Maryland
DEPARTMENT OF HEALTH
Larry Hogan, Governor · Boyd K. Rutherford, Lt. Governor · Dennis R. Schrader, Secretary

November 16, 2021

The Honorable Larry Hogan
Governor
State of Maryland
Annapolis, MD 21401-1991

The Honorable Bill Ferguson
President of the Senate
Maryland General Assembly
H-107 State House
Annapolis, MD 21401-1991

The Honorable Adrienne Jones
Speaker of the House
Maryland General Assembly
H-101 State House
Annapolis, MD 21401-1991

RE: Health-General Article, §§ 13-1207—13-1208 and §13-1212, Annotated Code of Maryland - 2020 Annual Report – Maryland Maternal Mortality Review

Dear Governor Hogan, President Ferguson, and Speaker Jones:

Pursuant to Health-General Article, §13-1204 and §13-1212; Senate Bill 459, Chapter 74 of the Acts of 2000; and House Bill 1518, Chapter 308 of the Acts of 2018, the Maryland Department of Health submits this legislative report. This report includes the findings and program actions of the Maternal Mortality Review Program, as well as the recommendations of two independent bodies, the Maternal Mortality Review Committee, and the Maternal Mortality Review Stakeholder Group.

If you have questions concerning this report, please contact Heather Shek, Director, Office of Governmental Affairs at heather.shek@maryland.gov.

Sincerely,

Dennis R. Schrader
Secretary

Cc: Heather Shek, Director, Office of Governmental Affairs
Jinlene Chan, MD, MPH, FAAP, Acting Deputy Secretary, Public Health Services
Donna Gugel, MHS, Director, Prevention and Health Promotion Administration
Shelly Choo, MD, MPH, Director, Maternal and Child Health Bureau
Sarah T. Albert, Department of Legislative Services (5 copies) MSAR # 11506

Maryland
DEPARTMENT OF HEALTH

Maryland Maternal Mortality Review

2020 Annual Report
Health – General Article §§13-1207—13-1208 and §13-1212

Larry Hogan
Governor

Boyd K. Rutherford
Lt. Governor

Dennis R. Schrader
Acting Secretary of Health

(This page intentionally left blank.)

Table of Contents

Acknowledgements

This review of maternal deaths in Maryland would not be possible without the data, expertise, and collaboration of the Maryland Department of Health's Vital Statistics Administration and the Office of the Chief Medical Examiner. The Maternal Mortality Review Program (the Program) would also like to offer special thanks to the volunteer members of its Maternal Mortality Review Committee (MMR Committee) for the hours spent in discussion and the serious attention given to this important public health project. The Program is grateful for the diligent work of the case abstractors in their careful and thorough abstraction of case materials. The Program also thanks MedChi, the Maryland State Medical Society, for their collaboration in the administrative support of the MMR Committee. Special thanks to all those who participated in this year's MMR Committee meetings and case reviews. A list of Committee members and staff can be found in Appendix A of this document.

The Committee acknowledges the women who died during or after their pregnancy. Each death represents a woman's life that ended too early.

Background

The Maryland Maternal Mortality Review Program (the Program) was established in statute in 2000. Md. Ann. Code Health-General Art., §13-1203—1207, establishes the Program in the Maryland Department of Health (the Department) and describes its scope. The purpose of the Program is to:

(1) Identify maternal death cases;
(2) Review medical records and other relevant data;
(3) Determine preventability of death;
(4) Develop recommendations for the prevention of maternal deaths; and
(5) Disseminate findings and recommendations to policymakers, physicians and other health care providers, health care facilities, and the general public.

The Maternal Mortality Review Committee (the MMR Committee), which was established by the Program and is made up of volunteer heath care and public health professionals, conducts maternal mortality case reviews. The Department contracts with MedChi to provide administrative support in the maternal mortality review process by obtaining medical records, abstracting cases, and hosting meetings of the Department's MMR Committee. The MMR Committee provides an in-depth review of maternal deaths to determine pregnancy-relatedness and preventability. Based upon the MMR Committee's reviews of mortality cases, the MMR Committee then develops recommendations for the prevention of maternal deaths and disseminates their findings and recommendations.

Key Definitions

- A **maternal death** is defined by the World Health Organization's (WHO's) International Classification of Diseases Ninth and Tenth Revisions (ICD-9 and ICD-10) as, "the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by pregnancy or its management but not from accidental or incidental causes." The ICD-10 codes used to identify maternal deaths are A34, O00-O95, and O98-O99.
- The **maternal mortality ratio or rate (MMR)** is the number of maternal deaths per 100,000 live births in the same time period.
- A **pregnancy-associated death** is defined by the Centers for Disease Control and Prevention (CDC) as "the death of a woman while pregnant or within one year or 365 days of pregnancy conclusion, irrespective of the duration and site of the pregnancy, regardless of the cause of death."
- The **pregnancy-associated mortality rate** is the number of pregnancy-associated deaths per 100,000 live births in the same time period.
- A **pregnancy-related death** is defined by the CDC as "the death of a woman while pregnant or within one year of conclusion of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by her pregnancy or its management, but not from accidental or incidental causes."
- The **pregnancy-related mortality rate** is the number of pregnancy-related deaths per 100,000 live births in the same time period.

