-associated, but unable to determine relatedness).

Maternal Mortality Facts, Mississippi, 2020:

- There were 48 pregnancy-associated deaths in 2020.
- 31% of the 2020 maternal deaths were determined by the MMRC to be directly related to the pregnancy.
- Black, non-Hispanic women have a pregnancy-related mortality rate 4 times higher than White, non-Hispanic women.

Five-Year Maternal Mortality Facts, Mississippi, 2016-2020:

- The pregnancy-related mortality rate was highest (81.5 per 100,000 live births) in women within the 35-39 age group from years 2016-2020.
- During the five-year period (2016-2020), the majority (43%) of pregnancy-related deaths occurred in women who were pregnant 43 days up to 1 year post pregnancy and before death.
- During the five-year period (2016-2020), 80% of pregnancy-related deaths were deemed preventable.
- Of all pregnancy-related deaths between 2016-2020, 92.3% had some level of chance to alter the final outcome (death).
- From 2016-2020, there were a total of 167 pregnancy associated deaths in which 39% were pregnancy related.

Summary of Key High Impact MMRC Recommendations:

- Medicaid expansion should be incorporated for rural hospitals to remain open and include access to telehealth services. There is a need for rural healthcare facilities to provide higher levels of critical care, recruit and retain adequate providers, and have access to life saving equipment, especially in the most vulnerable areas of the state.
- A statewide perinatal regionalization model should be developed to coordinate transfer of patients with obstetric emergencies and high-risk maternal patients.
- Hospital systems, providers, and other health systems should develop procedures and/or trainings to address maternal patients with severe complaints for the same health concern which includes bias/discrimination training.
- Providers should not dismiss patients' health-related complaints, especially if they are repeated/repetitive and/or result in numerous returns for the same complaint.
- Community and healthcare organizations should provide patients/families with access to quality mental health and substance abuse resources.
- The Department of Public Safety, State Medical Examiner's Office should mandate that all coroners perform autopsies on all maternal deaths unless the family/next of kin opts out.

INTRODUCTION

The Mississippi Maternal Mortality Review Committee (MMRC) was established in 2017 following passage of House Bill 494, which required the formal review of maternal deaths in Mississippi and secured protections for the confidentiality of the process. The MMRC was developed with guidance from the Centers for Disease Control and Prevention's (CDC) Division of Reproductive Health and modeled after well-established review committees in the United States. The committee includes representation from a broad range of physicians and nurses from multiple specialties (Obstetrics & Gynecology, Cardiology, Pulmonary Medicine, Anesthesiology, Maternal-Fetal Medicine, Public Health), community leaders, and other health/safety-related professionals who extensively review maternal deaths to identify opportunities for prevention. This report provides a description of the MMRC review process, statistics, findings from the MMRC, and recommendations for federal, state, and local government, healthcare systems/providers, communities/organizations, employers, regulatory organizations, and patients and families.

Mississippi defines "pregnancy-associated death" according to the Centers for Disease Control and Prevention's (CDC, 2023) Pregnancy Mortality Surveillance System (PMSS) definition. This definition includes deaths that occur during pregnancy and the first 365 days following the end of pregnancy. A "pregnancy-related death" refers to maternal deaths directly related to or aggravated by pregnancy or its management. 'Maternal' refers to women during pregnancy, childbirth, and the postpartum period. For this report, deaths up to one year after the end of pregnancy are included, based on the maternal deaths that occurred in 2020. In addition, this report also summarizes pregnancy-associated deaths that occurred in Mississippi during the years of 2016-2020.

COVID-19

In early 2020, the SARS-CoV-2 (COVID-19) pandemic emerged as a public health emergency. As 2020 progressed, it became apparent that pregnant and postpartum patients were at increased risks for moderate and severe COVID-19 infection as well as maternal death due to COVID-19. During 2020, COVID-19 was the underlying cause of death for five (5) maternal deaths in Mississippi. Although overall numbers of maternal deaths were low in 2020, the trends toward increasing maternal morbidity became evident in late 2020 and early 2021. This trend was followed by a spike in maternal deaths due to COVID-19 which will be more evident in the MMRC's next report. Overall, COVID-19 highlights the importance of continued robust support of the state's public health entities to study, track, and prevent emerging infectious diseases to reduce transmission of potentially deadly infections especially among vulnerable populations such pregnant and postpartum patients.

METHODOLOGY

*DISCLAIMER: Any pregnancy associated/maternal death that was certified and/or confirmed after the MMRC's record abstraction processes were completed **ARE NOT** reflected in this report.*

For review of the 2020 maternal deaths, the MMRC convened five (5) times from October 2022 through October 2023. There was a total of 48 pregnancy-associated deaths in which 39 (81%) were reviewed. The remaining 9 (19%) were excluded from the review due to the deaths being attributed to motor-vehicle and/or related accidents. These deaths are excluded from the MMRC process.

To identify pregnancy-associated deaths that occurred in Mississippi (by residence), potential maternal deaths are first identified via the state and national Offices of Vital Statistics. Potential maternal deaths include any death certificate with an indication of pregnancy at or within one year of death and/or matching a birth or fetal death certificate within one year of death, or with an underlying obstetric or pregnancy-related ICD-10 underlying cause of death code of A34, O00-O95, O98-O99.

Each identified death certificate is evaluated for possible errors including erroneous pregnancy check box selection and/or inaccurate reporting. Maternal deaths that are determined to not be pregnancy-associated are excluded from review.

After all pregnancy-associated deaths are identified, records pertinent to the pregnancy and maternal death are abstracted. Relevant records for review include prenatal records, hospital and emergency room records, medical transport records (if applicable), mental health records, coroner and autopsy reports, law enforcement reports, family interviews, news reports, and obituaries. A Community Vital Signs (CVS) report is also generated for each pregnancy-associated death. The CVS provides a synopsis of social determinants of health (SDOH) within the decedent's community, county, and/or neighborhood.

The Mississippi Maternal Mortality Review Committee (MMRC) uses the procedures from the CDC's *Maternal Mortality Review Committee Decision Form* to guide its evaluation of all deaths at committee meetings. In the maternal mortality review process, the committee seeks to answer 5 specific questions:

1. What was the cause of death?
2. Was the death "pregnancy-related"?
3. Was the death preventable and/or was there some chance to alter the outcome?
4. What were the contributing factors to the death?
5. What are the MMRC's recommendations for the contributing factors?

