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MISSISSIPPI MATERNAL MORTALITY REPORT

2017-2021 (includes COVID-19 Data)

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.
[Data are current as of November 2024]

Table of Contents

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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 2024 Maternal Mortality Report. This report builds on the important work of the Maternal Mortality Review Committee (MMRC) and includes findings for maternal deaths which occurred from 2017-2021. 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. This report for deaths occurring from 2017-2021 is especially important, as it informs us of the devastating impact that COVID-19 had on maternal deaths in 2020 and 2021.

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.

The MMRC, consisting of professionals from various organizations, disciplines, and backgrounds, met six times in calendar year 2024 to review 54 maternal deaths from 2021. This work, as difficult as it may be, remains critical for improving health outcomes for all women, children, and families. However, the work of the MMRC and the data produced does not impact change in isolation; deliberate and collaborative work to act on recommendations must occur 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 2017-2021 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
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Key Definitions and Acronyms

DEFINITIONS

1. **Contributing Cause of Death:** Disease, injury, etc. that contributed to the death, but was not the primary/immediate cause of the death.
2. **Discrimination:** Treating someone less or more favorably based on the group, class, or category they belong to resulting from biases (including implicit and explicit), prejudices, and/or stereotyping.
3. **Immediate Cause of Death (Primary):** Final disease or condition resulting in death.
4. **Maternal Death:** Death from any cause related to or aggravated by pregnancy or its management (excluding accidental or incidental causes) during pregnancy and childbirth or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy (WHO, 2023).
5. **Maternal Mortality:** Deaths of women that occur due to complications from pregnancy or childbirth (UNICEF, 2023).
6. **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).
7. **Pregnancy-Associated Deaths:** Includes all deaths that occur during pregnancy OR within one year of the end of pregnancy regardless of the cause.
8. **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.
9. **Pregnancy-Related Mortality Ratio:** Rate that measures the number of deaths that occurred during pregnancy or within one year after pregnancy.
10. **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 the postpartum period. Maternal mortality impact families, communities, and the entire state. From 2021 to 2022, the nation experienced a decrease in maternal mortality (Hoyert, 2023); however, improvements are still needed to further decrease the rates across the United States.

The Mississippi Maternal Mortality Review Committee (MMRC) is tasked with reviewing pregnancy-associated 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 Summaries, Mississippi, 2021:

- In 2021, there were 61 pregnancy-associated deaths in Mississippi (included all causes of deaths).
- 36% of pregnancy-associated maternal deaths in 2021 were determined by the MMRC to be directly related to the pregnancy.
- COVID-19 was an underlying or contributing cause of death in 17% of pregnancy-associated deaths from 2020-2021.

Five-Year Maternal Mortality Summaries, Mississippi, 2017-2021:

- From 2017-2021, a total of 202 pregnancy-associated deaths were reviewed in which 38% were identified as pregnancy-related deaths.
- During the five-year period (2017-2021), 36.3% 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 (2017-2021), 83% of pregnancy-related deaths were deemed preventable.
- COVID-19 heavily contributed to adverse outcomes for Mississippi's maternal population in 2020 and 2021.

Summary of Key High Impact MMRC Recommendations (2021 Reviews):

- The state should expand Medicaid. Designations for women and children should be considered with some of the money allocated to resources for maternal and child health populations
- All health providers should be educated about preeclampsia, blood pressure monitoring, hypertension, and related maternal warning signs/symptoms.
- There should be universal mental health screenings with resources available to providers for follow-up with knowledge on how, when and where to refer patients.
- All providers should be trained in cultural competency and how culture impacts the way they communicate with families.
- Providers should elevate patients with hypertensive/cardiac conditions in pregnancy to be seen within a week postpartum. They should have appointments set prior to discharge.
- Emergency Room Departments across should increase awareness for pregnancy and pregnancy-related complications.
- Community organizations may provide resources to educate men and women on the identification of unhealthy relationships, interpersonal violence (IPV), emotional/mental abuse, etc.
- Communities, medical, and public health professionals should communicate a sense of urgency around urgent maternal warning signs.
- Patients/Families should have access to [and education for] remote blood pressure monitoring systems/services and equipment, especially in rural areas within the state. This enhances the care for pregnancy and post-partum women who are hypertensive.

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 and/or 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, maternal deaths up to one year after the end of pregnancy are included. In addition, this report also summarizes pregnancy-associated deaths that occurred in Mississippi during the years of 2017-2021.

The majority of this report refers to pregnancy-related deaths. According to CDC (2024), deaths related to pregnancy are rare, however, too many people still die each year in the United States from complications due to pregnancy. Further, national data indicate that most pregnancy related deaths are preventable (CDC, 2024). The current percentage of preventability of pregnancy-related deaths for Mississippi is 83% compared to 84% (CDC,2024) nationally.

Maternal Health Burden of COVID-19 (2020 & 2021)

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 this disease. Progressing to 2021, COVID-19 deaths increased in Mississippi particularly due to the onset of the Delta variant that developed during the Spring of that year. This trend of increasing overall COVID-19 deaths was followed by a spike in pregnancy-associated deaths. In general, 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 conditions/infections especially among vulnerable populations such as pregnant and postpartum patients.

In 2020 and 2021, there were a total of 109 pregnancy-associated deaths in Mississippi. Of this number, **19 (17%)** of the deaths were either immediately caused by and/or were attributed to COVID-19. Among the number of deaths that were attributed to COVID-19, 58% were Non-Hispanic Black, 16% were Non-Hispanic White, 16% were Hispanic, and 10% were Other Races. During these two years, 26% of the women were pregnant at the time of death among the COVID-19 deaths.

