WYOMING MATERNAL MORTALITY REPORT (2018-2020)

Wyoming Department of Health
May 3, 2023

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INTRODUCTION

This report is Wyoming's first ever report on maternal morbidity and mortality. The first part of this document provides information on Wyoming demographics and data on maternal health from Wyoming Vital Statistical Services (VSS), the Wyoming Pregnancy Risk Assessment Monitoring System (PRAMS), and information about severe maternal morbidity from Wyoming Hospital Discharge data. These data are shown to give context about the environment in which mothers and families live and to describe conditions attributed to or aggravated by pregnancy, known as maternal morbidity. These data come from long-standing public health surveillance systems that are used to provide information about maternal and infant health.

In the last section of the report, findings from the Wyoming Maternal Mortality Review Committee (MMRC) are shared. The report describes the process of maternal mortality review and shares findings and committee recommendations for prevention. Maternal mortality review committees are the best way to count and understand maternal deaths. They use a comprehensive process to identify and count every death that occurs during pregnancy, childbirth and the year postpartum. The process can identify specific factors which contributed to the deaths, and identify how they could have been prevented.

Maternal mortality is not only an indicator of maternal health and quality of care but also is an overall indicator of population health. It is a measure of the health and well-being of women, children, and families. Pregnancy-associated deaths have been referred to as the tip of the iceberg, as for each death there are many others who experience life threatening complications or long-term health impacts. Maternal mortality is devastating to families and communities and can have long-term impacts. Many of these deaths are preventable. Prevention of maternal mortality has gained national attention through extensive collaborations among interested stakeholders and legislation. Prevention of maternal mortality is one of the Wyoming Maternal and Child Health State Priorities.

This report shares information based on a relatively small number of deaths. The small case count prevents us from calculating some commonly used indicators and from making comparisons by demographic factors or examining the data over time. The information shared should be interpreted with caution because it is based on small numbers. The potential risks of reporting the information based on small numbers were weighed with the benefit of having the information available for the prevention of future deaths. The Wyoming Department of Health believes it is important to share the data to inform action on this important health topic.

The Wyoming Department of Health extends our gratitude to the members of the MMRC for their time and expertise in case review and the development of recommendations for prevention of future deaths.

We wish to express our deepest sympathy and condolences to the families and communities of those who died while pregnant or within one year of pregnancy. We hope that our efforts to understand the causes and contributing factors to help prevent future deaths honors and respects their stories.

KEY FINDINGS

Maternal Morbidity

Data from Wyoming's PRAMS on maternal health highlight the changes in health care coverage during the perinatal period; 19.5% of new mothers were uninsured before pregnancy, 5.4% were uninsured during pregnancy, and 18% were uninsured postpartum (3-6 months). The prevalence of diabetes and hypertension increased during pregnancy. Obesity was the most prevalent chronic condition before pregnancy. Mental health conditions, including depression, are a commonly reported chronic health condition before, during, and after pregnancy.

Transfusion accounts for most of the severe maternal morbidity conditions, followed by eclampsia and disseminated intravascular coagulation. These conditions are rare, but they highlight the importance of Wyoming delivery facilities being prepared to deal with these emergencies through the implementation of protocols for hemorrhage and hypertensive emergencies.

Maternal Mortality

From 2018 - 2020, 13 women died during pregnancy or within one year after the end of their pregnancy. Most of these deaths occurred after the end of their pregnancy. Twelve of these deaths were reviewed and 6 were determined by the committee to be pregnancy-related. Pregnancy-related deaths are deaths occurring during pregnancy or within one year of pregnancy from a pregnancy complication, a chain of events initiated by pregnancy, or the aggravation of an unrelated condition by the physiologic effects of pregnancy. In addition to having a temporal relationship to pregnancy, these deaths are causally related to pregnancy or its management.

Mental health conditions were the most common cause of pregnancy-related deaths. Substance use was involved in all 6 pregnancy-related deaths. All of the pregnancy-related deaths were deemed to be preventable. The most commonly noted factors contributing to the deaths included Lack of access/Financial Resources, Substance Use Disorder, Mental Health Conditions, Clinical Skill/Quality of Care, and Social Support/Isolation.

DEMOGRAPHICS OF WYOMING IN RELATION TO MATERNAL HEALTH

Age and gender

Based on data from the 2016 - 2020 American Community Survey, Wyoming's total population was estimated at 581,348. The median age was 38.0 years. An estimated 23.2% of the population was under 18 years of age, 35.4% was 18 to 44 years, 25.0% was 45 to 64 years, and 16.4% 65 years and older.[1] Wyoming's population was estimated at 285,068 (49.0%) females and 296,280 (51.0%) males. There were an estimated 108,587 women of reproductive age (15-44 years).[2]

Race and ethnicity

The 2016 - 2020 American Community Survey data for race and ethnicity indicate that among Wyoming residents reporting one race alone, 90.3% were White; 0.9% were Black or African American; 2.3% were American Indian or Alaska Native; 0.8% were Asian; 0.1% were Native Hawaiian and Other Pacific Islander, and 1.7% were some other race. An estimated 3.9% reported two or more races. An estimated 10.1% of the people in Wyoming were Hispanic or Latino. An estimated 83.6% of the people in Wyoming were White alone, non-Hispanic. People of Hispanic origin may be of any race.[1]

Geography

Seventeen of Wyoming's 23 counties are designated as Frontier (fewer than six people per square mile); statewide there are an average of 5.9 people per square mile (2020 Census). Forty-seven percent of Wyoming's residents live in frontier areas of the state. Two counties are designated as urban and the remaining population lives in rural areas.[3]

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[1] 2016—2020 ACS 5-Year Narrative Profile United States Census Bureau. Retrieved from https://www.census.gov/acs/www/data/data-tables-and-tools/narrative-profiles/2020/report.php?geotype=state&state=56

[2] Bridged Race Population Estimates. CDC Wonder Centers for Disease Control and Prevention. Retrieved from https://wonder.cdc.gov/

[3] What is Rural? Wyoming Department of Health Retrieved from: https://health.wyo.gov/publichealth/rural/officeofruralhealth/what-is-rural/#:~:text=Forty%2Dseven%20percent%20of%20Wyoming's,population%20lives%20in%20rural%20areas.

WYOMING BIRTH STATISTICS

Location of deliveries

Based on data from Wyoming VSS, from 2018 - 2020, there were 19,146 births to Wyoming residents, an average of 6,382 per year. There were 17,162 (89.6%) infants delivered in Wyoming and just over 10% were delivered out of state; 98% (16,793) of in-state deliveries occurred in hospitals, 2% (366) were home births or births at a non-medical birthing center. Births occurred in 22 Wyoming hospitals. However, 75% of in-state deliveries occurred in 7 facilities; 37% occurred in two facilities. The out-of-state deliveries were most common in Colorado, Utah, South Dakota, and Montana hospitals. We cannot determine the reasons for out-of-state deliveries from the birth certificate alone. However, a majority of the out-of-state deliveries occur at facilities that offer a higher level of maternal and/or neonatal care than is available in Wyoming facilities.

Maternal Race and Ethnicity

Table 1 illustrates maternal race among births from 2018 - 2020. Just over 87% of births occurred among White mothers, and 3.5% occurred among American Indian/Alaska Native mothers.

Just over 13% of mothers identified as Hispanic/Latina.

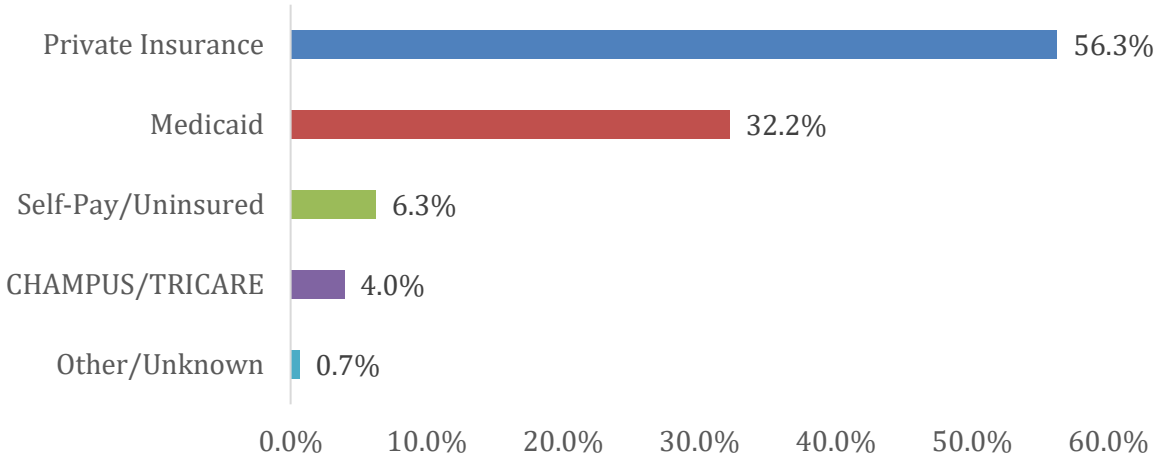
Table 1: Births to Wyoming Residents by Maternal Race, 2018 - 2020 Wyoming Vital Statistics Services

Maternal Race	Number (Percent)
American Indian/Alaska Native	665 (3.5%)
Asian	205 (1.1%)
Black/African American	198 (1.0%)
Native Hawaiian/Other Pacific Islander	32 (0.2%)
White	16, 722 (87.3%)
Other	450 (2.4%)
Refused	170 (0.9%)
Unknown	123 (0.6%)
Multi Race	558 (2.9%)
Missing	23 (0.1%)
Total	19,146

Insurance coverage

According to Wyoming VSS, just over 56% of deliveries to Wyoming residents were paid by private insurance and 32% were paid by Medicaid. The primary payment source of delivery for births to Wyoming residents from 2018 - 2020 is illustrated in Figure 1. Indian Health Services, other government, and unknown accounted for less than 1% of the payment sources of deliveries.