The three terms “maternal death,” “pregnancy-associated death,” and “pregnancy-related death,” create a challenge when comparing data for different jurisdictional entities from different sources and reports. The WHO monitors maternal deaths worldwide as a key indicator of population health, and of social and economic development. Maternal deaths are identified solely from information on the death certificate or similar registration of the occurrence and cause of death. Maternal deaths are limited in both the time period and causes considered.

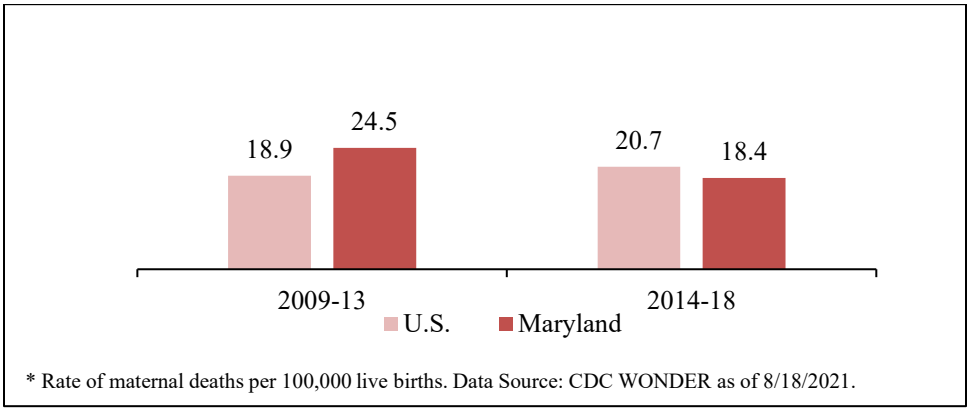
In more developed countries with improved medical care, many deaths related to pregnancy occur beyond 42 days after the end of pregnancy. In 1986, the CDC and the American College of Obstetricians and Gynecologists (ACOG) collaborated to recommend the use of expanded definitions to more accurately identify deaths among women where pregnancy was a contributing factor. This collaboration led to the definitions for pregnancy-associated and pregnancy-related deaths. Enhanced surveillance methods are necessary to determine pregnancy-associated and pregnancy-related deaths and are discussed below.

Rising Rates of Maternal Deaths

Nationally, maternal deaths as defined above have declined dramatically since the 1930s when the MMR was 670 maternal deaths per 100,000 live births. The U.S. MMR was at its lowest level in 1987 at 6.6 maternal deaths per 100,000 live births. However, the MMR has risen since that time, and was 17.4 maternal deaths per 100,000 live births in 2018, the latest year for which national data are available. It should be noted that previous years of this report used a different method to calculate maternal death, which included ICD-10 codes O00-O99, accounting for differences in reported numbers of maternal deaths and MMR. The MMR Committee uses a 5-year average of Maryland’s MMR rate to compare it with the national rate. Averaging the Maryland rate stabilizes the number and is necessary because maternal deaths are relatively infrequent events that may vary considerably year to year, particularly in a small state like Maryland.

In previous years, the Maryland MMR had consistently been higher than the national rate. For the period from 2009 to 2013, the Maryland MMR was 7 percent higher than the national rate. However, for the period from 2014 to 2018, the Maryland MMR was 12 percent less than the national rate. Between the two 5-year periods shown (Figure 1), the U.S. MMR increased by 19.3 percent and the Maryland rate decreased by 1.2 percent. Both the U.S. and Maryland rates remain above the Healthy People 2020 Objective MICH-5 target of 11.4 maternal deaths per 100,000 live births.

Figure 1. Maternal Mortality Rates*, U.S. and Maryland
2009-2013 and 2014-2018



* Rate of maternal deaths per 100,000 live births. Data Source: CDC WONDER as of 8/18/2021.