When examined by age group, 37% of pregnancy-associated COVID-19 deaths occurred among women who were between the ages of 35-39 in Mississippi.

After reviews of 2020 and 2021 cases by the MMRC, 79% of COVID-19 deaths were deemed pregnancy-related; out of the pregnancy-related COVID-19 deaths, 47% were deemed preventable. The MMRC did take into consideration the public health policies that were established during those years. Emphasis was placed on prioritizing patients who were diagnosed with COVID-19 due to the rapidity of progression of death among some patients, especially those with other vulnerabilities and/or pre-existing conditions. In addition, the lack of hospital resources added additional burdens, thus allowing facilities to reserve critical units for COVID-19 patients versus those with other illnesses and/or health conditions.

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 2021 pregnancy-associated deaths, the MMRC convened six (6) times from January 2024 through October 2024. There was a total of 61 pregnancy-associated deaths in which 54 (88%) were reviewed. The remaining 7 (11%) 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 in Mississippi.

To identify pregnancy-associated deaths that occurred in Mississippi (by residence), potential maternal deaths are first identified via the state Office of Vital Records. Pregnancy-associated 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. If found not to be pregnancy-associated, these are either removed or not uploaded to MMRIA, thus are not counted as a maternal death. Non-Mississippi resident pregnancy-associated deaths were also excluded from MMRC 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 five 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 good chance, to alter the outcome. For the pregnancy-related deaths which were considered preventable, the committee also reviewed potential contributing factors of the death(s). Recommendations were then generated by the MMRC in an effort to provide information to prevent additional maternal deaths in Mississippi.

Overview: Pregnancy-Associated Deaths in Mississippi

Overview of Pregnancy-Associated Deaths by Relatedness

From 2017-2021, there were a total of 181,659 live births to Mississippi residents. Over the five-year period, the highest number of live births were recorded in 2017 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 ratios outlined in this report.

YEAR	TOTAL LIVE BIRTHS
2017	37,370
2018	37,009
2019	36,634
2020	35,480
2021	35,166
FIVE YEAR TOTAL	**181,659**

Even though this report heavily focuses on pregnancy-related deaths, it is noted that a total of 202 **pregnancy-associated deaths** occurred from 2017-2021 among Mississippi residents. Pregnancy-associated deaths include **all** deaths **(regardless of cause of death)** that occurred among women who were pregnant and/or had given birth up to one year (365 days) before death. Of the state's pregnancy-associated deaths, 37 (18%) were related to motor vehicle-related deaths and were excluded from the actual MMRC review process. Of the number of pregnancy-associated deaths, 77 (38%) were determined to be pregnancy-related, 105 (52%) were pregnancy-associated but not related, and 20 deaths (10%) were determined to be pregnancy-associated but their relatedness could not be determined.

Among the pregnancy-associated deaths, 130 (64.3%) were among Black, Non-Hispanic women; 59 (29.2%) were among White, Non-Hispanic women; 6 (3%) were among Hispanic women; and 7 (3.5%) were among women of Other Races. Of all **pregnancy-related deaths,** the vast majority (78%) occurred among Black, Non-Hispanic women.

Interpersonal Violence (IPV) among Pregnancy-Associated Deaths, 2017-2021 (n=27)

Interpersonal Violence (IPV) may be defined as the intentional use of force or power against other persons by an individual or small group of individuals (Mercy, et. al, 2017). Inclusive of IPV, intimate partner violence is defined as the abuse or aggression that occurs in romantic relationships which may involve current and former spouses and/or dating partners (CDC, 2024). During 2017-2021, Mississippi had 27 **pregnancy-associated** deaths that directly resulted in instances related to IPV in the form of homicides. These IPV deaths **were not** pregnancy-related homicides. Of note, national data indicate that less than half of violent victimizations are never reported to the police (Morgan & Truman, 2020), thus suggesting that IPV rates and cases may be higher.

For the period of 2017-2021, the majority (56%) of IPV cases reviewed by the MMRC during this period were caused by intimate partners. IPV affected younger women, with most of the cases (48%) impacting women ages 17-24.

Pregnancy-Related Deaths in Mississippi

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.

The MMRC process helps its members identify pregnancy-related deaths in the state. According to the MMRC process, members decide whether 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.

As indicated in the following table, which is inclusive of COVID-19 deaths, Mississippi's **pregnancy-related** mortality ratio in 2021 was 62.6 per 100,000 live births, which is an increase from the previous year of 42.2 per 100,000 live births. The state's pregnancy-related mortality ratio for the five-year period was 42.4 per 100,000 live births.

YEAR	*Pregnancy Related*		Total Births
	Count	Ratio	
2017	11	29.4	37,370
2018	14	37.8	37,009
2019	15	40.9	36,634
2020	15	42.2	35,480
2021	22	62.6	35,166
TOTAL	**77**	**42.4**	**181,659**

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

The table below indicates the pregnancy-related mortality ratios if COVID-19 was not an underlying, contributing, and/or immediate cause of death. This table further highlights the burden COVID-19 had on maternal health in Mississippi. This suggests that if the COVID-19 pandemic had not occurred during 2020-2021, it is highly likely that Mississippi's **five-year** pregnancy-related mortality

ratio would have indicated a decrease **[from 42.4 to 34.1 per 100,000 live births]** from 2017-2021.