Figure 1. Delivery Payment Source for Wyoming Resident Births, 2018 - 2020 Wyoming Vital Statistics Services



Maternal Health and Morbidity in Wyoming

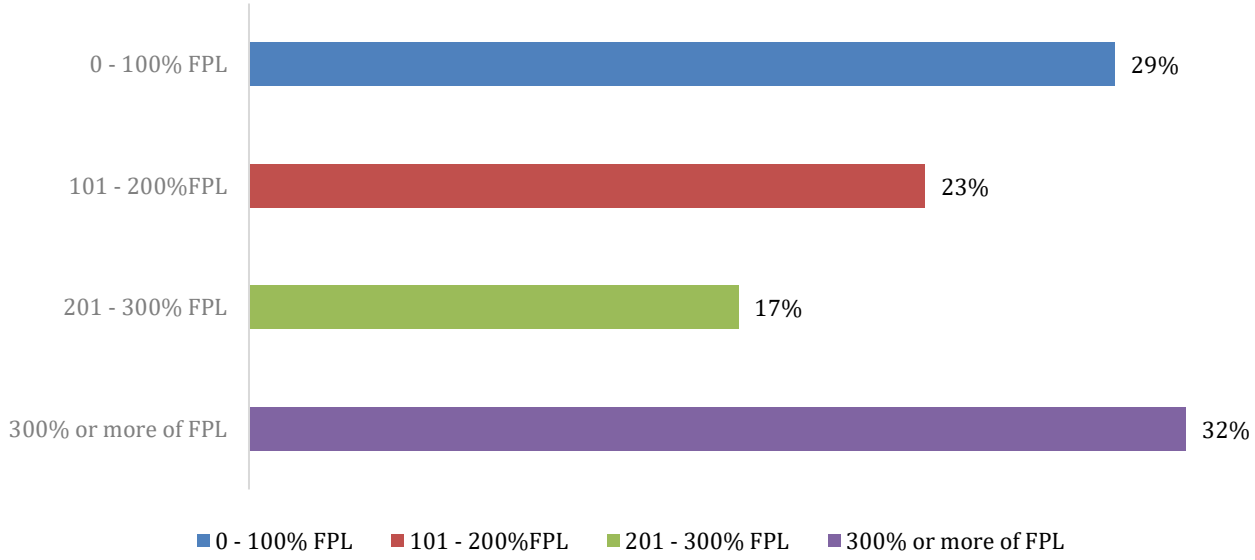
The health of a woman during pregnancy, childbirth, and in the postpartum period can impact her long-term health and is important to the health of the infant. During the perinatal period major physiologic and psychologic changes occur. Chronic physical health conditions may worsen or new conditions may arise. The same is true for mental health conditions; new conditions may develop during the perinatal period or existing conditions may worsen in severity. Maternal health ranges during the perinatal and postpartum period; most women have uncomplicated pregnancies and deliveries, but a small number experience some minor complications, and a few experience serious life threatening events (known as severe maternal morbidity) or death. Many factors contribute to perinatal health including access to care, health behaviors, and the context/environment surrounding the pregnant individual, her family and her community.

Data in the following section come from the Wyoming Pregnancy Risk Assessment Monitoring System (PRAMS), a surveillance system that monitors health before, during and just after pregnancy.

Socioeconomic Status and Insurance Coverage Before During and After Pregnancy

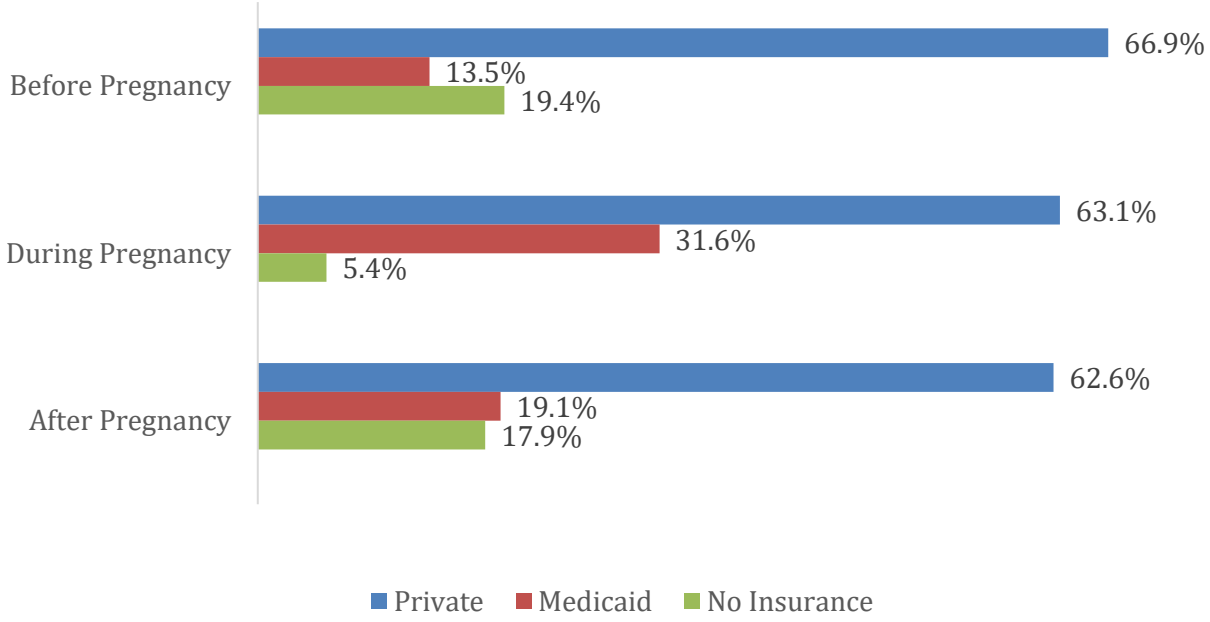
The Federal Poverty Level category for new mothers is illustrated in Figure 2. Over half (52%) of new mothers in Wyoming are living at or below 200% of the federal poverty level. Additionally, 10.2% of new mothers in Wyoming reported eating less than they felt they should because there wasn't enough money to buy food.

Figure 2. Federal Poverty Level of New Mothers, WY PRAMS, 2018 - 2020



WY PRAMS data from 2018 - 2020 illustrated that healthcare coverage shifted for many new mothers during the perinatal period (Figure 3). Specific to Medicaid coverage, the proportion of women with Medicaid was 13.5% before pregnancy, during pregnancy the proportion increased significantly to 31.6%, and then after pregnancy the proportions decreased significantly to 19.1% (women complete the PRAMS survey 3-6 months after giving birth). The proportion of women uninsured before pregnancy (19.4%) decreased significantly during pregnancy to 5.4%, and then after pregnancy increased significantly to 17.9%. These shifts reflect eligibility requirements for Wyoming Medicaid's Pregnant Women programs. The programs provide health coverage for eligible pregnant women for up to 60 days postpartum. Those who were enrolled in Medicaid pregnant women programs during the federal COVID-19 public health emergency have not lost their Medicaid benefits at the time of this publication because of the Families First Coronavirus Response Act, enacted in March, 2022.