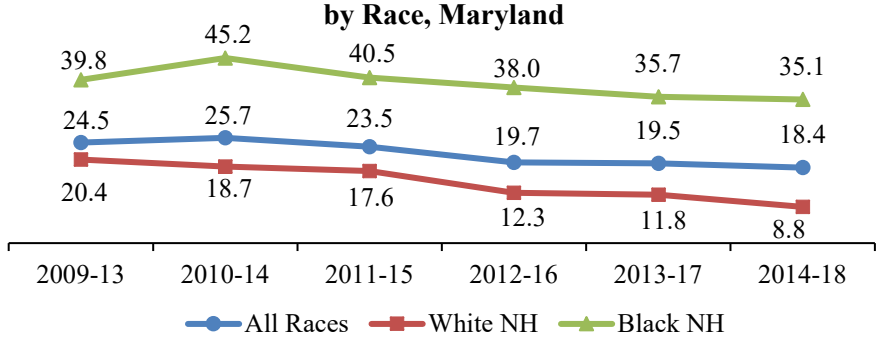
The reason for the increase in MMR since the 1980s is unclear. Many studies have shown an increase in chronic health conditions among pregnant women in the United States, including obesity, hypertension, diabetes, and heart disease.[1, 2, 3] These conditions likely put pregnant women at higher risk of adverse outcomes.

Racial Disparity

In the U.S. in 2018, Black non-Hispanic women had an MMR 2.5 times greater than White non-Hispanic women, a disparity that has persisted since the 1940s. In Maryland, there is also a large disparity between the rates among Black non-Hispanic and White non-Hispanic women. Figure 2 shows the MMR by race in Maryland for six overlapping five-year periods over the past decade. Compared to 2009-2013, the 2014-2018 White non-Hispanic MMR in Maryland decreased 56.7 percent and the Black non-Hispanic MMR decreased 12.0 percent. Although the rates are decreasing for both racial groups, the disparities are increasing. The 2009-2013 Black non-Hispanic MMR was 2.0 times the White non-Hispanic MMR, while the 2014-2018 Black non-Hispanic MMR was 4.0 times the White non-Hispanic MMR. Given this racial disparity, it appears that the recent decrease in the Maryland MMR is a result of the decrease in the White non-Hispanic MMR. Appendix C shows the five-year rolling average MMR by race in Maryland going back to the 2000-2004 year period.

[1] Azeez O, Kulkarni A, Kuklina EV et al. Hypertension and Diabetes in Non-Pregnant Women of Reproductive Age in the United States. Prev. Chronic Dis. 2019;16(E146):1-9. https://www.cdc.gov/pcd/issues/2019/19_0105.htm.
[2] Catalano PM, Shankar K. Obesity and Pregnancy: Mechanisms of Short Term and Long Term Adverse Consequences for Mother and Child. BMJ. 2017;356:j1. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6888512/.
[3] Bateman BT, Bansil P, Hernandez-Diaz S et al. Prevalence, Trends, and Outcomes of Chronic Hypertension: A Nationwide Sample of Delivery Admissions. Am J Obstet Gynecol. 2012 Feb;206(2):134.e1-8. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4103984/.

Figure 2. Five-Year Rolling Average Maternal Mortality Rate* by Race, Maryland



*Rate of maternal deaths per 100,000 live births. Data Source: CDC WONDER as of 8/18/2021.

Methodology

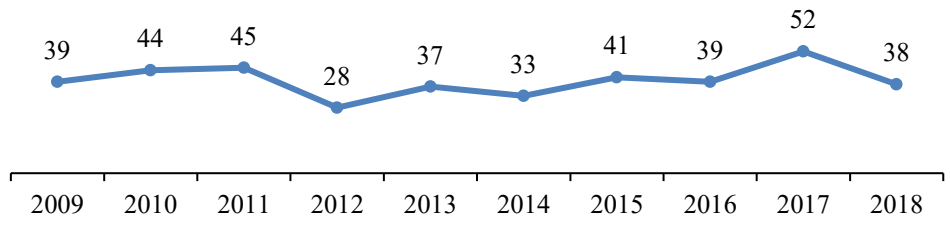
Case Identification

Cases for review are limited to women who were residents of Maryland at the time of their death. Maryland residents who died in other states are not included in the case reviews. Maternal deaths are determined by cause of death and pregnancy information on the death certificates alone. The Maryland death certificate was revised in January 2001 to include questions about pregnancy status, pregnancy outcome, and date of delivery for the 12 months preceding death. This pregnancy checkbox has significantly increased identification of maternal deaths beyond those recognized by cause of death alone.[4, 5]

Pregnancy-associated deaths are identified in one of three ways in Maryland. Individual death certificates are the first method of identifying pregnancy-associated deaths through the use of checkbox questions, or because the cause of death is clearly related to pregnancy (e.g., ruptured ectopic pregnancy, postpartum hemorrhage). The second method of determining pregnancy-associated deaths comes from linking death certificates for women aged 10-50 years with birth certificates and fetal death certificates from the 365 days preceding death to identify additional cases that were not found through examination of death certificates alone. The third method is the review of cases reported to the Office of the Chief Medical Examiner that are identified to show evidence of pregnancy in deceased women.