YEAR	*Pregnancy Related*		Total Births
	Count	Ratio	
2017	11	29.4	37,370
2018	14	37.8	37,009
2019	15	40.9	36,634
***2020**	11	31.0	35,480
***2021**	11	31.3	35,166
TOTAL	**62**	**34.1**	**181,659**

* excluded COVID-19 pregnancy-related deaths in 2020 & 2021, w/ live births remaining unchanged

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

Race and Ethnicity	*Pregnancy Related*		2017-2021 Total Births (by race/ethnicity)
	Count	Ratio	
Black, Non-Hispanic	60	77.6	77,321
White, Non-Hispanic	13	14.3	91,040
Hispanic	1	12.5	8,023
Other/Unknown Races (includes Non-Hispanic)	3	56.9	5,275
TOTAL	**77**	**42.4**	**181,659**

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

Data Tables and Graphs (Pregnancy-Related Deaths)

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/regions; (4) insurance status; and (5) education status among **all pregnancy-related** deaths from 2017-2021. For the five-year period (2017-2021), there were a total of **77 pregnancy-related deaths**.

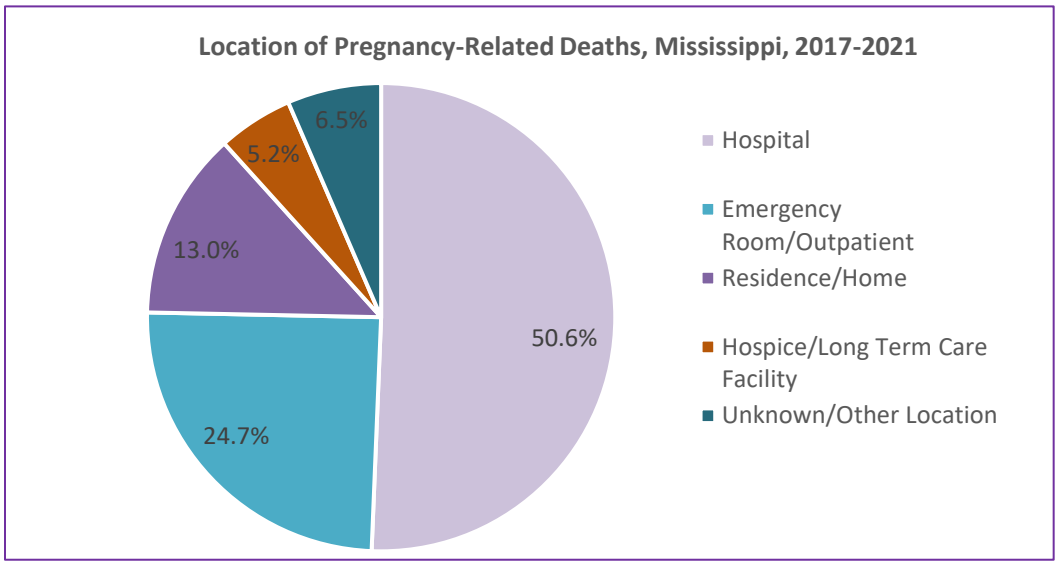
Location of death

Among pregnancy-related deaths, 39 deaths (50.6%) occurred in a hospital and/or inpatient setting; 19 (24.7%) of the deaths occurred in an emergency room or outpatient healthcare setting. In addition, 10 (13%) of the deaths occurred at the residence/home of the deceased. There were four (5.2%) that

occurred in a hospice [or related] facility. Five (6.5%) 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=77) deaths from 2017-2021.

	Pregnancy Related	
Location of Death	**Count**	**%**
Hospital	39	50.6%
Emergency Room/Outpatient	19	24.7%
Residence/Home	10	13.0%
Hospice/Long Term Care Facility	4	5.2%
Unknown/Other Location	5	6.5%
TOTAL	**77**	**100%**

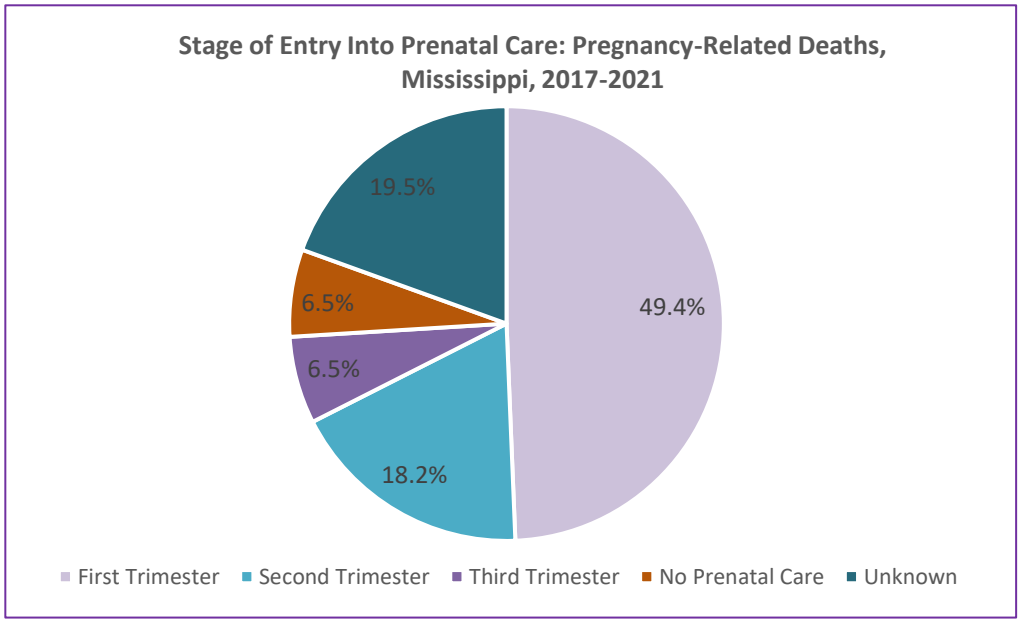


Timing of prenatal care

Of the **pregnancy-related** deaths, 38 deaths (49.3%) occurred among women who began prenatal care in the first trimester, 14 deaths (18.2%) occurred among women began prenatal care in the second trimester, and 5 deaths (6.5%) occurred among women beginning prenatal care in the third trimester. There were 5 (6.5%) deaths that occurred whereby the women did not have any prenatal care. During the five-year period, there were 15 (19.5%) deaths that were unknown as to when the women entered into prenatal care.