Figure 3. Insurance Coverage Before, During and After Pregnancy among Recent Deliveries, WY PRAMS 2018 - 2020

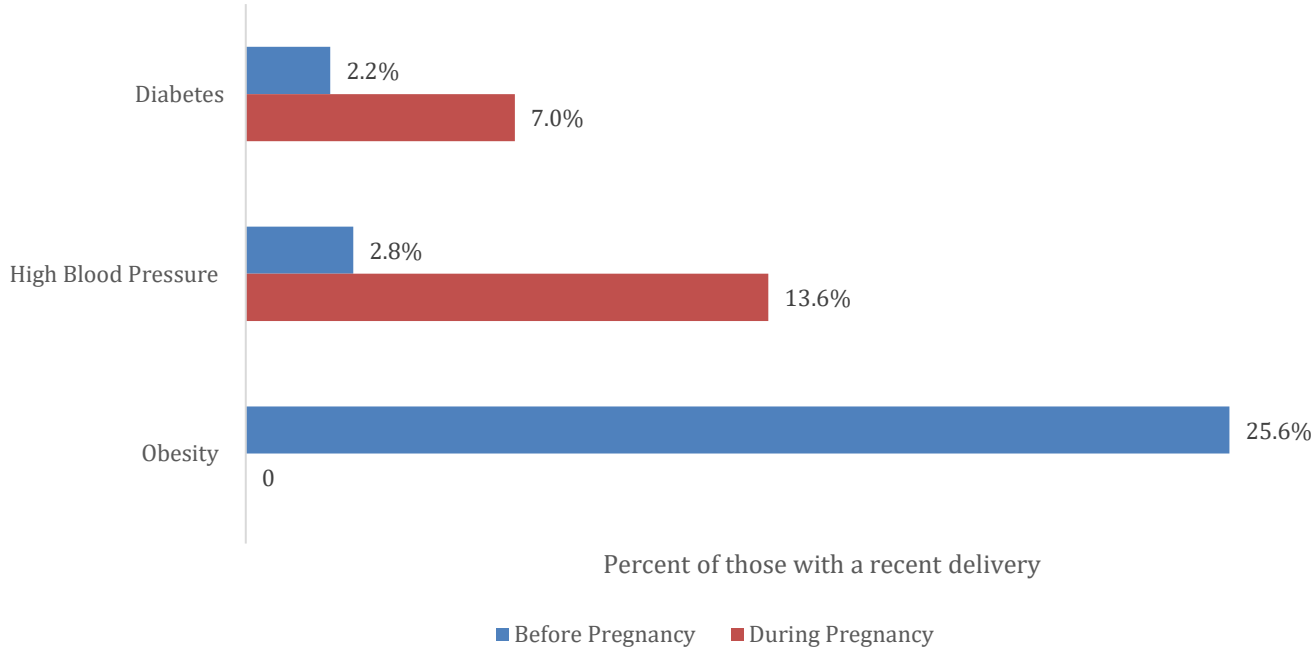


Wyoming PRAMS asks respondents about receipt of prenatal care. During 2018 - 2020, 86.5% of new moms in Wyoming reported receiving during the first trimester.

Chronic Disease and Maternal Health in Wyoming

Common chronic diseases such as obesity, hypertension, and diabetes may increase the risk of pregnancy complications and maternal death. Figure 4 illustrates the prevalence of pre-pregnancy diabetes, hypertension, and obesity, and the prevalence of diabetes and hypertension occurring during pregnancy. Over 25% of new mothers were classified as obese before pregnancy. The prevalence of pre-pregnancy diabetes and hypertension were relatively low. During pregnancy both of these conditions became more common.

Figure 4. Prevalence of Chronic Conditions Before and During Pregnancy, WY PRAMS 2018 - 2020



Perinatal Mental Health

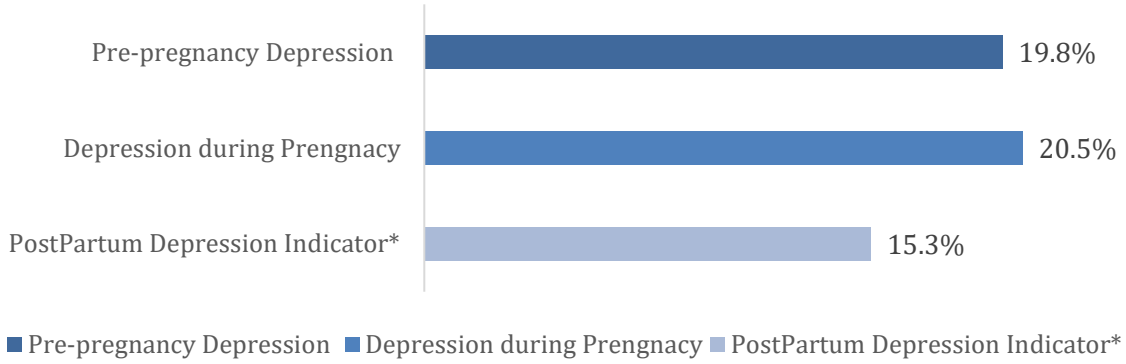
Perinatal mental health disorders are among the most common morbidities during pregnancy[4] and mental health conditions are an important contributing factor to maternal mortality.[5]

Depression and anxiety before, during, and after pregnancy are measured by Wyoming PRAMS. They are the most frequently reported conditions before and during pregnancy. Figure 5 shows the prevalence of depression before and during pregnancy and shows the percent of new mothers who were identified as experiencing postpartum depression symptoms. One in every five new moms reported depression before and during pregnancy, and 15% indicated they experienced symptoms of postpartum depression.

[4] Howard, L. M., & Khalifeh, H. (2020). Perinatal mental health: a review of progress and challenges. *World psychiatry : official journal of the World Psychiatric Association (WPA)*, *19*(3), 313–327. https://doi.org/10.1002/wps.20769

[5] Trost SL, Beauregard JL, Smoots AN, Ko JY, Haight SC, Moore Simas TA, Byatt N, Madni SA, Goodman D. Preventing Pregnancy-Related Mental Health Deaths: Insights From 14 US Maternal Mortality Review Committees, 2008-17. Health Aff (Millwood). 2021 Oct;40(10):1551-1559. doi: 10.1377/hlthaff.2021.00615. PMID: 34606354.

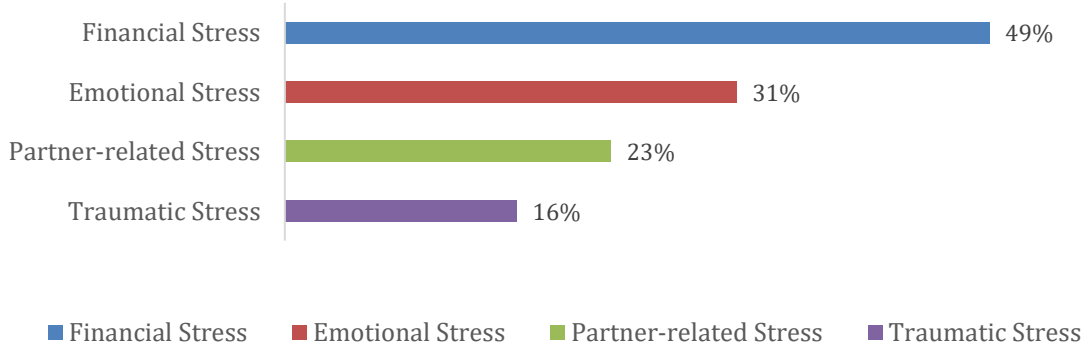
Figure 5. Prevalence of Depression Before and During Pregnancy and Postpartum Depression, WY PRAMS 2018 - 2020



*Postpartum depression indicator is a combination of women who reported feeling down/depressed/hopeless and those who reported having little interest or pleasure in doing things they usually enjoy.

Wyoming PRAMS also asks respondents about stressful life events occurring in the 12 months before pregnancy. Perinatal stress has been reported to be associated with adverse infant outcomes, postpartum anxiety and depressive symptoms.[6,7,8,9] Forty percent (40%) of respondents reported experiencing 1-2 stressful life events, 26% reported experiencing 3-5 stressful events and 5% reported experiencing 6 or more stressful life events. The stressors can also be grouped into categories. Figure 6 illustrates the percent of respondents experiencing each type of stressful life events in the year prior to pregnancy.

Figure 6. Type of Stressful Life Events Experienced in the Twelve Months Before Delivery, WY PRAMS 2018 - 2020



[6] Hobel CJ, Goldstein A, Barrett ES. Psychosocial stress and pregnancy outcome. Clin Obstet Gynecol 2008;51:333–48.

[7] Witt W, Litzelman K, Cheng ER, Wakeel F, Barker ES. Measuring stress before and during pregnancy: a review of population-based studies of obstetric outcomes. Matern Child Health J 2014;18:52–63.

[8] Austin MP, Leader L. Maternal stress and obstetric and infant outcomes: epidemiological findings and neuroendocrine mechanisms. Aust N Z J Obstet Gynaecol 2000;40:331–7.