For reviewed pregnancy-related deaths in which medical records were available, the committee determined if the death was preventable and if there was at least some chance [or a strong chance] to alter the outcome. For the pregnancy-related deaths which were considered preventable, the committee also reviewed potential contributing factors of the death. Recommendations were then generated by the MMRC in an effort to prevent additional maternal deaths in Mississippi.

DATA, ANALYSES & RESULTS

Overview of Pregnancy-Associated Deaths by Relatedness

From 2016-2020, there were a total of 184,421 live births in Mississippi. Over the five-year period, the highest number of live births were recorded in 2016 compared to the other four years. The table below indicates the number of live births for each of the five years identified in the analyses. The number of live births is used to calculate the rates outlined in this report.

YEAR	TOTAL LIVE BIRTHS
2016	37,928
2017	37,370
2018	37,009
2019	36,634
2020	35,480
FIVE YEAR TOTAL	**184,421**

A total of 167 **pregnancy-associated deaths** occurred from 2016-2020. Of this number, 32 (19%) were related to motor vehicle-related deaths and were excluded from the actual MMRC review process. Of the number of pregnancy-associated deaths, 65 (39%) were determined to be pregnancy-related, 87 (52%) were pregnancy-associated but not related, and 15 deaths (9%) were determined to be pregnancy-associated but their relatedness could not be determined. The pregnancy-related mortality ratio for the five-year (2016-2020) period was **35.2 deaths per 100,000 live births**.

Among the pregnancy-associated deaths, 104 (62.3%) were among Black, Non-Hispanic women; 56 (33.5%) were among White, Non-Hispanic women; 3 (1.8%) were among Hispanic women; and 4 (2.4%) were among women of Other Races. The majority (76.9%) of **pregnancy-related deaths** also occurred among Black, Non-Hispanic women.

Even though women ages 35-39 had the highest **rates** for pregnancy-related deaths, women within the 25-29 age group had the highest numbers of both pregnancy-associated and pregnancy-related deaths.

The tables below outline the demographics of all pregnancy-associated deaths by relatedness for race, ethnicity, and age group in Mississippi from 2016-2020. As indicated, during the five-year period, there were a total of 167 pregnancy-associated deaths. Percentages are **calculated by row** for each relatedness category.

By Race & Ethnicity, 2016-2020

Race	ALL Pregnancy-Associated Deaths Number	Pregnancy-Related Deaths Number (%)	Pregnancy Associated, But Not Pregnancy-Related Deaths Number (%)	Unable to Determine Relatedness Number (%)
Black, Non-Hispanic	**104**	50 (48%)	44 (42%)	10 (10%)
White, Non-Hispanic	**56**	14 (25%)	37 (66%)	5 (9%)
Hispanic	**3**	0 (0%)	3 (100%)	0 (0%)
Other Races	**4**	1 (25%)	3 (75%)	0 (0%)
TOTALS	**167**	**65**	**87**	**15**

By Age Group, 2016-2020

Age	ALL Pregnancy-Associated Deaths Number	Pregnancy-Related Deaths Number (%)	Pregnancy Associated, But Not Pregnancy-Related Deaths Number (%)	Unable to Determine Relatedness Number (%)
<20	**8**	1 (12%)	7 (88%)	0 (0%)
20-24	**30**	10 (33%)	17 (57%)	3 (10%)
25-29	**53**	21 (40%)	25 (47%)	7 (13%)
30-34	**41**	19 (46%)	21 (51%)	1 (2%)
35-39	**31**	13 (42%)	14 (45%)	4 (13%)
40+	**4**	1 (25%)	3 (75%)	0 (0%)
TOTALS	**167**	**65**	**87**	**15**

Mortality Rates of Pregnancy-Associated Deaths by Relatedness, 2016-2020

By definition, a pregnancy-related mortality rate is defined as the number that constitutes the rate of death of women in a specific area who died while pregnant or within one year after the end of pregnancy by a cause related to or aggravated by pregnancy (CDC, 2023). The rate is calculated based on the number of live births within a specified time period. This rate can change often, depending on factors such as the time period being investigated, the variation in live births, and/or changes in populations (if analyzed by groups).

A similar rate that is sometimes used simultaneously with the pregnancy-related mortality is the maternal mortality ratio. According to the World Health Organization (WHO, 2023), a maternal mortality ratio is defined as the number of maternal deaths during a given/specified time period per 100,000 live births. This ratio measurement includes any maternal death occurring **during pregnancy and childbirth, or within 42 days of the end of pregnancy** from any cause **related to** or **aggravated by the**

pregnancy or **its management**, but not from accidental or incidental causes. Notably, the pregnancy-related mortality rate **does** take into account women who died from accidental and/or incidental causes.

As indicated in the table below, Mississippi's pregnancy-related mortality rate in 2020 was 42.2 per 100,000 live births, which is a slight increase from the previous year of 40.9 per 100,000 live births. The state's average pregnancy-mortality rate for the five-year period was 35.2 per 100,000 live births.

YEAR	*Pregnancy Related*		*Pregnancy- Associated, Not Related to Pregnancy*		*Unable to Determine Relatedness*		Total Count	Total Births
	Count	Rate	Count	Rate	Count	Rate		
2016	10	26.4	14	36.9	2	5.3	26	37,928
2017	11	29.4	15	40.1	2	5.4	28	37,370
2018	14	37.8	22	59.4	2	5.4	38	37,009
2019	15	40.9	7	19.1	5	13.6	27	36,634
2020	15	42.2	29	81.7	4	11.3	48	35,480
TOTAL	**65**	**35.2**	**87**	**47.2**	**15**	**8.1**	**167**	**184,421**

Pregnancy-related mortality ratios calculated as deaths per 100,000 live births

Mortality Rates of Pregnancy-Associated Deaths by Relatedness, Race and Ethnicity, 2016-2020 (n=167)

During the five-year period, a total of 104 **pregnancy-associated** maternal deaths were reviewed for Black, non-Hispanic mothers. Black, non-Hispanic deaths accounted for 50 of the 65 pregnancy-related deaths which equates to 76.9%. During the same period, the pregnancy-related mortality rate for Black, non-Hispanic women was 63.3 deaths per 100,000 live births, which is the highest of all racial groups. In addition, Black, non-Hispanic deaths accounted for 44 of the 87 (50.6%) pregnancy-associated, but not related deaths.

A total of 56 **pregnancy-associated** maternal deaths were reviewed for White, non-Hispanic mothers. White, non-Hispanic deaths accounted for 14 of the 65 (21.5%) pregnancy-related deaths. The pregnancy-related mortality rate for White, non-Hispanic women was 15.1 deaths per 100,000 live births. White, non-Hispanic maternal deaths accounted for 37 of the 87 (42.5%) pregnancy-associated, but not related [to pregnancy] deaths.