The following table and chart indicate the timing of prenatal care among **pregnancy-related** deaths that occurred from 2017-2021:

	Pregnancy Related	
Entry to Prenatal Care	**Count**	**%**
First Trimester	38	49.3%
Second Trimester	14	18.2%
Third Trimester	5	6.5%
No Prenatal Care	5	6.5%
Unknown	15	19.5%
TOTAL	**77**	**100%**

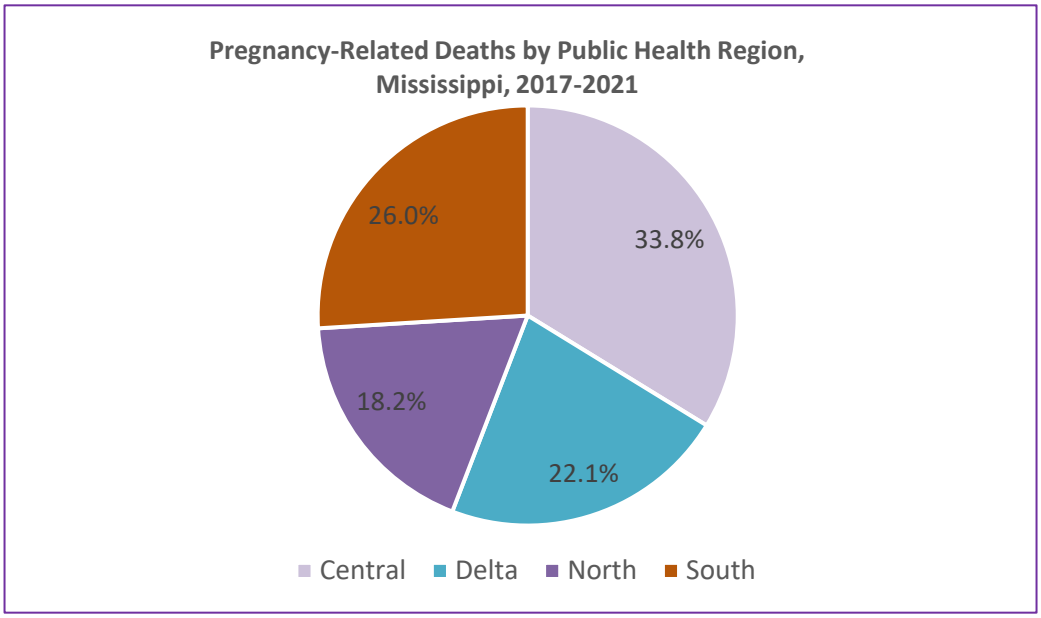


Public Health Region/Geography

In 2024, the MSDH modified the public health district map to be more representative of the state. There are now 4 public health regions compared to the nine that were identified in past maternal mortality reports. The new public health regions are Central, Delta, North, and South regions. A map of Mississippi's realigned public health regions is located in the Appendix (A).

As indicated in the following table and graph, from 2017-2021, 33.8% of **pregnancy-related** deaths occurred in the Central Region of the state. The second largest percentage (26.0%) of pregnancy-related deaths occurred in the South(ern) Public Health Region.

Public Health Region	Pregnancy-Related Deaths Number (#)	Pregnancy-Related Deaths Percent (%)
Central	26	33.8%
Delta	17	22.1%
North	14	18.2%
South	20	26.0%
TOTALS	**77**	**100%**



The table below indicates the pregnancy-related mortality ratio by public health region for the five-year period (2017-2021). As indicated, the ratio was highest in the Delta Region compared to the others. These ratios also include COVID-19 pregnancy-related deaths.

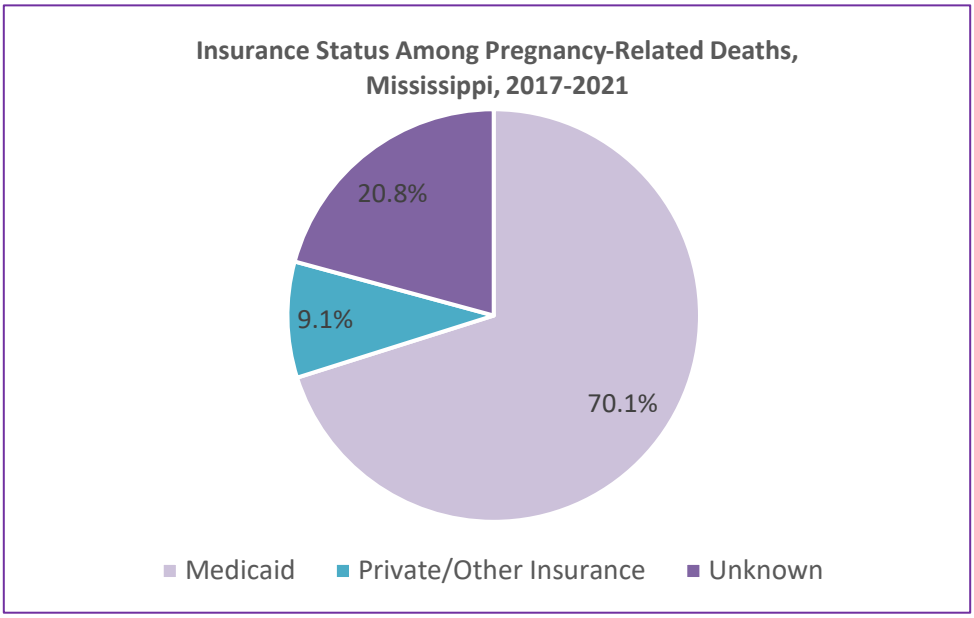
Region	***Pregnancy Related***		**Total Live Births (2017-2021)**
	Count	Ratio	
Central	26	48.9	53,118
Delta	17	107.6	15,794
North	14	25.7	54,386
South	20	34.3	58,361
TOTAL	**77**	**42.4**	**181,659**