The MMR Committee designates and further investigates all deaths occurring during pregnancy or within 365 days of pregnancy conclusion. Using the three methods above, 38 pregnancy-associated deaths were identified in 2018. These cases are reviewed in detail in this report. Figure 3 shows the numbers of pregnancy-associated deaths in Maryland from 2009 to 2018. An average of 40 pregnancy-associated deaths occurred per year during this period.

Figure 3. Number of Pregnancy-Associated Deaths, Maryland



Data Source: Maryland MMR Program.

[4] Horon IL. Underreporting of Maternal Deaths on Death Certificates and the Magnitude of the Problem of Maternal Mortality. Am J Public Health. 2005; 95:478-82. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1449205/.
[5] Horon IL, Cheng D. Effectiveness of Pregnancy Check Boxes on Death Certificates in Identifying Pregnancy-Associated Mortality. Pub Health Reports. 2011; 126:195-200. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3056032/.

Case Review

Pregnancy-associated deaths undergo several stages of review. Once cases are identified, medical records are obtained from the hospitals of death and delivery, when applicable. Physician and nurse-midwife abstractors review death certificates, hospital records, Office of the Chief Medical Examiner records, and other available materials for all cases, and prepare case summaries that are submitted to the MMR Committee for review. The MMR Committee reviewed all 2018 pregnancy-associated deaths from all causes (medical, injury, substance use, homicide, and suicide) for cause of death, pregnancy-relatedness, and preventability.

Pregnancy-relatedness and potential preventability of the deaths are determined through MMR Committee discussion. The MMR Committee includes obstetric, maternal fetal medicine, nurse-midwifery, nursing, and social work specialists. Public health professionals also participate on the MMR Committee, including representatives from the Department's Maternal and Child Health Bureau. The MMR Committee discussions incorporate the CDC framework for case review.[6] This approach takes into account medical and non-medical factors contributing to maternal death and examines quality and content of medical care. Cases discussed by the MMR Committee are de-identified and all members sign confidentiality agreements.

2018 Case Findings

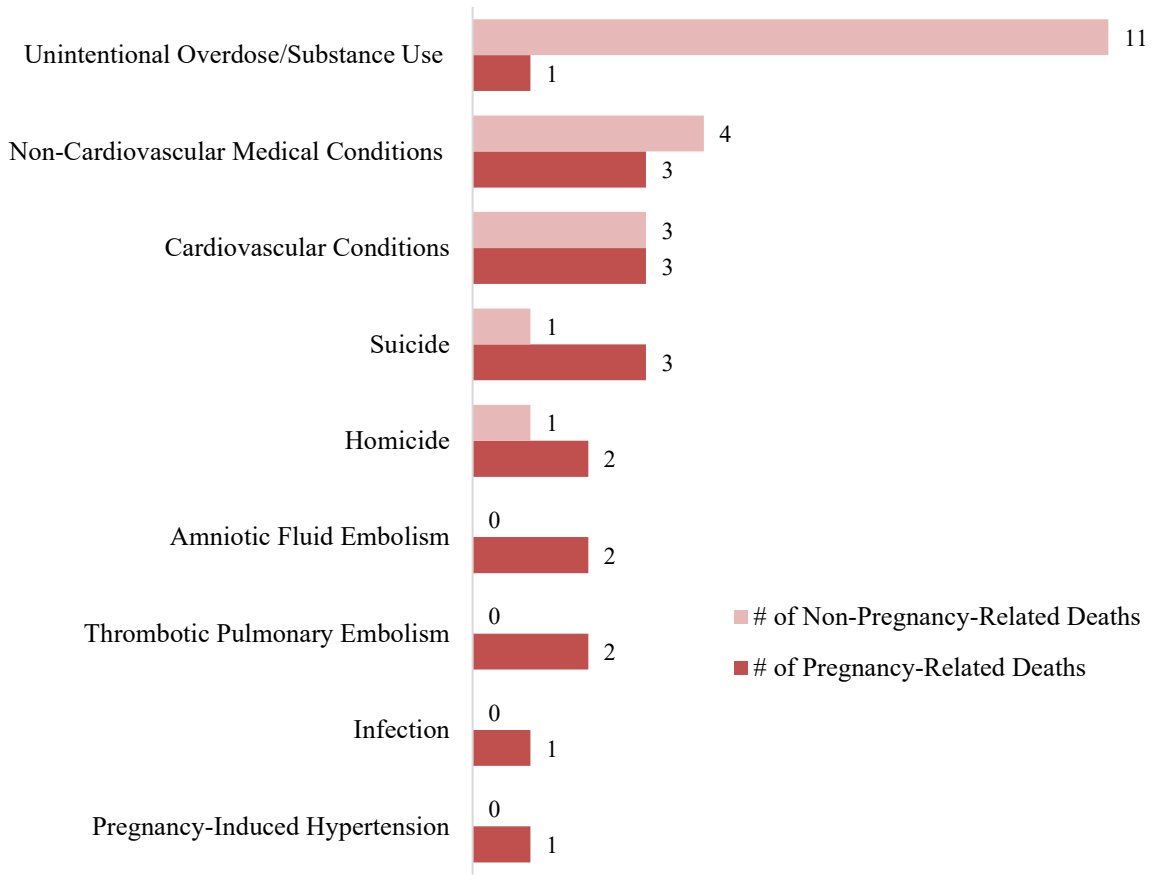
The MMR Committee identified a total of 38 pregnancy-associated deaths in 2018, resulting in a pregnancy-associated mortality rate of 53.5 deaths per 100,000 live births. For further analysis, the MMR Committee divided these deaths into pregnancy-related and non-pregnancy-related deaths, which represent two non-overlapping groups. Of the 38 pregnancy-associated deaths, 18 were determined to be pregnancy-related, for a pregnancy-related mortality rate of 25.3 deaths per 100,000 live births. The remaining 20 deaths were determined to be non-pregnancy-related.