As indicated in the table below, the overall **pregnancy-related** mortality ratio was four times higher among Black, non-Hispanic women than among White, non-Hispanic women.

Race and Ethnicity	*Pregnancy Related*		*Pregnancy-Associated, Not Related to Pregnancy*		*Unable to Determine Relatedness*		Total Count	2016-2020 Total Births (by race/ethnicity)
	Count	Rate	Count	Rate	Count	Rate		
Black, Non-Hispanic	50	63.3	44	60.0	10	12.7	104	78,574
White, Non-Hispanic	14	15.1	37	40.0	5	5.4	56	92,565
Hispanic	0	0.0	3	35.9	0	0.0	3	8,362
Other/Unknown Races	1	20.3	3	61.0	0	0.0	4	4,920
TOTAL	**65**	**35.2**	**87**	**47.2**	**15**	**8.1**	**167**	**184,421**

Pregnancy-related mortality ratios calculated as deaths per 100,000 live births

Mortality Rates of Pregnancy-Associated Deaths by Relatedness and Age Group, 2016-2020 (n=167)

Of the 65 **pregnancy-related deaths**, the majority (32.3%) of the deaths occurred among women who were ages 25-29. The pregnancy-related mortality rate for this age group was 35.9 per 100,000 live births; however, the rate was higher at 81.5 per 100,000 live births for the 35-39 age group. The second highest pregnancy-related mortality rate occurred among women within the 30-34 age group.

Age Group	*Pregnancy Related*		*Pregnancy- Associated, Not Related to Pregnancy*		*Unable to Determine Relatedness*		Total Count	Total Births (by age group)
	Count	Rate	Count	Rate	Count	Rate		
<20	1	6.6	7	6.6	0	0.0	8	15,078
20-24	10	18.6	17	31.6	3	5.6	30	53,703
25-29	21	35.9	25	42.7	7	11.9	53	58,538
30-34	19	49.7	21	54.9	1	2.6	41	38,228
35-39	13	81.5	14	87.8	4	25.1	31	15,947
40+	1	34.2	3	102.7	0	0.0	4	2,920
Unknown Age	0	0.0	0	0.0	0	0.0	0	7
TOTALS	**65**	**35.2**	**87**	**47.2**	**15**	**8.1**	**167**	**184,421**

Pregnancy-related mortality ratios calculated as deaths per 100,000 live births

Timing of maternal death and pregnancy relatedness, 2016-2020 (n=167)

During the MMRC process, timing of death was also reviewed and discussed. The process currently groups women into three categories as related to time of death: (1) currently pregnant at time of death; (2) pregnant within 42 days of death; and (3) pregnant within 43 days up to 1 year before death. The data are collected using certified death certificates.

The table below indicates the cumulative counts and category percentages of deaths by timing and pregnancy relatedness for the five-year period (2016-2020). For all **pregnancy-related** deaths, 13 deaths (20%) occurred among women who were pregnant at the time of death. In addition, 19 deaths (29.2%) occurred among women pregnant within 42 days of death and 28 (43%) occurred among women who were pregnant 43 days to 1 year before death.

Of all **pregnancy-associated, but not related to pregnancy** deaths during the five year period, 14 deaths (16.1%) occurred among women who were pregnant at the time of death. Within the same category, 3 deaths (3.4%) occurred among women who were pregnant within 42 days of death and 57 (65.5%) occurred among women who were pregnant 43 days to 1 year before death. Among those deaths that were reviewed and relatedness was unable to be determined, 5 (33.3%) were among women who were pregnant at the time of death; 2 (13.3%) were among those who were pregnant within 42 days of death; and 7 (46.7%) were among women who were pregnant 43 days to 1 year before death.

	Pregnancy Related		***Pregnancy- Associated, Not Related to Pregnancy***		***Unable to Determine Relatedness***		**Total Count**
Pregnancy Status	**Count**	**%**	**Count**	**%**	**Count**	**%**	
Pregnant at time of death	13	20.0%	14	16.1%	5	33.3%	32
Pregnant within 42 days of death	19	29.2%	3	3.4%	2	13.3%	24
Pregnant 43 days to 1 year before death	28	43.0%	57	65.5%	7	46.7%	92
Blank/Unknown Period	5	7.7%	13	14.9%	1	6.7%	19
TOTAL	**65**	**100%**	**87**	**100%**	**15**	**100%**	**167**

Overview of Pregnancy-Related Deaths in Mississippi, 2016-2020 (n=65)

The MMRC process helps its members identify pregnancy-related deaths in the state. According to the MMRC process, members decide whether or not the death is pregnancy-related if at least one the following conditions are involved:

1. The death occurred during pregnancy or within one year of the end of pregnancy from a pregnancy complication.
2. A chain of events initiated by pregnancy occurred.
3. The aggravation of an unrelated condition caused the death due to the physiologic effects of pregnancy.

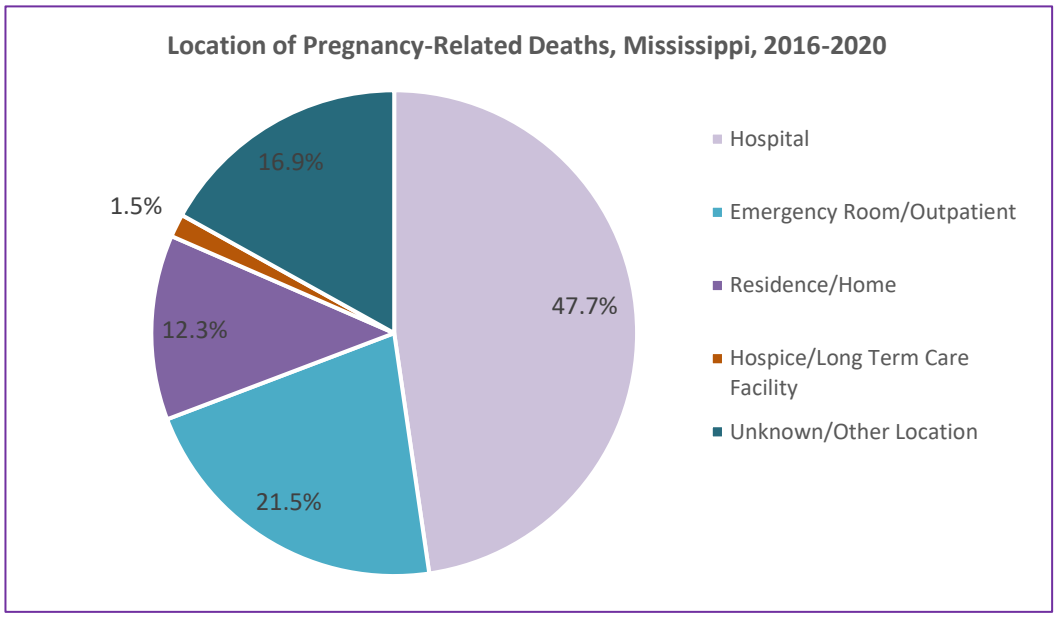
The tables and graphs in this section show the analyses for (1) location of the deaths; (2) timing of prenatal care; (3) public health district/geographical analyses; (4) and insurance status among **all pregnancy-related** deaths from 2016-2020.