Ratios are calculated per 100,000 live births

Insurance status

As indicated in the following table and chart, data from 2017-2021 indicated that 54 (70.1%) of **pregnancy-related** deaths were among women who had Medicaid coverage at the time of delivery. In addition, 7 (9.1%) had private and/or another insurer and 16 (20.8%) were unknown. Abstracted medical records were used to determine their insurers and were entered in the MMRIA system.

	Pregnancy Related	
Insurance Provider	**Count**	**%**
Medicaid	54	70.1%
Private/Other Insurance	7	9.1%
Unknown	16	20.8%
TOTAL	**77**	**100%**



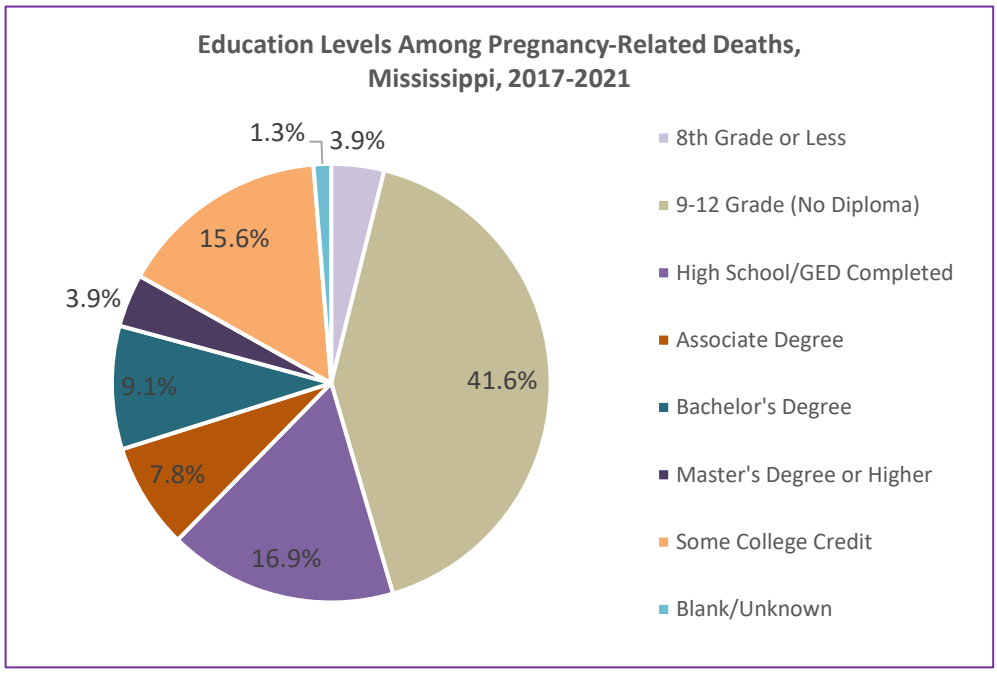
Education Status

Education data are also 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 following table and graph, 41.6% of women whose death was **pregnancy-related** had a 9th-12th grade education, but no diploma.

	Pregnancy Related	
Level of Education	**Count**	**%**
8th Grade or Less	3	3.9%
9th – 12th Grade (No Diploma)	32	41.6%
High School/GED Completed	13	16.9%
Some College Credit (No Degree)	12	15.6%
Associate Degree	6	7.8%
Bachelor's Degree	7	9.1%
Master's Degree or Higher	3	3.9%
Blank or Unknown	1	1.3%
TOTAL	**77**	**100%**



Leading Causes of Pregnancy-Related Deaths in Mississippi, 2017-2021 (n=77)

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 and/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. Similarly to the MMRC process, the PMSS defines a pregnancy-related death as a death during or within 1 year of the end of pregnancy from any cause related to or aggravated by the pregnancy (CDC, 2024).

Pregnancy-Related Primary Causes of Death by Race (as reviewed by the MMRC)

Of the 77 **pregnancy-related deaths**, cardiovascular related conditions (excluding cardiomyopathy) and COVID-19 were most common for primary underlying causes of death from 2017-2021.

The following table illustrates the top four (4) primary causes of pregnancy-related deaths by race from 2017-2021. As identified, in both Blacks and Whites (Non-Hispanics), cardiovascular-related conditions and COVID-19 were the primary causes of pregnancy-related deaths. In addition, preeclampsia and postpartum/peripartum cardiomyopathy impacted pregnancy related deaths in Black, Non-Hispanic women. In White, Non-Hispanic women, embolisms (thrombotic), sepsis/septic shock, and diabetes mellitus were among the top four primary causes of pregnancy related deaths.