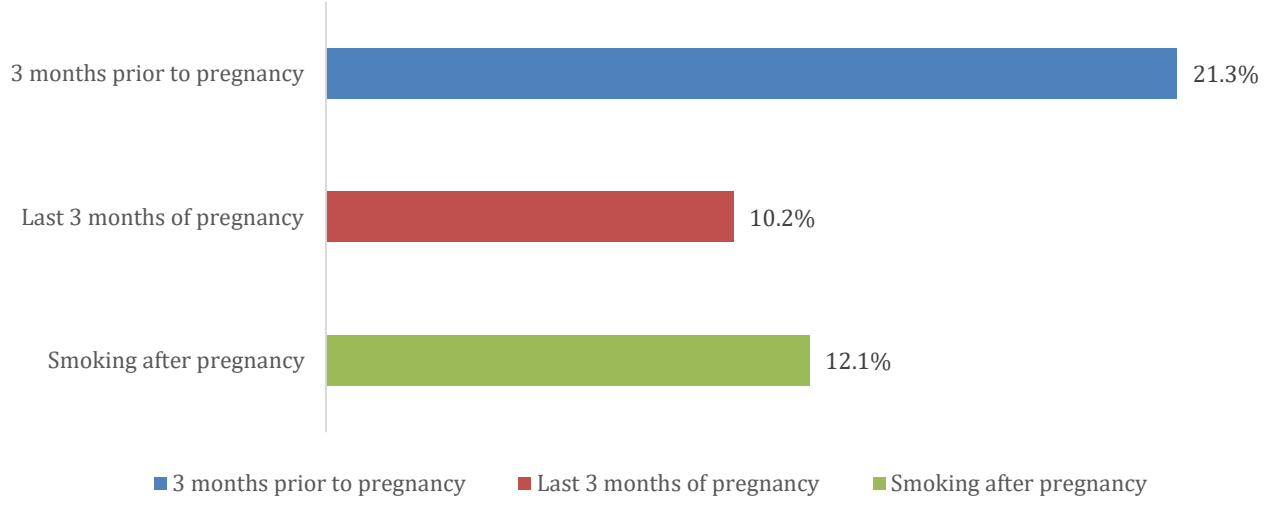
[9] Farr SL, Dietz PM, O'Hara MW, Burley K, Ko JY. Postpartum anxiety and comorbid depression in a population-based sample of women. J Womens Health (Larchmt) 2014;23:120–8.

Substance Use and Pregnancy

From 2018 -2020, 7.4 % of new mothers reported substance use (use of at least one of the following: marijuana or hash, synthetic marijuana, methadone, heroin, amphetamines, methamphetamine, cocaine, tranquilizers, hallucinogens, LSD, sniffing gas, glue or huffing) during the month before becoming pregnant.

Figure 7 shows the prevalence of tobacco smoking before, during and after pregnancy among new Wyoming mothers. One in five new mothers (20.1%) reported smoking in the three months prior to pregnancy. The prevalence decreased during pregnancy and postpartum.

Figure 7. Prevalence of Smoking Before, During and After Pregnancy, Wyoming PRAMS 2018 - 2020



Severe Maternal Morbidity

Severe maternal morbidity (SMM) represents a group of potentially life-threatening unexpected maternal conditions or complications that occur during labor and delivery. Some types of SMM may cause long-lasting health problems that extend beyond the pregnancy.[10]

Diagnosis and procedure codes from hospital discharge data are used to identify delivery hospitalizations with SMM. A woman was classified as having SMM if any of 21 indicators of severe complications were listed on the record for her delivery hospital stay.[11] Women who receive blood transfusions account for a majority of SMM cases, so Table 2 illustrates rates with and without

[10] American College of Obstetricians and Gynecologists and the Society for Maternal–Fetal Medicine, Kilpatrick SK, Ecker JL. Severe maternal morbidity: screening and review *Am J Obstet Gynecol.*2016;215(3):B17–B22.

[11] Severe Maternal Mortality in the United States. Centers for Disease Control and Prevention. Retrieved from: https://www.cdc.gov/reproductivehealth/maternalinfanthealth/severematernalmorbidity.html

transfusion. Transfusions are generally related to postpartum hemorrhage (PPH) or pre-delivery anemia.

Table 2. Severe Maternal Morbidity among Deliveries to Wyoming Residents in WY Hospitals, 2018 - 2020*

DELIVERIES	SMM (without transfusions) rate per 10,000 deliveries (number)	SMM (with transfusions) rate per 10,000 deliveries (number)
13,684	79.7 (109)	182.0 (249)

**Not every hospital reported every year. See table 3 for hospital reporting by quarter.*

The rate of SMM without transfusions in Wyoming from 2018 - 2020 was 79.7 per 10,000 live deliveries to Wyoming residents; the SMM rate with transfusions was 182.0. This number does not include SMM occurring outside of Wyoming hospitals. Additionally, not every hospital reported data to the WY hospital discharge data system every year. See Table 3 for the number of reporting facilities by year. The denominator has been adjusted to be the number of reported deliveries in hospital discharge data each year, and caution should be used when interpreting the numbers. Because of the inconsistent reporting from 2018 - 2020, rates over time or within subgroups were not analyzed.

The most common SMM conditions reported in Wyoming from 2018 - 2020 were:

- Transfusions (140)
- Eclampsia (11)
- Disseminated Intravascular Coagulation (11)
- Respiratory Distress (10)
- Shock (8)

Table 3. Number of Hospitals Reporting Deliveries by Quarter, WY Hospital Discharge Data, 2018 - 2020

	2018		2019		2020	
	Number of Facilities Reporting	Total Deliveries	Number of Facilities Reporting	Total Deliveries	Number of Facilities Reporting	Total Deliveries
Quarter 1	18	1249	18	1270	16	1022
Quarter 2	18	1306	18	1284	16	1079
Quarter 3	18	1355	17	1282	15	986
Quarter 4	18	1255	17	995	15	860
Total		5165		4831		3947

MATERNAL MORTALITY

Definitions

The death of a woman during pregnancy, at delivery, or in the postpartum period is a tragedy for her family and community.

There are different definitions of maternal mortality, which makes comparisons across different locations complicated. Wyoming uses the following definitions from the Centers for Disease Control and Prevention.[12] Pregnancy-associated deaths include deaths during or within one year of pregnancy regardless of the cause. They are further delineated into two categories:

Pregnancy-Related: A death during or within one year of pregnancy, from a pregnancy complication, a chain of events initiated by pregnancy, or the aggravation of an unrelated condition by the physiologic effects of pregnancy. In addition to having a temporal relationship to pregnancy, these deaths are causally related to pregnancy or its management.

Pregnancy-Associated, ***but not related***: The death of a woman during pregnancy or within one year of the end of a pregnancy from a cause other than one which is causally related to pregnancy.

Maternal Mortality Review Committees

Maternal mortality review committees are a process and a committee. The process includes a comprehensive approach to identify deaths occurring during pregnancy, childbirth and the year postpartum; review and analyze deaths; disseminate findings; and act on results. The committee is a multidisciplinary group of experts who review the cases to identify contributing factors to the death, determine relatedness to the pregnancy, and identify opportunities to prevent future deaths.[13]

Maternal Mortality Review in Wyoming

In 2019, WDH-MCH partnered with the Utah Department of Health (UDOH) to apply for the CDC's Enhancing Reviews and Surveillance to Eliminate Maternal Mortality (ERASE MM) grant. The application was successful and funding was awarded in September of 2019 establishing a cross-state MMRC. Following the grant award, the two states negotiated a contract and Wyoming became a sub-recipient of the UDOH ERASE MM grant.

The Utah-Wyoming MMRC is one of 30 MMRCs funded by the CDC's ERASE MM grant. The partnership capitalizes on the Utah MMRC's 18 plus years of experience and includes specialty

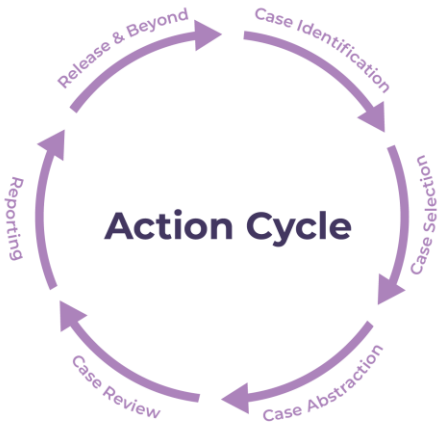
[12] Pregnancy Associated Deaths Definitions. Centers for Disease Control and Prevention. Retrieved from https://reviewtoaction.org/learn/definitions

[13] Pregnancy Associated Deaths 7 Things to Know. Centers for Disease Control and Prevention. Retrieved from https://reviewtoaction.org/learn/7-things-to-know

providers (e.g. maternal fetal medicine specialists, neonatologists, obstetric subspecialists) that Wyoming does not have due to its small population. The Utah MMRC has full authority to access and review records, and protections of collected data proceedings and activities in place[14] and has established and documented processes;[15] two important characteristics of fully functioning MMRCs outlined by the CDC. The partnership also offers efficiency for Wyoming. In a typical year, Wyoming sees fewer than five pregnancy-associated deaths. Partnership with another committee allows for quarterly reviews and more timely recommendations. The UT-WY MMRC includes representatives from Utah and Wyoming in state public health, clinical practice, and community partners whose work or experiences are related to maternal health. Wyoming committee members include representatives from the Maternal and Child Health (MCH) Unit, MCH Epidemiology, Wyoming Medicaid, Public Health Nursing, physicians with specialties in OB/GYN and family medicine, a family nurse practitioner/nurse midwife specializing in reproductive health, a psychiatrist specializing in perinatal and reproductive mental health, and a victim's advocate.