Location of death

Among pregnancy-related deaths, 31 deaths (47.7%) occurred in a hospital and/or inpatient setting; 14 (21.5%) of the deaths occurred in an emergency room or outpatient healthcare setting. In addition, 8 (12.3%) of the deaths occurred at the residence/home of the deceased. There was one (1.5%) that occurred in a hospice facility. Eleven (16.9%) did not have a location listed and/or was unknown in the women's records.

The table and chart below illustrate the location of death for all **pregnancy-related** (n=65) deaths from 2016-2020.

	Pregnancy Related	
Location of Death	**Count**	**%**
Hospital	31	47.7%
Emergency Room/Outpatient	14	21.5%
Residence/Home	8	12.3%
Hospice/Long Term Care Facility	1	1.5%
Unknown/Other Location	11	16.9%
TOTAL	**65**	**100%**

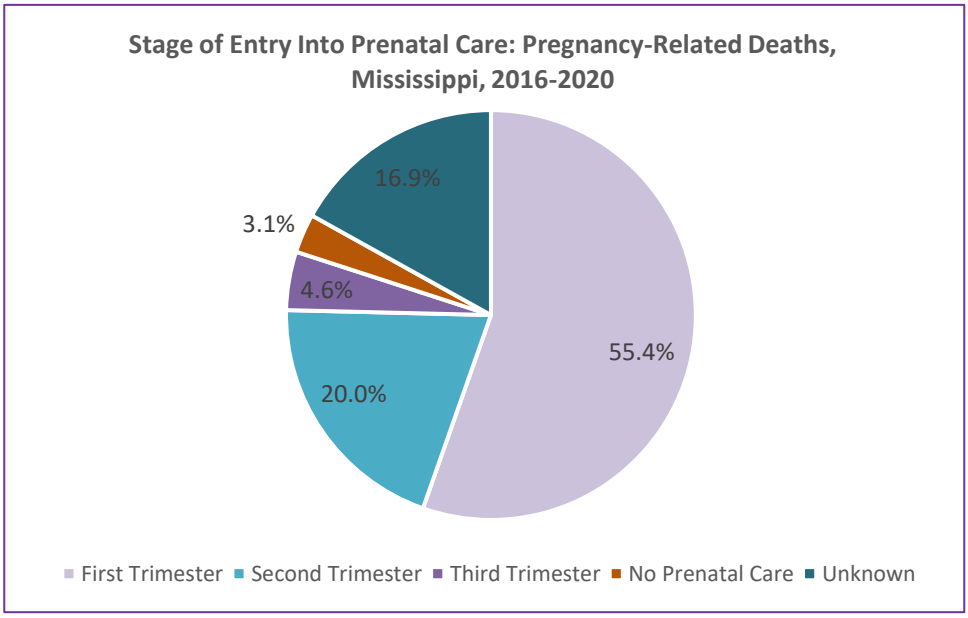


Timing of prenatal care

Of the **pregnancy-related** deaths, 36 deaths (55.4%) occurred among women who began prenatal care in the first trimester, 13 deaths (20%) occurred among women began prenatal care in the second trimester, and 3 deaths (4.6%) occurred among women beginning prenatal care in the third trimester. There were 2 (3.1%) deaths that occurred whereby the women did not have any prenatal care. During the five-year period, there were 11 (16.9%) deaths that were unknown as to when the women entered into prenatal care.

The table and chart below indicate the timing of prenatal care among **pregnancy-related** deaths that occurred from 2016-2020:

	Pregnancy Related	
Entry to Prenatal Care	**Count**	**%**
First Trimester	36	55.4%
Second Trimester	13	20.0%
Third Trimester	3	4.6%
No Prenatal Care	2	3.1%
Unknown	11	16.9%
TOTAL	**65**	**100%**



Public Health District/Geography

As indicated below, from 2016-2020, the majority (30.8%) of pregnancy-related deaths occurred in Public Health District V, which represents the central part of the state. A map of Mississippi's nine (9) public health districts is located in the Appendix.

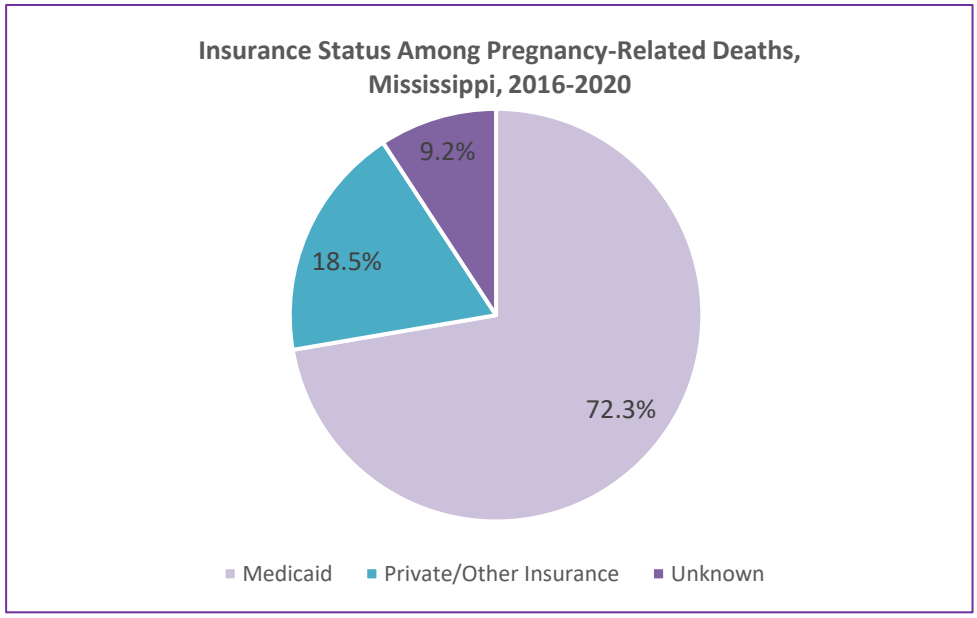
Note: In accordance with MSDH policy, counts of 1-4 are suppressed to protect privacy.