Race	Top Four (4) Primary Conditions/Causes	Count
Black, Non-Hispanic	Cardiovascular Related (excluding cardiomyopathy)	8
	COVID-19/Pneumonia	8
	Preeclampsia	7
	Postpartum/Peripartum Cardiomyopathy	6
White, Non-Hispanic	COVID-19	3
	Cardiovascular Related (excluding cardiomyopathy)	3
	Embolism-Thrombotic	2
	Sepsis/Septic Shock & Diabetes Mellitus	2
***Hispanic**	N/A	
***Other Races**	N/A	

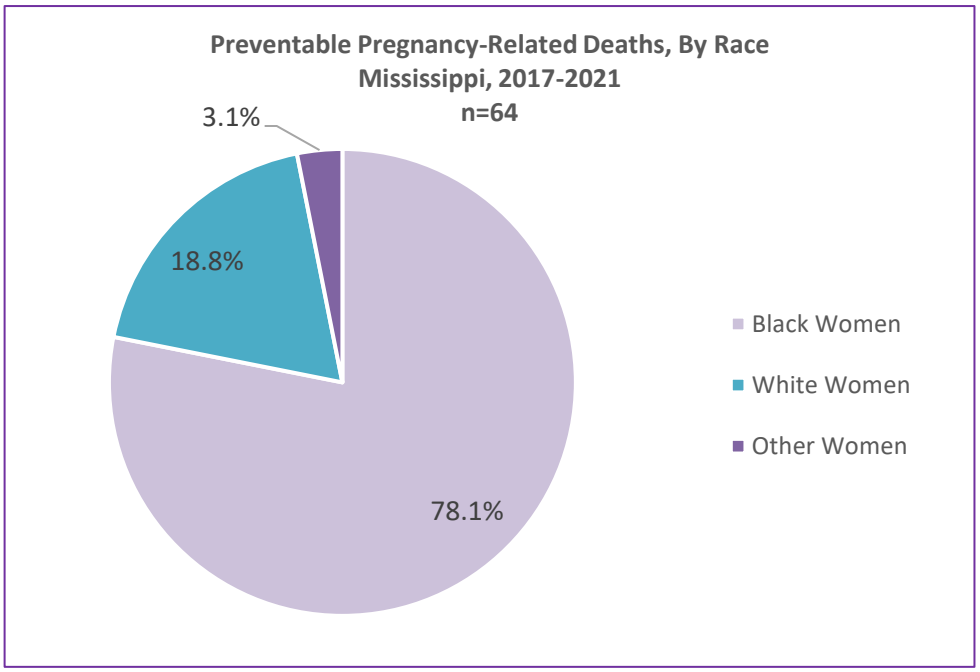
*Note: There were <5 top four (4) causes of pregnancy-related deaths for the Hispanic and Other Races groups.

Preventability & Contributing Factors

As indicated in the table below, of the 77 **pregnancy-related** deaths reviewed by the MMRC from 2017-2021, 64 **(83.1%)** were determined by the committee to be preventable. A death is considered preventable if the committee determines that there was at least some chance of the death being averted by one of more reasonable changes to patient, family, provider, facility, system, and/or community factors.

	Pregnancy Related	
Was the Pregnancy-Related Death Preventable?	**Count**	**%**
Yes	64	83.1%
No	11	14.3%
Undetermined/Unknown	2	2.6%
TOTAL	**77**	**100%**

As indicated in the chart below, of the 64 **pregnancy-related** deaths that were deemed **preventable** by the MMRC, 50 (78.1%) were among Black women,12 (18.8%) were among White women, and 2 (3.1%) were among women of Other Races.



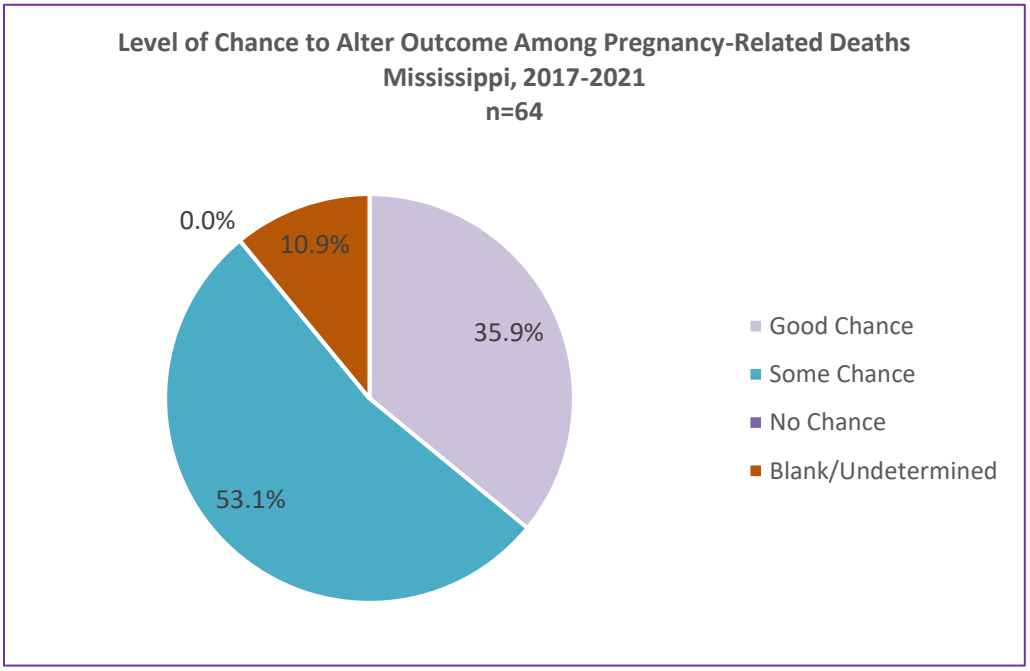
Altering the Outcome, Pregnancy Related Deaths

One of the major tasks of the MMRC is to determine if pregnancy-related deaths were not only preventable, but also assess 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 64 **preventable** pregnancy-related deaths, a total of 57 cases **(89%)** had some level of chance to alter the outcome (death).