Cases by Cause of Death Category

Figure 4 shows pregnancy-related and non-pregnancy-related deaths by category of cause of death. The leading cause of non-pregnancy-related death was substance use with unintentional overdose, accounting for 12 deaths: 11 non-pregnancy-related and one pregnancy-related unintentional overdose death (55 percent of non-pregnancy-related deaths and 32 percent of all pregnancy-associated deaths in 2018). One of the suicide deaths was also due to opioid overdose. Other leading causes of non-pregnancy-related death were non-cardiovascular medical conditions and cardiovascular conditions.

[6] Berg C, Danel I, Atrash H, Zane S, Bartlett L (Editors). Strategies to Reduce Pregnancy-related Deaths: from Identification and Review to Action. Atlanta: Centers for Disease Control and Prevention; 2001 https://stacks.cdc.gov/view/cdc/6537.

Figure 4. Number of Pregnancy-Related and Non-Pregnancy-Related Deaths by Category of Cause of Death, Maryland, 2018 (Total Deaths = 38)



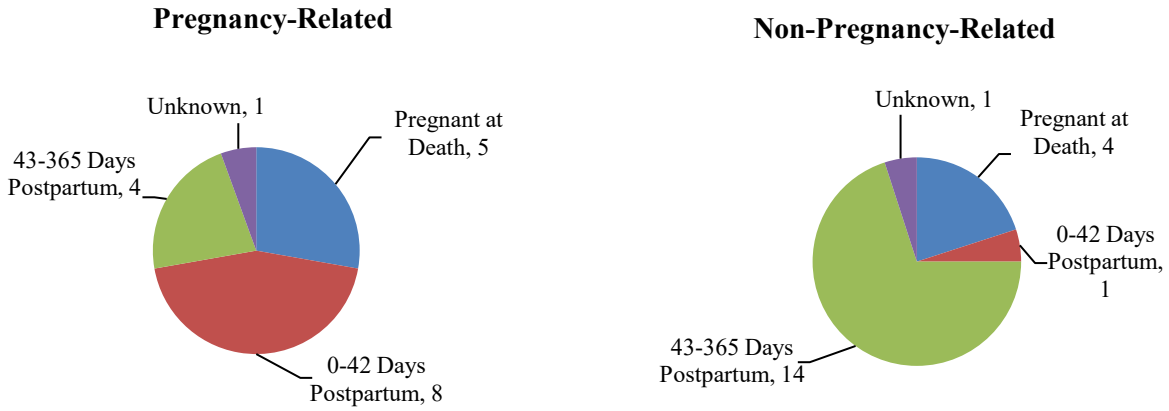
Data Source: Maryland MMR Program.

Among the 18 pregnancy-related deaths in 2018, the leading causes of death were non-cardiovascular conditions, cardiovascular conditions, and suicide, each accounting for three deaths. Homicide, amniotic fluid embolism, and thrombotic pulmonary embolism each accounted for two deaths. The remaining pregnancy-related deaths were single cases of substance use with unintentional overdose, infection, and pregnancy-induced hypertension.

Cases by Timing of Death in Relation to Pregnancy

Among the 18 pregnancy-related deaths in 2018, eight (44 percent) occurred within 42 days postpartum, five (28 percent) occurred during pregnancy, four (22 percent) occurred between 43-365 days postpartum, and, for one case, the timing of death was unknown. Of the 20 non-pregnancy-related deaths, 14 (70 percent) occurred between 43-365 days postpartum, four (20 percent) occurred during pregnancy, one occurred within 42 days postpartum, and the timing of death was unknown for one case (Figure 5). Deaths in the early postpartum period, before the traditional six-week postpartum visit, were much more frequent among pregnancy-related deaths compared to non-pregnancy-related deaths.