Public health District	Pregnancy-Related Deaths Number (#)	Pregnancy-Related Deaths Percent (%)
I	<5	---
II	8	12.3%
III	13	20.0%
IV	<5	---
V	20	30.8%
VI	<5	---
VII	<5	---
VIII	8	12.3%
IX	6	9.2%
TOTALS	**65**	**100%**

Insurance status

As indicated in the table and chart below, data from 2016-2020 indicated that 47 (72.3%) of **pregnancy-related** deaths were among women who had Medicaid at the time of delivery. In addition, 12 (18.5%) had private and/or another insurer and 6 (9.2%) were unknown. Abstracted medical records were used to determine their insurers and were entered in the MMRIA system.

	Pregnancy Related	
Insurance Provider	**Count**	**%**
Medicaid	47	72.3%
Private/Other Insurance	12	18.5%
Unknown	6	9.2%
TOTAL	**65**	**100%**



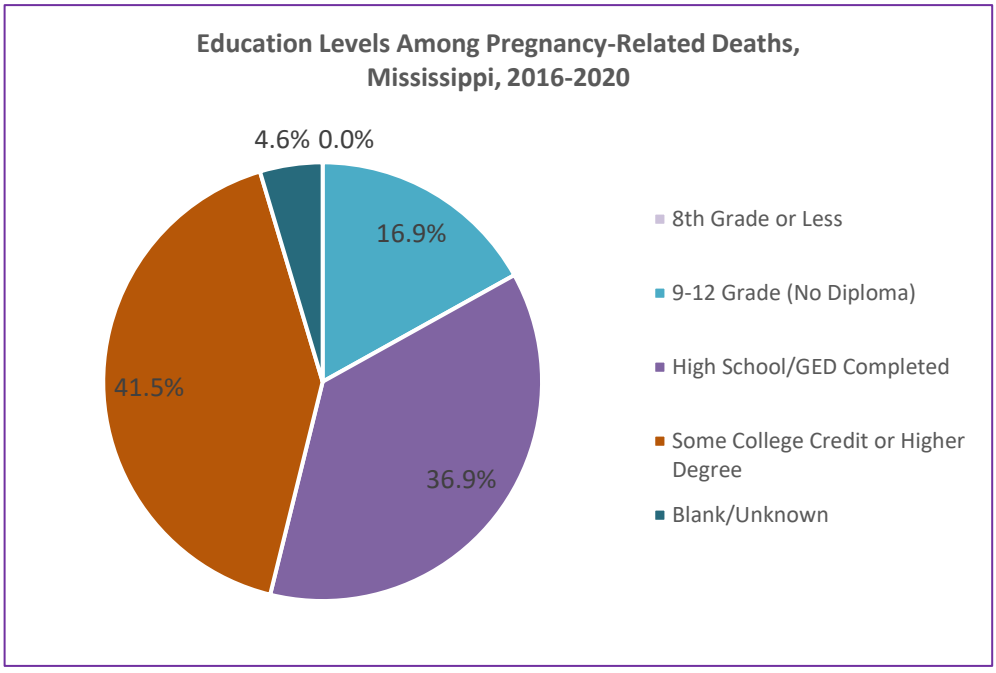
Education Status

Education data are captured in the MMRIA system for **all pregnancy-associated** deaths and are grouped into the following categories:

- 8th Grade or Less
- 9-12th Grade/No Diploma
- High School/GED Completed
- Some College Credit, No Degree
- Associate degree
- Bachelor's Degree
- Master's Degree
- Doctorate or Professional Degree
- Blank/Unknown

As indicated in the table and graph below, the majority (41.5%) of women whose death was **pregnancy-related** had some college credit (with and without a college degree) or higher educational degree.

	Pregnancy Related	
Level of Education	**Count**	**%**
8th Grade or Less	0	0%
9th – 12th Grade (No Diploma)	11	16.9%
High School/GED Completed	24	36.9%
Some College Credit (No Degree)	10	15.4%
Associate Degree	6	9.2%
Bachelor's Degree or Higher	11	16.9%
Blank or Unknown	3	4.6%
TOTAL	**65**	**100%**



Leading Causes of Pregnancy-Related Deaths in Mississippi, 2016-2020 (n=65)

During the review process by members of the MMMRC, causes of death are grouped in accordance to contributing factors. This grouping includes whether the cause of death was an underlying, contributing, immediate and/or other significant factor. The MMRIA system utilizes the Pregnancy Mortality Surveillance System (PMSS) maternal mortality cause of death lists or PMSS-MM codes. The PMSS-MM codes were developed by CDC and the American College of Obstetricians and Gynecologists (ACOG) Maternal Mortality Study Group classifying pregnancy-related deaths.

Pregnancy-related underlying causes of death determined by the MMRC

Of the 65 **pregnancy-related deaths**, cardiovascular related conditions (excluding cardiomyopathy, hypertensive disorders of pregnancy, and cerebrovascular accidents) were the most common for immediate, contributing, and underlying causes of death from 2016-2020.

The table below illustrates the top five immediate, contributing, and underlying causes of pregnancy-related deaths from 2016-2020. This list does not account for the number of deaths, but rather the number of conditions grouped in each category. Because some women died from multiple immediate, contributing, and/or underlying factors, data were analyzed by actual conditions rather than the number of deaths.