Wyoming MMRC Process

The Wyoming Maternal Mortality Review has defined its scope as all pregnancy-associated deaths or any death with an indication of pregnancy within 365 days regardless of cause or place of death among Wyoming residents. Cases are identified by the Wyoming MMRC Epidemiologist through 1) linkages of vital records birth and death certificates 2) linkages between vital records and Medicaid claims 3) the pregnancy check box on death certificates (checked by the official/medical care profession completing the death certificate if a woman was pregnant in the year before death), and 4) ICD10 cause of death codes in the death file. The Epidemiologist has worked to find cases across different data sources, but it is possible that some cases are missing, especially those occurring after a miscarriage when the death certifier did not have access to review the decedent's medical records, did not know the woman was pregnant in the year before death, and thus did not check the pregnancy box on the death certificate.



Under the WDH public health authority and following confidentiality procedures, records are requested by the MMRC case abstractor from entities such as medical providers, hospitals, coroners, law enforcement, and social service providers. The abstractor may also collect information from news articles, publicly available social media accounts/GoFundMe posts, and obituaries. The identified cases are reviewed and abstracted by the abstractor who is a certified nurse midwife/family nurse practitioner with a Doctorate of Nursing Practice. After the case abstraction is complete, the abstractor creates a de-identified case narrative to summarize the case. The UT-WY MMRC convenes

[14] Maternal Mortality Review Committee Authority and Protections. Centers for Disease Control and Prevention. Retrieved from https://reviewtoaction.org/learn/definitions https://reviewtoaction.org/implement/getting-started/authority-and-protections

[15] Maternal Mortality Review Committee Policies and Procedures. Centers for Disease Control and Prevention.https://reviewtoaction.org/implement/getting-started/policies-and-procedures

quarterly to review the individual cases. The committee makes and documents the following key decisions:

- Was the death pregnancy-related? i.e. "If this woman had not been pregnant, would she have died?"
- What was the underlying cause of death?
- Was the death preventable? Was there a chance to alter the outcome? A death is considered preventable if the committee determines that there was at least some chance of the death being averted by one or more reasonable changes to patient, family, community, provider, facility, and/or systems factors.
- What were the factors that contributed to the death?
- If there was at least some chance that the death could have been averted, what were the specific and feasible actions that, if implemented or altered, might have changed the course of events?

If the committee finds that a death could have been prevented, they take special care to craft recommendations for needed action. The committee aims to make recommendations that are specific and feasible, including *who* should do *what* action, by *when*, and *how*.[16]

The UT-WY MMRC uses standardized criteria in the determination of the pregnancy relatedness for accidental drug-related deaths and suicides. The criteria apply to accidental substance use-related deaths and suicides and consider elements of pregnancy relatedness 1) due to a pregnancy complication, 2) death due to a chain of events initiated by pregnancy, or 3) death due to the aggravation of an unrelated condition by the physiologic effects of pregnancy.[17] The application of this criteria may result in more cases determined to be pregnancy-related compared to states who do not use the criteria.

Summary of Wyoming MMRC Review Findings

In 2021, Wyoming began case reviews with deaths occurring in 2018. The MMRC has completed reviews of women who died during 2018 - 2020; 12 deaths have completed the review cycle, one is on hold pending completion of legal proceedings. The remainder of the report will focus on the deaths that have been reviewed. Table 4 shows the number of pregnancy-associated cases by year of death. The small case count prevents the calculation of some commonly used indicators such as pregnancy-related mortality ratios (the number of pregnancy related deaths per 100,000 live births) and from comparing ratios by maternal demographics. However, the Wyoming Department of Health feels it is important to share the data to inform action on this important health topic.

[16] Maternal Mortality Case Review. Centers for Disease Control and Prevention Retrieved from https://reviewtoaction.org/index.php/implement/process-review/case-review

[17] Smid, M. C., Maeda, J., Stone, N. M., Sylvester, H., Baksh, L., Debbink, M. P., Varner, M. W., & Metz, T. D. (2020). Standardized Criteria for Review of Perinatal Suicides and Accidental Drug-Related Deaths. *Obstetrics and gynecology*, *136*(4), 645–653. https://doi.org/10.1097/AOG.0000000000003988

Table 4. Number of MMRC Reviewed Pregnancy-Associated Deaths by year of death, Wyoming 2018 - 2020

Year	2018	2019	2020
Number of deaths	3	4	5

Key Decision: Was the death pregnancy-related?

Figure 8 illustrates the distribution of the committee determination of pregnancy-relatedness among reviewed cases in Wyoming 2018 - 2020; 6 (50%) of the cases were found to be pregnancy-related (causally related to pregnancy or its management), 5 were associated, *but not related, to the pregnancy,* and there was one death that the committee could not determine the relatedness to pregnancy.

Figure 8. Number of Deaths by Pregnancy Relatedness, WY 2018 - 2020

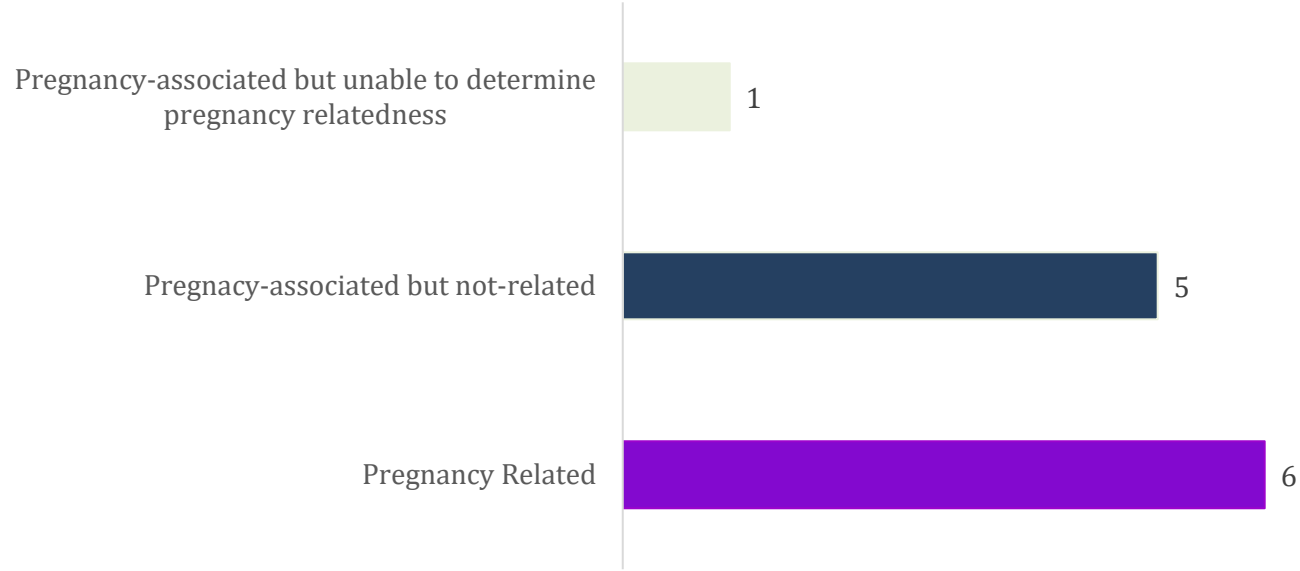


Figure 9 and Table 5 display the timing of death in relation to pregnancy by pregnancy-relatedness. Regardless of relation to pregnancy, most deaths occurred postpartum.