Figure 5. Number of Pregnancy-Related and Non-Pregnancy-Related Deaths by Timing of Death, Maryland, 2018

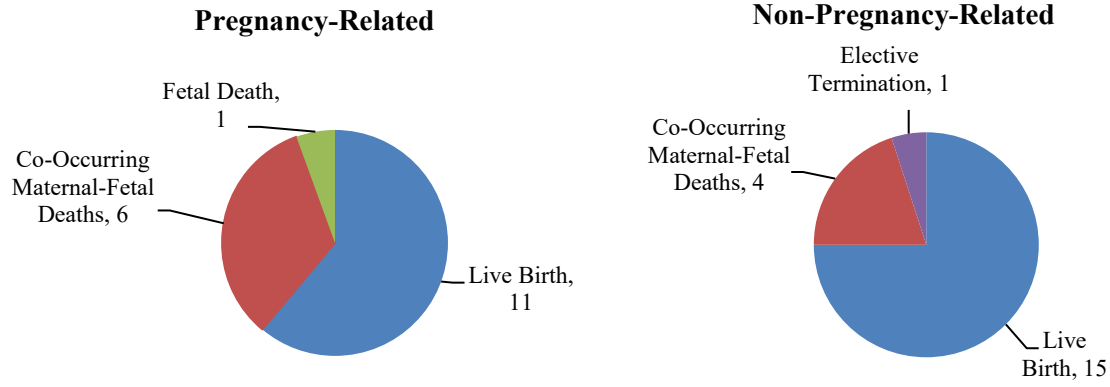


Data Source: Maryland MMR Program.

Cases by Outcome of Pregnancy

Among the 18 pregnancy-related deaths in 2018, 11 (61 percent) had a live birth, six (33 percent) involved co-occurring maternal and fetal deaths, and one involved a fetal death that preceded the maternal death. Among the 20 non-pregnancy-related deaths, 15 (75 percent) had a live birth, four (20 percent) involved co-occurring maternal and fetal deaths, and one had an elective termination (Figure 6).

Figure 6. Number of Pregnancy-Related and Non-Pregnancy-Related Deaths by Pregnancy Outcome, Maryland, 2018

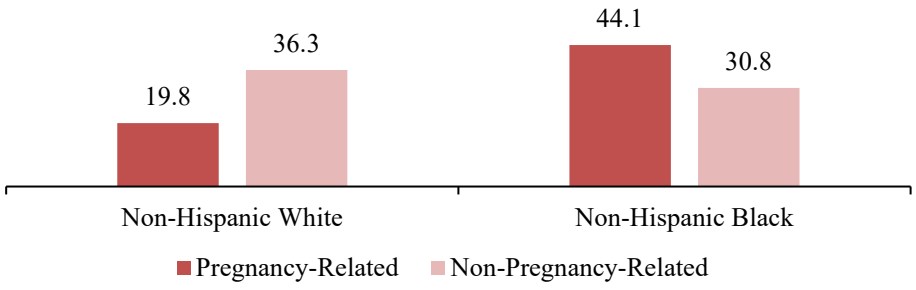


Data Source: Maryland MMR Program.

Cases by Maternal Race and Ethnicity

Of the 18 pregnancy-related deaths occurring in 2018, six cases (33 percent) involved non-Hispanic White women, ten cases (56 percent) involved non-Hispanic Black women, and two cases (11 percent) involved Asian/Pacific Islander women. Among the 20 non-pregnancy-related deaths, 11 cases (55 percent) involved non-Hispanic White women, seven cases (35 percent) involved non-Hispanic Black women, one case involved a Hispanic woman, and one case involved a non-Hispanic woman whose race was identified as other. Pregnancy-related and non-pregnancy-related mortality rates among non-Hispanic Black and non-Hispanic White women in 2018 are shown in Figure 7.

Figure 7. Pregnancy-Related and Non-Pregnancy-Related Mortality Rates* by Selected Race/Ethnicity, Maryland, 2018



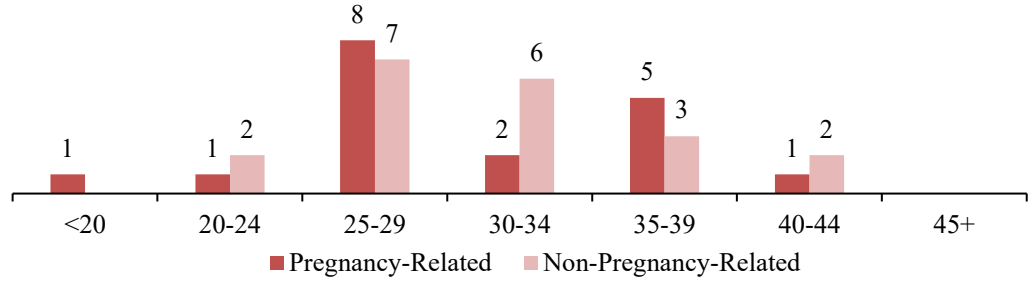
* Number of deaths per 100,000 live births.
Data Source: VSA and Maryland MMR Program.