	Pregnancy Related	
What Chance Was There to Alter Outcome?	**Count**	**%**
Good Chance	23	35.9%
Some Chance	34	53.1%
No Chance	0	0%
Blank/Undetermined	7	10.9%
TOTAL	**64**	**100%**



Contributing Factors of Pregnancy-Related Deaths, MMRC Results, 2017-2021 *[also known as Circumstances Surrounding Death]*

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?

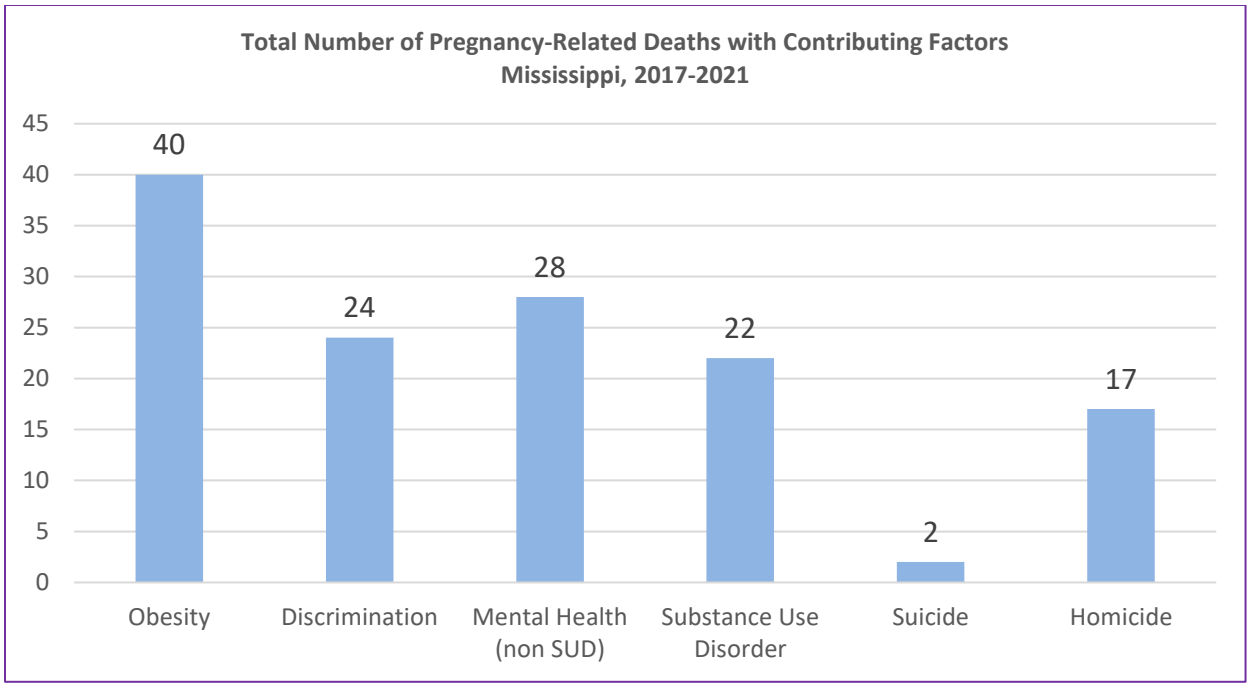
4. Did substance use disorder contribute to the death?
5. Was this death a suicide?
6. Was this death a homicide?

The table and graph below illustrate the contributing causes (*circumstances surrounding death*) 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. As indicated, **obesity** was the highest contributing factor for pregnancy related deaths in Mississippi from 2017-2021.

Number of Pregnancy-Related Deaths (By Year)

Contributing Factors (Pregnancy-Related Deaths)	2017	2018	2019	2020	2021	Five Year Totals
Obesity contributed to the death	9	6	5	8	12	**40**
Discrimination contributed to the death	5	3	9	5	2	**24**
Mental health conditions contributed to the death (excluding substance use disorders)	7	6	5	9	1	**28**
Substance use disorder (SUD) contributed to the death	5	4	3	10	0	**22**
Death was a suicide	1	1	0	0	0	**2**
Death was a homicide	3	4	4	6	0	**17**

Note: Some pregnancy-related deaths had multiple contributing factors.



Note: Some pregnancy-related deaths had multiple contributing factors.

2021 MMRC Recommendations

Federal, State, and Local Government

The state should require an autopsy for any maternal-related death up to 1 year post-delivery to determine the actual cause of death.

The state should ensure that accurate information is presented and incorporate safeguards for confirmation on all maternal death certificates.

State and local entities should adhere to the importance of rapid dissemination of information during the COVID-19 endemic and/or other emerging pandemics, epidemics, etc.

Local, state, and federal entities should provide more resources for substance abuse support for low-income women, those who are pregnant, and those with children.

The state should expand Medicaid. Designations for women and children should be considered with some of the money allocated to resources for maternal and child health populations.

Health-related programs should be adopted for anybody who interfaces with pregnant women.

A system should be developed whereby law enforcement officers who identify domestic violence situations may confidentially report the instances whereby healthcare/mental health providers will receive the information.

Healthcare Systems and Providers

Interpersonal Violence (IPV) Screenings should be provided to all pregnant and post-partum women during each visit (e.g. prenatal, admissions, etc.). Resources and education should be readily available for everyone who has a positive IPV screening.