Figure 9. Timing of Death in Relation to Pregnancy, Wyoming 2018 – 2020

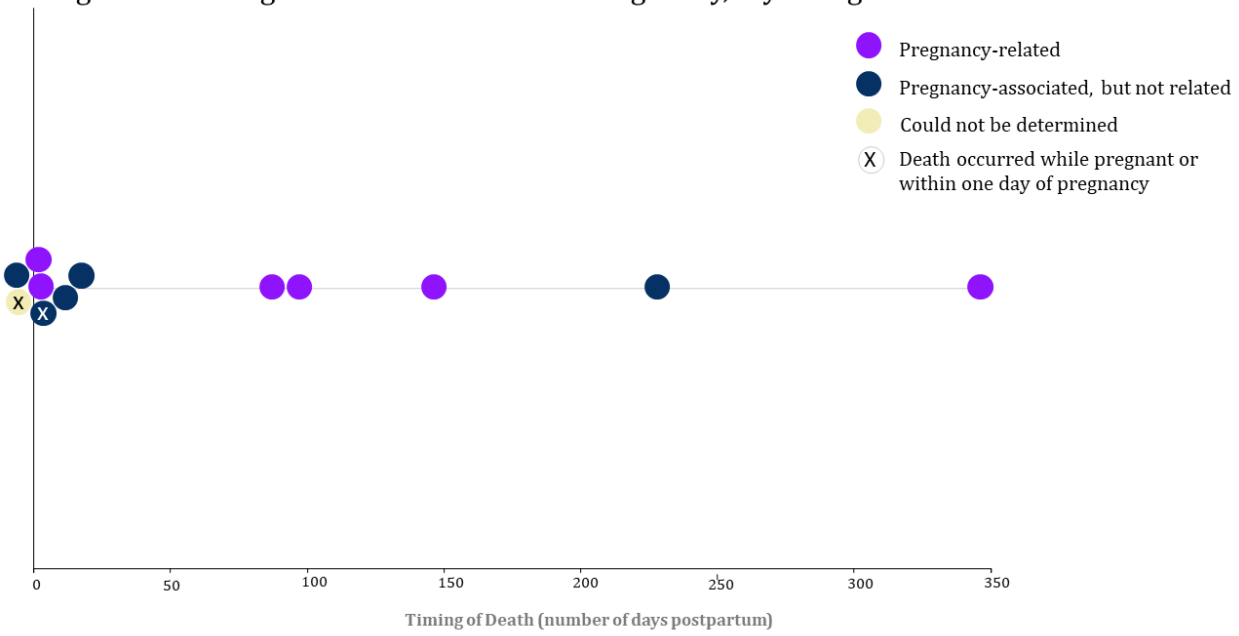


Table 5. Timing of death in relation to pregnancy by pregnancy-relatedness, Wyoming 2018 - 2020

Timing of death in relation to pregnancy	Pregnancy-Related	Pregnancy-Associated, but not related	Pregnancy-Associated, but unable to determine relatedness
During pregnancy or within 1 day of delivery	1	1	1
Within 42 days of pregnancy	0	2	0
Within 43 days to one year of pregnancy	5	2	0

Race/Ethnicity of Pregnancy Associated Deaths

All race and ethnicities that were identified for the 12 deaths are listed in Table 6. Where individuals were multi-race, both races are listed. Individuals who identified as more than one race are included in all race categories which they identified, rather than aggregated into one multi-race category. Ethnicity is listed separately. Therefore, the count in the table is greater than the total number of pregnancy associated deaths. For the races that are not listed, there were no pregnancy-related cases identified among these groups during 2018 – 2020. The multi-race category was disaggregated so that deaths among non-white women are not hidden, which allows for examination of health disparities, even in the setting of small numbers. In the United States, Black and American

Indian/Alaska Native women are 2-3 times more likely to die from pregnancy related causes than white women.[18] According to the CDC, many factors contribute to the disparities, including differing access to and quality of healthcare, underlying chronic conditions, structural racism and implicit bias. Social determinants of health prevent many people from racial and ethnic minority groups from having fair opportunities for economic, physical, and emotional health.[19] Health equity means reducing and ultimately eliminating disparities in health and its determinants that adversely affect excluded or marginalized groups.[20]

Table 6. Race and ethnicity of Pregnancy Associated Deaths by Pregnancy Relatedness, Wyoming 2018 - 2020

Race	Pregnancy-Related	Pregnancy-Associated, but not Related or Unable to determine
White	5	6
American Indian	--	1
Black	1	1
Asian	1	--
Hispanic Ethnicity*	1	--

Where individuals were multi-race, both races are listed.
Ethnicity is listed separately from race

Age

The mean age at death of pregnancy-associated but not related or unable to determine cases was 31.0 years, the mean age at death of pregnancy-related deaths was 27.2 years.

Key Decision: What was the underlying cause of death?

Both pregnancy-related and pregnancy-associated deaths are tragedies to the families and communities in which they occur. Among deaths which were determined to be pregnancy-associated but not related, most deaths were caused by cancer; the other causes included motor vehicle crash and homicide. Prevention activities for these topics fall into the realm of prevention programs within the Wyoming Department of Health, Public Health Division, such as Comprehensive Cancer Control and Prevention and the Injury and Violence Prevention programs. For the deaths that were categorized by the committee as preventable, the MMRC has shared any recommendations related to the prevention of these deaths with the appropriate programs. The MMRC recommendations for those cases are also summarized at the end of the report. The remainder of the report will focus on pregnancy-related deaths in Wyoming from 2018 - 2020.

[18] Pregnancy Mortality Surveillance System Centers for Disease Control and Prevention Retrieved from https://www.cdc.gov/reproductivehealth/maternal-mortality/pregnancy-mortality-surveillance-system.htm
[19] Working Together to Reduce Black Maternal Mortality. Centers for Disease Control and Prevention Retrieved from https://www.cdc.gov/healthequity/features/maternal-mortality/index.html
[20] Braveman P, Arkin E, Orleans T, Proctor D, and Plough A. What Is Health Equity? And What Difference Does a Definition Make? Princeton, NJ: Robert Wood Johnson Foundation, 2017.

Among deaths which were determined to be pregnancy-related, most deaths were caused by mental health conditions. Mental health conditions include deaths to suicide, overdose/poisoning, and unintentional injuries determined by the MMRC to be related to a mental health condition. The committee determined that these pregnancies were complicated by mental health and substance use disorders (even in the case of chronic drug use in the past) and led to a cascade of events resulting in death. The other causes of pregnancy-related deaths included cardiomyopathy (a form of heart disease) and hemorrhage.

The MMRC makes a determination if four specific circumstances surrounding the death (obesity, discrimination, mental health, and substance use) contributed to the death. Table 7 shows the committee decisions for each circumstance for the 6 pregnancy-related cases. The committee determined that substance use did contribute to 5 deaths and probably contributed to one other death. Mental health did contribute to four deaths and probably contributed to one other death. Discrimination probably contributed to at least one death; discrimination was the circumstance that the committee most commonly classified as unknown or could not be determined.

Table 7. Committee determination of contribution of four circumstances to death for pregnancy-related deaths, Wyoming 2008 - 2020

Circumstance	Yes	Probably	No	Unknown/could not be determined
Obesity	0	0	5	1
Discrimination*	0	1	2	3
Mental Health	4	1	1	0
Substance Use	5	1	0	0

**added to the form in 2020*

Common Themes from Case Summaries

All of the six pregnancy-related deaths had a history of substance use; five cases had a documented history of illicit substance use and one woman's cause of death was related to chronic excessive alcohol use. Three of the five cases did not use substances during pregnancy, but relapsed postpartum. None of the cases were receiving medication-assisted treatment for their substance use disorders; one person was actively seeking medication-assisted treatment but was told it was not available in her community. Two cases had cardiomyopathy associated with long-term chronic drug use.

Two cases had prior involvement as a parent with the Department of Family Services.

Two cases had a history of incarceration.

Three of the cases had a documented history of mental health conditions, and two cases had documented postpartum depression. Due to a lack of access/availability of mental health diagnoses and records from mental health providers, it was difficult to determine if those with mental health conditions were under the care of mental health providers or if their conditions were managed by primary care providers.

Three cases had underlying chronic diseases (chronic conditions may include: diabetes, obesity, hypertension), two of which were noted to be poorly controlled.

Three women were known to have lost insurance coverage after delivery. Three of the six women who died of pregnancy-related causes had Medicaid at the time of delivery; two of them lost Medicaid coverage 60 days postpartum in accordance with Wyoming Medicaid eligibility policies in place at the time, and one death occurred before 60 days postpartum. One case had private insurance at the time of delivery, but had lost coverage postpartum.

All six cases were impacted by lack of access/financial resources either through lack of access to mental health treatment, substance use treatment, access to primary care, or health insurance coverage.

Opportunities for prevention

Key Decision: Was the death preventable?

A death is considered preventable if the committee determines there is at least some chance of the death being averted by one or more reasonable changes to patient, family, community, provider, facility, and/or systems factors.[21] If the committee determines the death to have been preventable, they also determine the chance to alter the outcome (no chance, some chance, or good chance).

[21] Berg, C.J., Harper, M. A., Atkinson, S. M., Bell, E. A., Brown, H. L., Hage, M. L., et al., Preventability of pregnancy-related deaths: results of a state-wide review.Obstetrics & Gynecology, 2005. 106(6): p. 1228.

The MMRC determined that all six of the pregnancy-related deaths were preventable; three were classified as having some chance of altering the outcome and three were classified as having a good chance of altering the outcome.

Key Decision: What were the factors that contributed to the death?