The rate of non-pregnancy-related deaths is similar between non-Hispanic White and non-Hispanic Black women. However, the rate of pregnancy-related deaths in non-Hispanic Black women was 2.2 times higher than that of non-Hispanic White women, illustrating that the preponderance of pregnancy-related deaths is occurring among non-Hispanic Black women.

Cases by Maternal Age

The distribution of pregnancy-related and non-pregnancy-related deaths by maternal age group is shown in Figure 8. Rates of death by age group are not calculated because the numbers of deaths in most groups are very small. Rates involving fewer than five events cannot be reported.

Figure 8. Number of Pregnancy-Related and Non-Pregnancy-Related Deaths by Maternal Age, Maryland, 2018

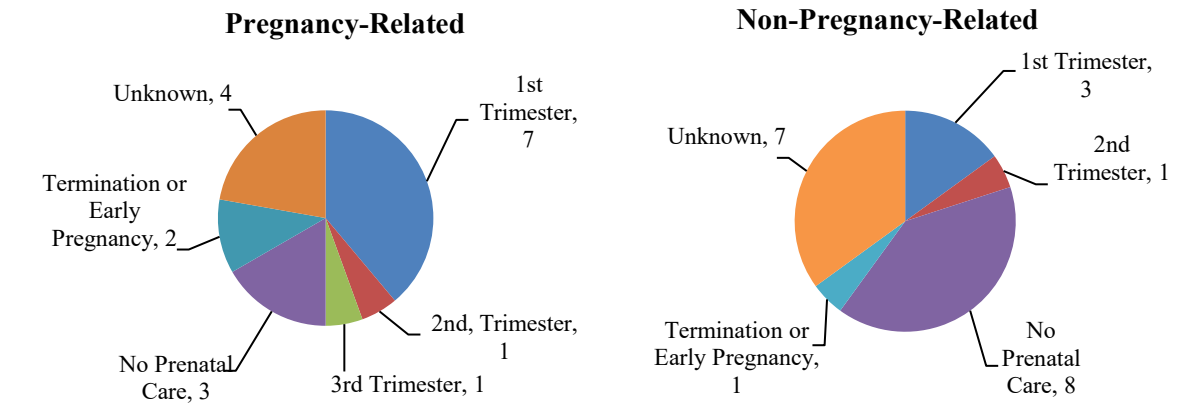


Data Source: VSA and Maryland MMR Program.

Cases by Timing of Prenatal Care Initiation

Pregnancy-related and non-pregnancy-related deaths by the trimester when prenatal care was initiated are shown in Figure 9. Of the 18 pregnancy-related deaths, eight (44 percent) were among women who initiated care in the first or second trimester of pregnancy. Among the 20 non-pregnancy-related deaths, four (20 percent) began prenatal care in the first or second trimester. In four pregnancy-related and seven non-pregnancy-related cases, the timing of prenatal care initiation was unknown.

Figure 9. Number of Pregnancy-Related and Non-Pregnancy-Related Deaths by Prenatal Care Initiation, Maryland, 2018



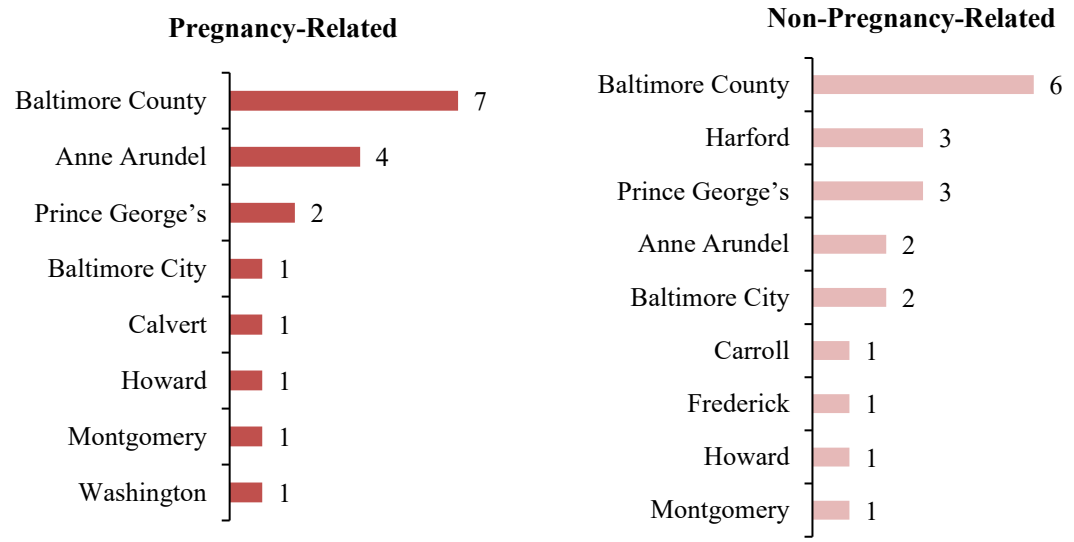
Data Source: Maryland MMR Program.