Top 5 Immediate, Contributing, and Underlying Causes of Pregnancy-Related Deaths	Count
Cardiovascular-Related (excluding cardiomyopathy)	14
Cardiomyopathy	8
Embolisms (includes pulmonary and amniotic fluid)	11
Metabolic/Endocrine Conditions	5
Sepsis and Other Infections (including septic shock)	5

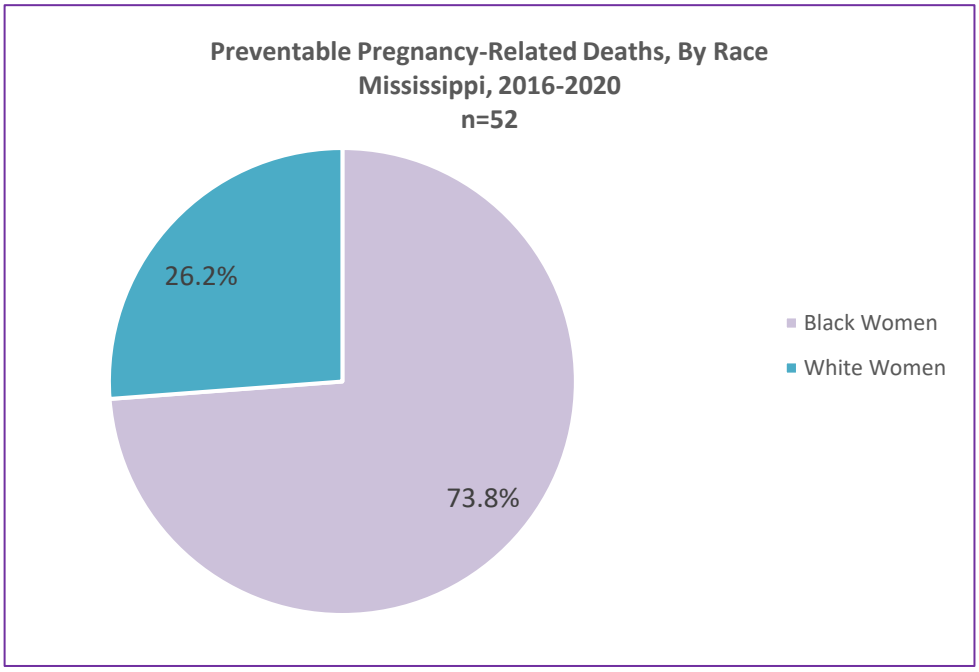
Note: This table includes the count of conditions and not deaths.

PREVENTABILITY AND CONTRIBUTING FACTORS

As indicated in the table below, of the 65 **pregnancy-related** deaths reviewed by the MMRC from 2016-2020, 52 **(80%)** were determined by the committee to be preventable. A preventable death is defined as one that has some chance of not occurring if one or more factors and/or chain of reactions did or didn't happen as a result of her death. As evidenced by the World Health Organization (2023), most maternal deaths are preventable, as the healthcare solutions to prevent or manage complications are well known.

	Pregnancy Related	
Was the Pregnancy-Related Death Preventable?	**Count**	**%**
Yes	52	80.0%
No	10	15.4%
Undetermined/Unknown	3	4.6%
TOTAL	**65**	**100%**

As indicated in the chart below, of the 52 pregnancy-related deaths that were deemed preventable, 31 (59.6%) were among Black women and 11 (40.4%) were among White women.



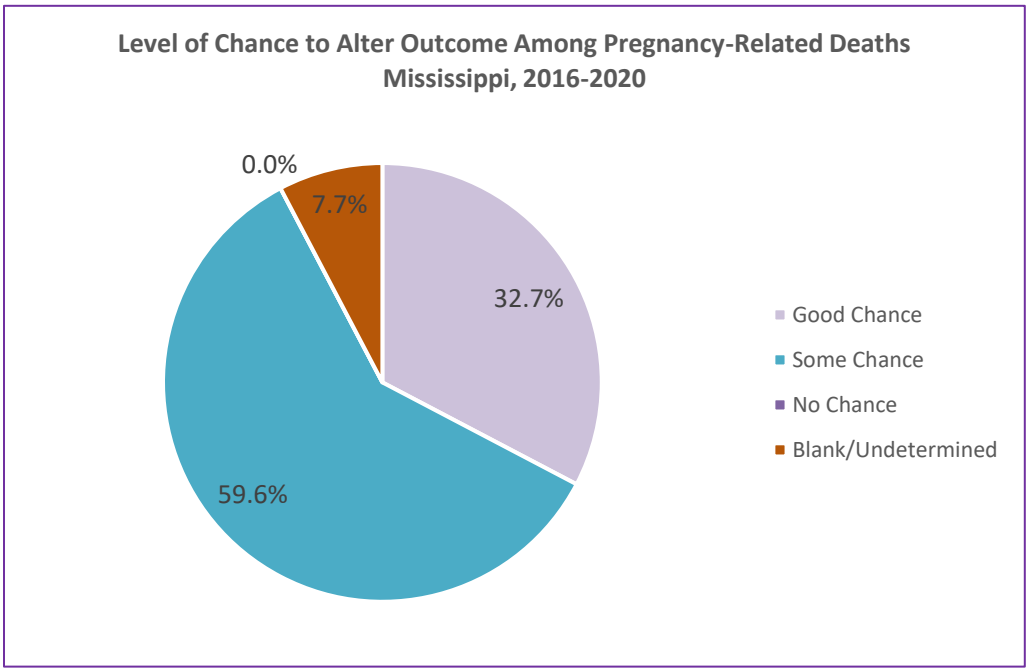
Altering the Outcome, Pregnancy Related Deaths

One of the major tasks of the MMRC is to determine if pregnant-related deaths were not only preventable, but also assessing available information to decide the chance of altering the outcome of death. The committee determines if either (a) there was a good chance to alter the outcome; (b) there was some chance to alter the outcome; (c) there

was no chance to alter the outcome; or (d) it was undetermined if the outcome could/should have been altered.

As indicated in the table and graph below, of the 52 preventable pregnancy-related deaths, 48 **(92.3%)** had some level of chance to alter the outcome (death).

	Pregnancy Related	
What Chance Was There to Alter Outcome?	**Count**	**%**
Good Chance	17	32.7%
Some Chance	31	59.6%
No Chance	0	0%
Blank/Undetermined	4	7.7%
TOTAL	**52**	**100%**



Contributing Factors of Pregnancy-Related Deaths, MMRC Results, 2016-2020

In some cases, there may be other contributing factors among all **pregnancy-related** deaths that the MMRC deemed as a contributor to death. During each review/convening, the committee answers the following questions as they relate to factors that may have contributed to the women's deaths:

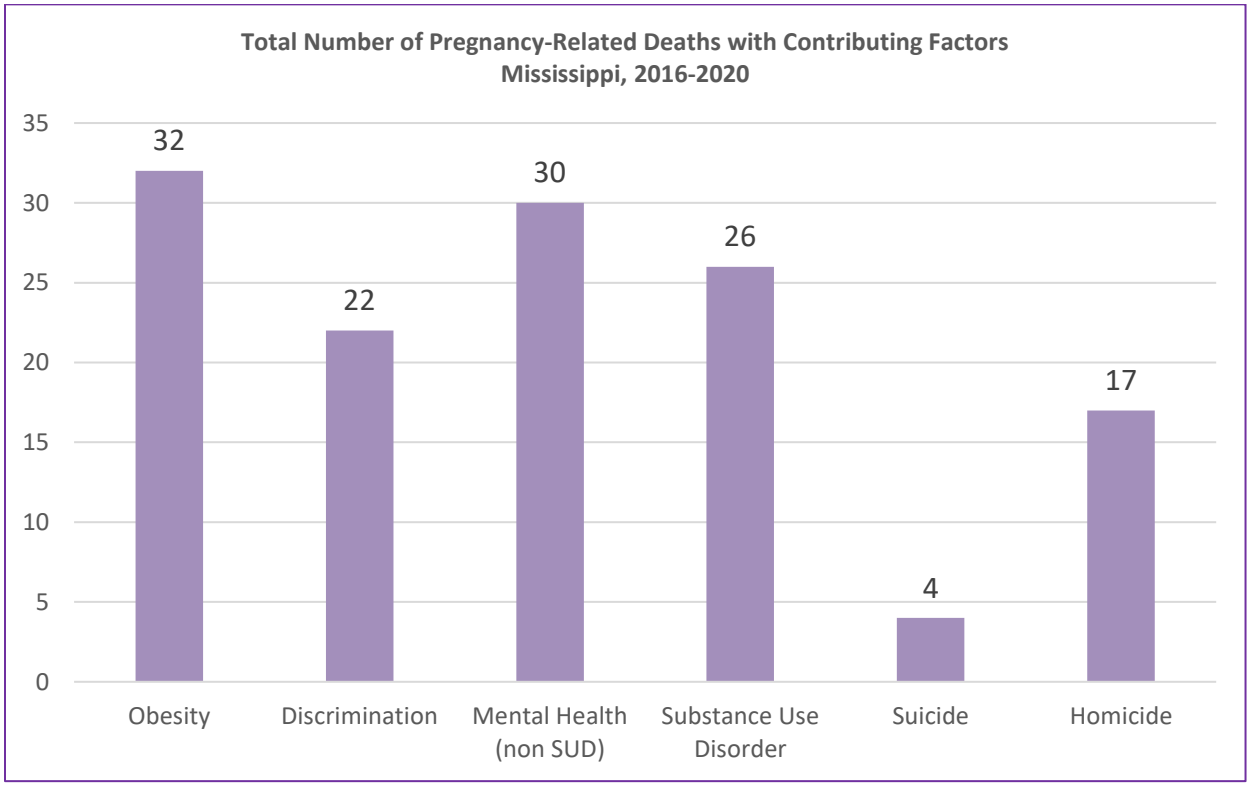
1. Did obesity contribute to the death?
2. Did discrimination contribute to the death?
3. Did mental health conditions other than substance use disorder contribute to the death?
4. Did substance use disorder contribute to the death?
5. Was this death a suicide?

6. Was this death a homicide?

The table and graph below illustrate the contributing causes of death as identified by the MMRC utilizing death certificates, abstracted medical records, and other supporting documentation. The surveillance data extracted from the MMRIA system were analyzed based on the MMRC's decision responses of "yes" and "probably" as to whether the factors contributed to the deaths.

	Number of Deaths (By Year)					
Contributing Factors (Pregnancy-Related Deaths)	**2016**	**2017**	**2018**	**2019**	**2020**	**Five Year Totals**
Obesity contributed to the death	4	9	6	5	8	**32**
Discrimination contributed to the death	0	5	3	9	5	**22**
Mental health conditions contributed to the death (excluding substance use disorders)	3	7	6	5	9	**30**
Substance use disorder (SUD) contributed to the death	4	5	4	3	10	**26**
Death was a suicide	2	1	1	0	0	**4**
Death was a homicide	0	3	4	4	6	**17**

Note: Some pregnancy-related deaths had multiple contributing factors.
Note: The *Discrimination* contributing factor was added to reviews after 2016



MMRC RECOMMENDATIONS

Federal, State, and Local Government

Medicaid expansion should be incorporated for rural hospitals to remain open and include access to telehealth services. There is a need for rural healthcare facilities to provide higher levels of critical care, recruit and retain adequate providers, and have access to life saving equipment, especially in the most vulnerable areas of the state.

County and city governmental officials must increase access to rural roads, add streetlights to darker areas of the city/county, and improve overall local infrastructure to better accommodate citizens needing emergency services.

A more robust Global Positioning System (GPS) and affiliated services for rural areas should be improved for better navigation, especially for emergency personnel.

The State of Mississippi should develop a standardized policy for paid maternity leave for working women who recently delivered.

The State of Mississippi should provide incentives for any provider practicing in rural and/or impoverished areas of the state.

Federal and state public health leaders and/or entities should address public health emergency concerns early and accurately disseminate consistent information through the appropriate channels.

Federal and state government should support efforts to eliminate fentanyl being easily accessible to people in the United States.

There should be resources available for maternal mental health conditions statewide. In addition, a perinatal mental health program should be established.

The Mississippi State Department of Health and/or State Department of Mental Health should assist in recruiting more mental health and substance abuse providers in the state. In addition, these agencies should collaborate to develop perinatal mental health and substance use disorder divisions within the agencies.

The Mississippi Division of Medicaid should develop a statewide portal in order for all providers to see what medications have been currently/previously prescribed for patients in Mississippi.

Local and state government(s) should consider sensible control measures (i.e. background checks) to improve gun safety and purchases in Mississippi.

The Mississippi State Department of Health should promote/publicize the availability and proper use of Narcan statewide using the ODFREE.org website.

The Mississippi Office of the Attorney General should continue to globally promote the Mississippi Access to Maternal Assistance (MAMA) initiative and technology.

National and state agencies must provide resources to quickly disseminate information about emerging public health threats (i.e. epidemics, pandemics, etc.).

A statewide perinatal regionalization model should be developed to coordinate transfer of patients with obstetric emergencies and high-risk maternal patients.

The state should consider a policy to change the mandated 30-day Medicaid policy to pay for tubal ligations for unwanted fertility.

The state of Mississippi and county-level administrators should invest more resources in rural health emergency services.

Healthcare Systems and Providers

Hospital systems, providers, and other health systems should have policies and procedures readily available to identify POTENTIAL and/or suspected victims [patients] of human trafficking.

Hospital systems, providers, and other health systems should develop procedures and/or trainings to address maternal patients with severe complaints for the same health concern. Bias/Discrimination training should be included, especially in caring for pregnant and postpartum women.

Medical providers, healthcare systems, etc. should ensure that high risk obstetric patients have referrals for contraception.

Training is needed for medical providers/personnel to identify human trafficking which includes providing resources to suspected cases.