Health entities/providers should make education available on tobacco/vaping cessation and emphasize the harms of smoking during and after pregnancy.

All health providers should be educated about pre-eclampsia, blood pressure monitoring, hypertension, and related maternal warning signs/symptoms.

Providers in urgent care settings (i.e. emergency facilities) should ensure that they have access to information regarding hypertension treatment, pre-eclampsia education, maternal warning signs, etc.

Maternal care providers should stress the importance of aspirin prophylaxis for pre-eclampsia.

Recognizing that pulmonary embolus, heart disease or hypertensive disorders (preeclampsia) may all present with complaints of shortness of breath (SOB). As these are all significant contributors to maternal mortality, this complaint should be appropriately investigated by any clinician eliciting this complaint during their evaluation of a pregnant person. This can be nurse midwives, ER doctors, OB-GYNs or any other clinician (NP, PA, etc).

Providers should provide patients with information about the link between hypertensive disorders in pregnancy and cardiovascular disease (CVD). Hypertensive disorders are risk factors for CVD.

There should be universal mental health screenings with resources provided to providers for follow-up, with knowledge on how, when, and where to refer patients.

Facility (healthcare) personnel should try to provide social and/or visitor support to maternal patients as much as possible, especially among non-English speaking patients and/or those with language barriers. NOTE: COVID-19 was a time when patients were not allowed to have social and visitor support, which may have hindered progress for healing.

Public Health Services and providers should continue to improve in combatting and relaying messages about vaccines. They should continue using health equity driver approaches to be more proactive in places whereby people receive the most information and/or misinformation.

Healthcare facilities/providers should consider keeping pregnant women categorized in special population groups due to potential risks, especially during pandemics (i.e. COVID-19).

When public health/medical/research professionals develop new interventions, research should include pregnant patients in the study so that the impact of pregnancy (i.e. new drugs, etc.) are readily available much quicker to expecting women.

All providers should be trained in cultural competency and how culture may impact the way they communicate with families with emphasis placed on intrinsic/extrinsic biasness.

Providers should be familiar with the American College of Obstetricians and Gynecologists' Levels of Maternal Care.

Providers should elevate patients with hypertensive/cardiac conditions in pregnancy to be seen within a week postpartum. They should have appointments set prior to discharge.

Healthcare systems should enable access to Admission, Discharge, and Transfer (ADT) notifications for primary providers, CCOs (Coordinated Care Organizations), and case management programs.

Healthcare providers/clinicians should receive training on mental health stigmas.

Mental health providers/systems should have the capacity to provide telehealth to increase the chance of positive outcomes.

Providers should be trained on acute and chronic pain management in pregnant women. They may develop a pain management plan. Note: A hotline to assist providers will be helpful for this recommendation.

Providers and community leaders should provide knowledge and education around emergency and other contraception options.

Providers and community leaders should provide knowledge and education on how to access emergency and other contraception options.

Providers/Clinicians and public health leaders should encourage and highly recommend COVID vaccinations.

Emergency Room Departments across the state should increase awareness for pregnancy and pregnancy-related complications.

Providers should explore the utility of remote monitoring for high-risk maternity patients.

Healthcare facility leaders and providers should become aware of resources that are available to patients' families who have prolonged illnesses. There should be resources readily available/easily accessible.

Communities/Organizations

In collaboration with community partners, a mandatory statewide reporting system should be developed for people who screen positive for IPVs, mental illnesses, substance use disorders (SUDs) including inhalants, especially for those that may not be seen in provider offices. A decision tree (or artificial intelligence) analysis may be used as a pathway for resources and follow-up.

Community leaders should raise the awareness of illicit drug use before, during, and after pregnancy.

Communities should work together to enhance confidence and/or education to support vaccines and their impact on health.

Community-based and related organizations should provide resources for substance abuse, rehabilitation services, etc.

Expand resources for shelters to assist in Interpersonal Violence situations whereby they will be able to create opportunities for people who are at different stages of the "flee" process.

Community organizations may provide resources to educate men and women on identification of unhealthy relationships, IPV, emotional/mental abuse, etc.

Communities, medical, and public health professionals should communicate a sense of urgency around urgent maternal warning signs.

Universities and School Systems

High Schools should provide education regarding intimate partner violence, self-esteem, healthy relationships, etc. In addition, people will need to know where resources are located that address intimate partner violence.

Educational systems should promote policies on comprehensive sex education [abstinence plus].

Licensing and Regulatory Agencies/Organizations

Authorities and health-related organizations should have social workers available to assess families with children who have/may have witnessed the drug death/overdose of a parent.

Patients and Families

Patients/Families should have access to [and education for] remote blood pressure monitoring systems/services and equipment, especially in rural areas within the state. This enhances the care for pregnant and post-partum women who are hypertensive.

Resources

Data & Statistics

- **Centers for Disease Control & Prevention, Pregnancy Mortality Surveillance System**
- https://www.cdc.gov/maternal-mortality/php/pregnancy-mortality-surveillance/?CDC_AAref_Val=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/maternal-mortality/php/erase-mm/?CDC_AAref_Val=https://www.cdc.gov/reproductivehealth/maternal-mortality/erase-mm/index.html

Maternal Mortality Prevention

- **Support for MMRCs**
  www.cdc.gov/erasemm

Patient Safety Bundles, Clinical Tools, & 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-resources/

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/

- **CDC's "Hear Her" Campaign**
  https://www.cdc.gov/hearher/index.html

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Appendix A

Mississippi Public Health District Map, 2024