For each preventable death, the committee identifies and describes the factors that contributed to the death. These factors form the basis for the committee's recommendations. Each factor is assigned at least one of 23 specific contributing factor classes. The list of contributing factors and their definitions are shown in Table 8.[22]

Table 8. CDC defined Contributing Factors Class

Contributing Factor Class	Definition
Lack of Access/Financial Resources	Systemic barriers, e.g, lack or loss of healthcare insurance or other financial duress, as opposed to noncompliance, impacted their ability to care for themselves (e.g., did not seek services because unable to miss work or afford postpartum visits after insurance expired). Other barriers to accessing care: insurance non-eligibility, provider shortage in their geographical area, and lack of public transportation.
Substance Use Disorder (alcohol, illicit/prescription drugs)	Substance use disorder is characterized by recurrent use of alcohol and/or drugs causing clinically and functionally significant impairment, such as health problems or disability. The committee may determine that a substance use disorder contributed to the death when the disorder directly compromised their health status (e.g, acute methamphetamine intoxication exacerbated pregnancy- induced hypertension, or they were more vulnerable to infections or medical conditions).
Mental Health Conditions	The patient had a documented diagnosis of a psychiatric disorder. This includes postpartum depression. If a formal diagnosis is not available, refer to your review committee subject matter experts (e.g, psychiatrist, psychologist, licensed counselor) to determine whether the criteria for a diagnosis of substance use disorder or another mental health condition are met based on the available information.
Clinical Skill/Quality of Care (provider or facility perspective)	Personnel were not appropriately skilled for the situation or did not exercise clinical judgment consistent with standards of care (e.g, error in the preparation or administration of medication or unavailability of translation services).
Social Support/Isolation – Lack of family/friend or support system	Social support from family, partner, or friends was lacking, inadequate, and/or dysfunctional.

[22] *Maternal Mortality Review Committee Decisions Form*. (2017). Centers for Disease Control and Prevention. Retrieved from https://reviewtoaction.org/sites/default/files/2021-06/CommitteeDecisionsForm-mmria-form-v21-fillable1_0.pdf

Trauma	The individual experienced trauma: i.e., loss of child (death or loss of custody), rape, molestation, or one or more of the following: sexual exploitation during childhood plus persuasion, inducement, or coercion of a child to engage in sexually explicit conduct; or other physical or emotional abuse other than that related to sexual abuse during childhood.
Lack of Continuity of Care (provider or facility perspective)	Care providers did not have access to individual's complete records or did not communicate their status sufficiently. Lack of continuity can be between prenatal, labor and delivery, and postpartum providers.
Failure to Screen/Inadequate Assessment of Risk	Factors placing the individual at risk for a poor clinical outcome recognized, and they were not transferred/transported to a provider able to give a higher level of care.
Poor Communication/Lack of Case Coordination or Management/Lack of Continuity of Care (system perspective)	Care was fragmented (i.e, uncoordinated or not comprehensive) among or between healthcare facilities or units, (e.g, records not available between inpatient and outpatient or among units within the hospital, such as Emergency Department and Labor and Delivery).
Discrimination	Treating someone less or more favorably based on the group, class or category they belong to resulting from biases, prejudices, and stereotyping. It can manifest as differences in care, clinical communication and shared decision-making.

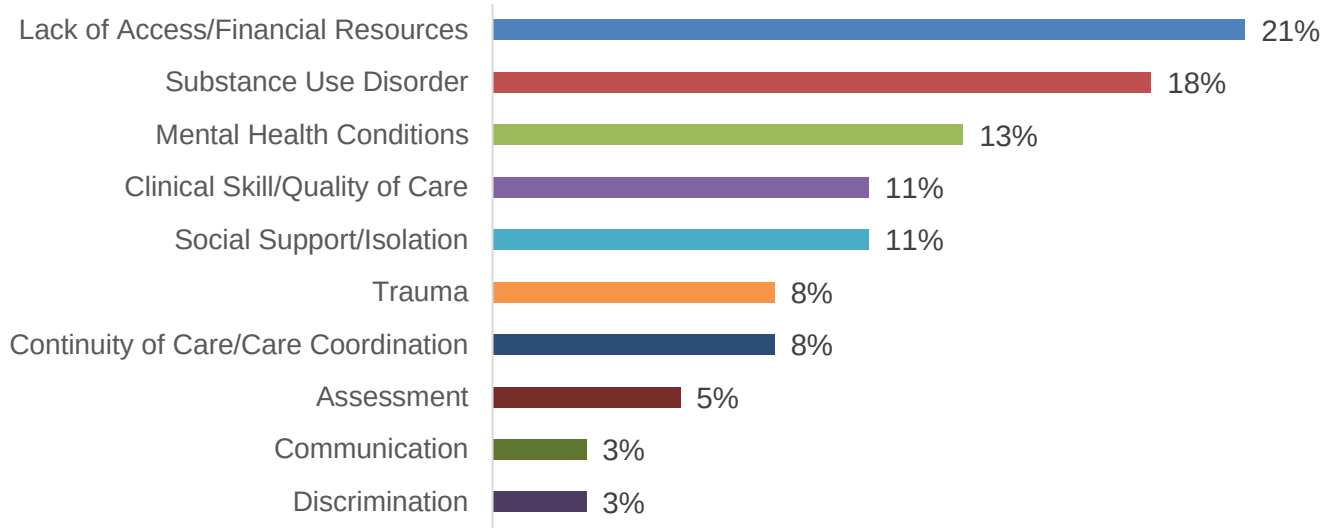
The contributing factors fell into 10 different categories. The number of deaths with each factor classification are listed in Table 9; substance use was identified as a contributing factor in 5 of the 6 cases.

Table 9. Contributing factors by the number of deaths, WY 2018 – 2020

Contributing Factor	Number of deaths with factor
Substance Use	5
Mental Health Conditions	3
Access/Financial	3
Continuity of Care/Care Coordination	3
Trauma	2
Social Support/Isolation	2
Communication	1
Clinical Skill/Quality of Care	1
Assessment	1
Discrimination	1

Among the 6 deaths, the committee identified 38 contributing factors and issued 38 corresponding recommendations for prevention. Figure 10 shows the distribution of the 38 identified contributing factors among the 10 identified categories of contributing factors. Lack of access/financial resources, substance use disorders, and mental health conditions were the most often identified factors. The CDC definitions for each of the contributing factors are listed above in Table 8.[23]

Figure 10. Distribution of Contributing Factors among Pregnancy Related Deaths, WY 2018 - 2020



Level of Contributing Factors and Recommendations

The committee identifies a level for each contributing factor and for each recommendation. Figure 11 shows the proportion of the level of contributing factors and recommendations while Table 10 defines each level. The system level (37%) and patient/family level (24%) were the most commonly identified level of the contributing factor. However, the MMRC recommendations were most often at the system level (63%) and none were at the individual level.

[23] *Maternal Mortality Review Committee Decisions Form*. (2017). Centers for Disease Control and Prevention. Retrieved from https://reviewtoaction.org/sites/default/files/2021-06/CommitteeDecisionsForm-mmria-form-v21-fillable1_0.pdf

Figure 11. Contributing Factor and Recommendation Level among Pregnancy-Related Deaths, WY 2018 - 2020

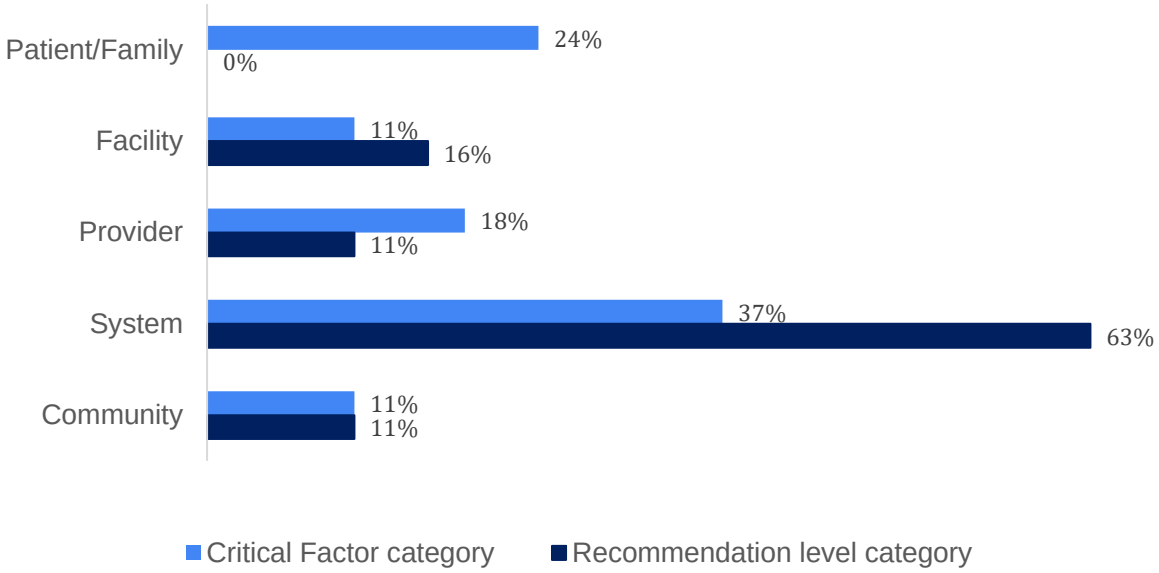


Table 10. Definitions of the level of contributing factor and recommendations[24]