Drug and naloxone treatments should be readily and/or easily accessible for anyone experiencing substance use disorder, especially postpartum women.

Improve utilization of telehealth services in rural areas for pregnant women and families to easily access maternal and fetal medicine specialists.

Develop algorithm for toolkits focusing on postpartum care, especially for cardiologists and related medical professionals.

Healthcare professionals/providers should not delay treating patients with syncope symptoms. A full workup is needed which would include a cardiopulmonary assessment with possibly ruling out pulmonary embolism and arrhythmia.

Utilize and/or develop standardized criteria to determine indications for ruling out cardiopulmonary causes of maternal and postpartum symptoms. Maternal early warning signs should be implemented universally and applied to pregnant and postpartum women.

Hospital/Healthcare systems should have methods in place to identify unexplained inadequate care and offer a safe space for patients to report their feelings on whether they are receiving adequate treatment in real time. Incorporating a patient complaint process would be beneficial for any providers who encounter pregnant or postpartum women.

Healthcare providers must recognize the importance for stabilizing critically ill pregnant women and those who recently delivered and have a plan of treatment readily available.

Healthcare organizations should provide annual trainings/information/education about critically ill patients.

Maternal care providers should properly screen for intimate partner violence (IPV) cases and have resources readily available for patients who experience this issue.

Providers should be educated on options for treatment for women with mental health conditions during and after pregnancy.

All healthcare providers should have knowledge and/or education regarding urgent maternal warning signs.

All healthcare facilities should be utilizing electronic health records (EHRs) to prevent unreadability and/or misunderstandings of patients' care.

Providers should incorporate measures/screenings for possible Intimate Partner Violence (IPV) and/or Domestic Violence (DV) cases and provide appropriate referrals for maternal patients. This should happen at various intervals during pregnancy and should be a routine assessment that occurs throughout pregnancy and up to one-year postpartum.

Case managers, patient navigators, social workers, etc. working in obstetric clinics and/or maternity care providers should collaborate to help ensure treatment transparency for particularly complex patients where providers don't share or have access to an electronic health record (EHR).

Access to Human Immunodeficiency Virus (HIV) medications and/or treatment should be readily available and accessible for all HIV patients.

There should be communication between all providers caring for the same patient during the same time period. Mental health providers should be included in the communication loop (if applicable) and equipped to handle all referrals from other providers.

Providers should not dismiss patients' health-related complaints, especially if they are repeated/repetitive and/or results in numerous returns for the same complaint.

A coordinated system of care program (or similar) and/or home visiting program should be recommended/necessary for some high-risk maternal patients.

Healthcare providers should be cognizant of potential mistreatment/discrimination that is sometimes shown to patients who are frequent drug users.

When healthcare providers decide to transfer maternal patients, there should be a fetal assessment completed and knowledge of early maternal warning signs readily available.

Healthcare facilities/organization should consider incorporating human trafficking training for OB/ER providers.

Maternal patients who are obese need to be referred for obesity management and treatment options.

Communities/Organizations

Increase trauma training and access to treatment for pregnant and postpartum women and their families who have a history and/or currently experiencing substance use disorders (SUDs).

Community leaders and members should be properly educated and learn how to screen for potential cases of intimate partner violence. Resources should be readily available to offer to women and other people who are suffering from intimate partner violence (IPV).

Community and healthcare organizations should provide patients/families with access to quality mental health and substance abuse resources.

Community and/or healthcare organizations should provide Narcan to patients and/or their families who have a history of opioid drug use/disorders.

Access to contraceptives should be easily and readily available via community and/or healthcare organizations.

Employers

Women should have adequate paid maternity leave to allow for the appropriate amount of recovery time needed before returning to work after giving birth.

Organizations that employ social workers, medical professionals, emergency responders, public health staff, etc. should provide training on how to identify potential cases of IPV.

Increased mental health resources should be provided to organizations who employ psychiatrists, mental health professionals, social workers, etc.

Licensing and Regulatory Agencies/Organizations

The Department of Public Safety, State Medical Examiner's Office should have more comprehensive standards for coroners and allow death certificates to be medically adjudicated by medical professionals if the person died from a medical condition.

Coroners and other professionals should be educated about Human Immunodeficiency Virus (HIV) postmortem discriminatory practices.

The Department of Public Safety, State Medical Examiner's Office should mandate that all coroners perform autopsies on all maternal deaths (including pregnant women, if known) unless the family/next of kin opts out.

Regulatory agencies should not provide approval for a firearms/weapons for people who have been involved in a prior domestic violence issue/crime.

Patients and Families

Patients and their families must adhere to and take medications as prescribed by the provider.

Families should be educated on the utilization and prescribing of psychiatric medications that are appropriate to use during pregnancy.

Patients and their families should be educated on maternal early warning signs.

RESOURCES

Data & Statistics

- **Centers for Disease Control & Prevention, Pregnancy Mortality Surveillance System**

  https://www.cdc.gov/reproductivehealth/maternal-mortality/pregnancy-mortality-surveillance-system.htm

- **Centers for Disease Control & Prevention, Enhancing Reviews and Surveillance to Eliminate Maternal Mortality (ERASE MM)**
  https://www.cdc.gov/reproductivehealth/maternal-mortality/erase-mm/index.html

Maternal Mortality Review Committees

- **Review to Action: Working Together to Prevent Maternal Mortality**
  http://reviewtoaction.org/

Patient Safety Bundles & Toolkits

- **Alliance for Innovation on Maternal Health (AIM)**
  https://saferbirth.org/
- **Council for Patient Safety in Women's Healthcare-Alliance for Innovation in Maternal Health**
  https://safehealthcareforeverywoman.org/
- **Association of Women's Health, Obstetric & Neonatal Nurses – Clinical and Practical Resources**
  https://www.awhonn.org/nurse%E2%80%90resources/
- **Centers for Disease Control and Prevention, HEAR HER Campaign**
  https://www.cdc.gov/hearher/

Patient Advocacy and Resources

- **ACOG After Pregnancy – Educational Material for Patients**
  https://www.acog.org/womens-health/pregnancy/after-pregnancy
- **My Birth Matters**
  https://www.cmqcc.org/my-birth-matters
- **Count the Kicks**
  https://countthekicks.org/
- **Postpartum Support International**
  https://www.postpartum.net/

- **Preeclampsia Foundation**
  https://preeclampsia.org/
- **Mississippi Access to Maternal Assistance**
  https://mama.ms.gov/

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APPENDIX

Mississippi Public Health District Map