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

Impact Level of the Recommendation

The committee assigns a level of impact for each of their recommendations. The definitions for each of the levels is listed in Table 11.[25]

[24] Centers for Disease Control and Prevention. Retrieved from https://reviewtoaction.org/sites/default/files/2021-06/CommitteeDecisionsForm-mmria-form-v21-fillable1_0.pdf

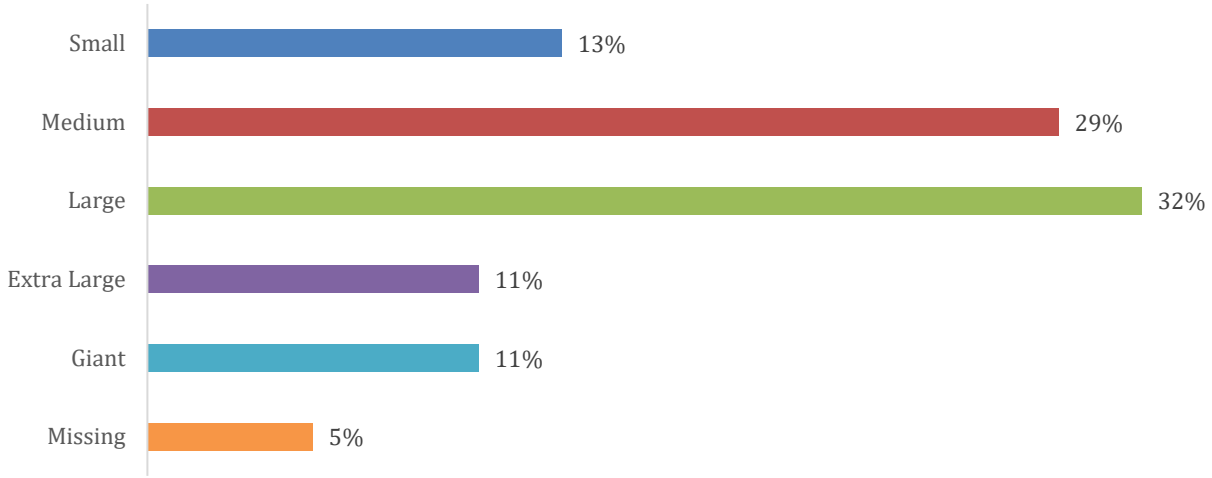
[25] Centers for Disease Control and Prevention. Retrieved from https://reviewtoaction.org/sites/default/files/2021-06/CommitteeDecisionsForm-mmria-form-v21-fillable1_0.pdf

Table 11. Definition of the impact level of MMRC Recommendations

Level	Definition
Small	Education/counseling (e.g. community- and/or provider-based health promotion and education activities)
Medium	Clinical intervention and coordination of care across continuum of well-woman visits (e.g. protocols, prescriptions)
Large	Long-lasting protective intervention (e.g. improve readiness, recognition and response to obstetric emergencies/Long Acting Reversible Contraception)
Extra Large	Change in context (e.g. promote environments that support healthy living/ensure available and accessible services)
Giant	Address social determinants of health (e.g. poverty, inequality, etc.)

Figure 12 illustrates the distribution of the expected impact levels; almost one third of the recommendations are expected to have a large impact in the prevention of maternal mortality in Wyoming.

Figure 12. Impact level of MMRC Recommendations, WY 2018 - 2020



MMRC Recommendations for Pregnancy-Related Deaths

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

The MMRC provides recommendations to the Wyoming Department of Health based on their reviews of maternal deaths. Each identified contributing factor is mapped to at least one recommendation. CDC encourages committees to craft recommendations which include "who" should do "what" and "when."

For the purposes of this report, the Wyoming Department of Health has grouped the MMRC recommendations from their review of Wyoming maternal deaths during 2018-2020 into five themes. The complete list of MMRC recommendations from 2018 - 2020 cases can be found on the Wyoming Department of Health's website or requested from the Wyoming Department of Health. (https://health.wyo.gov/wp-content/uploads/2023/05/MMRC-WY-Recommendations-2018-2020.pdf)

Theme 1: Improve Access to Medical and Behavioral Health Services

Improved access to medical and behavioral health services for pregnant and postpartum women was the focus of several MMRC recommendations. Increasing the ability to access insurance longer into the postpartum period may increase access to preventative care, substance use treatment, and mental health treatment. Access to care may also be enhanced by offering universal home visiting, increasing telehealth options, increasing the number of behavioral health providers with expertise in caring for pregnant and postpartum patients, and expanding funding for substance use disorder treatment through peer recovery support specialists and MAT programs statewide. Efforts may also be focused on consistent mental health screenings and referral processes for patients at high risk, such as those with limited familial or community support, or parents who have recently experienced the loss of an infant or child.

Theme 2: Improved Care Coordination by Healthcare Providers and Facilities

A second theme among MMRC recommendations was improved care coordination among medical and behavioral health providers and facilities. Such coordination can help to ensure referrals to available resources, place patients with complex medical conditions in facilities with appropriate expertise and technologies, and help patients stay in care. Infrastructure improvements to improve care coordination may include expansion of issue identification and care coordination using electronic medical records, processes to follow-up with patients who miss appointments, and communication between medical homes and specialty care providers for cohesive plans of care. State agencies and other organizations can help increase provider awareness of mental health, substance use, and social resources in the community and facilitate referrals and linkages to care.

Theme 3: Increase Access to Provider Training

MMRC recommendations also indicate that evidence-based training for providers, provided in a flexible and effective format, may improve quality of care and reduce preventable severe maternal morbidity and maternal mortality. Interactive, peer-to-peer training models (such as ECHO) for

care providers in trauma-informed care, Medication-Assisted Treatment (MAT) for individuals with substance use disorders, treatment of mental health conditions and substance use disorders during pregnancy and postpartum periods, implicit bias, and topics related to the short-term and chronic physiological impacts of mental health conditions and substance use disorders, may provide effective and efficient knowledge-sharing across the state.

Theme 4: Systematic Implementation of Evidence-Based Strategies in Healthcare Facilities

In addition to provider training, MMRC recommendations indicate that implementation of standardized, evidence-based protocols by healthcare providers and facilities can help improve quality of care and ensure underlying medical, mental health, substance use, and safety issues are identified and addressed during healthcare. Validated and standardized universal mental health, substance use, and interpersonal violence screenings at prenatal care visits, immediately after birth, and during postpartum visits may increase the likelihood of early identification and successful treatment or intervention. Screenings may take place in primary or obstetric care settings, as well Emergency Room settings. Prenatal visits may also offer the opportunity to conduct seatbelt use assessments and initiate patient and provider conversations on this topic. Implementation of evidence-based safety bundles in hospitals and birthing facilities, such as those for maternal hemorrhage and substance use disorders, can help ensure that best practices to identify and manage pregnancy complications are consistently implemented to improve maternal outcomes.

Theme 5: Increased Access to Community Support Services

Along with recommendations related to medical and behavioral healthcare, MMRC recommendations indicate that private and public partners can collaborate in Wyoming communities to ensure safe environments to live and work, especially for individuals who are at high risk for losing housing and employment. Individuals with substance use disorders or mental health conditions may benefit from workplace policies that protect them from termination of employment, ensuring stable incomes and access to healthcare insurance to seek ongoing treatment. Increased access to affordable, safe housing for persons in dangerous living conditions will improve their safety and facilitate seeking healthcare. Affordable childcare may support families in maintaining employment and access to health insurance to continue to seek needed healthcare. Partners in the private technology sector can increase safety by developing algorithms to identify pregnant and postpartum individuals at risk for interpersonal violence and suicide to be targeted with locally available or virtual resources.

Moving Forward

Prevention of maternal mortality is a priority for the Wyoming Department of Health's Maternal and Child Health Unit. The MCH Unit and MCH Epidemiology Program will continue to partner with the UDOH for Maternal Mortality Review. The Maternal and Child Health Unit will continue to promote awareness of the MMRC's function and recommendations for action. The MMRC Epidemiologist will continue to refine case ascertainment methods, and as more cases are reviewed, continue to release

data to inform maternal mortality prevention efforts. WDH is appreciative of and will continue to collaborate with the University of Wyoming's Fay W. Whitney School of Nursing for case abstraction.

The Wyoming Perinatal Quality Collaborative has selected maternal mental health and substance use as a priority project. The first planned Quality Improvement (QI) project will address substance use during pregnancy and the postpartum period. The QI Initiative will support birthing facilities to implement an evidence-based substance use screening tool among pregnant and postpartum women in Wyoming using the Alliance for Innovation on Maternal Health (AIM) Patient Safety Bundle guidance.