Cases by Jurisdiction of Residence and Occurrence

Figure 10 shows pregnancy-related and non-pregnancy-related deaths by jurisdiction of residence. Seven (39 percent) of the 18 pregnancy-related deaths were among residents of Baltimore County, four (22 percent) were among residents of Anne Arundel County, and two (11 percent) were among residents of Prince George's County. There were single death cases among residents of Baltimore City, and Calvert, Howard, Montgomery, and Washington Counties. Of the 20 non-pregnancy-related deaths, six (30 percent) were among residents of Baltimore County, three (15 percent) each were among residents of Harford and Prince George's Counties, and two (10 percent) each were among residents of Anne Arundel County and Baltimore City. There were single death cases among residents of Carroll, Frederick, Howard, and Montgomery Counties.

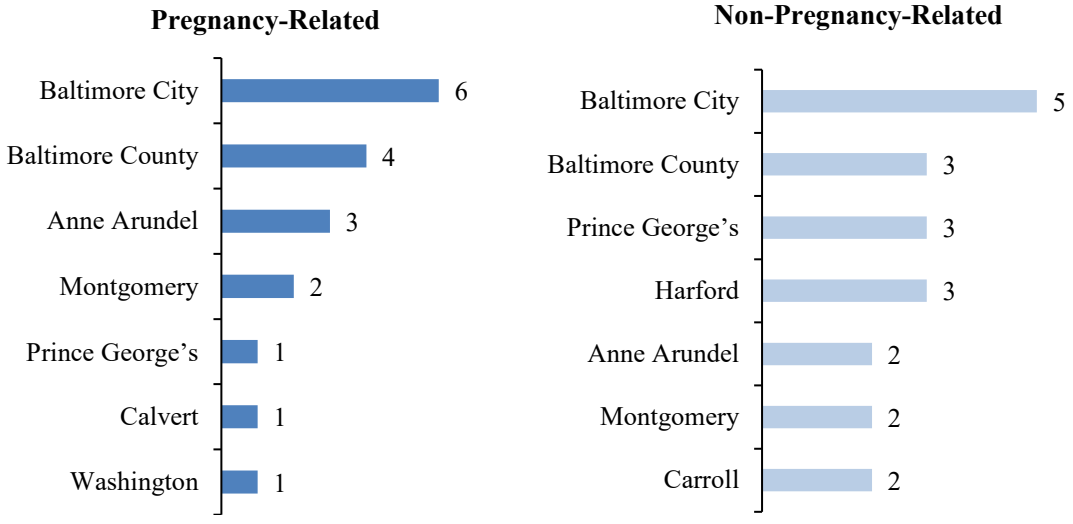
Figure 11 shows pregnancy-related and non-pregnancy-related deaths by jurisdiction in which the death occurred. Six (33 percent) of the 18 pregnancy-related deaths occurred in Baltimore City, four (22 percent) occurred in Baltimore County, three (17 percent) occurred in Anne Arundel County, and two (11 percent) occurred in Montgomery County. There were single death cases that occurred in Calvert, Prince George's, and Washington Counties. Among the 20 non-pregnancy-related deaths, five (25 percent) occurred in Baltimore City, three (15 percent) each occurred in Baltimore, Harford, and Prince George's Counties, and two (10 percent) each occurred in Anne Arundel, Carroll, and Montgomery Counties.

Figure 10. Number of Pregnancy-Related and Non-Pregnancy-Related Deaths by Jurisdiction of Residence, Maryland, 2018



Data Source: Maryland MMR Program.

Figure 11. Number of Pregnancy-Related and Non-Pregnancy-Related Deaths by Jurisdiction of Occurrence, Maryland, 2018



Data Source: Maryland MMR Program.

Preventability of Deaths

A death was considered preventable if the death "may have been averted by one or more changes in the health care system related to clinical care, facility infrastructure, public health infrastructure and/or patient factors."[7] Whether the death was clearly preventable or only potentially preventable by some intervention is a decision made by the MMR Committee. Of the 18 pregnancy-related deaths, 15 (83 percent) were judged to be preventable. Three cases were considered unpreventable deaths. Among the 20 non-pregnancy-related deaths, 17 (85 percent) were judged to be preventable. Three deaths were considered unpreventable. All 12 of the unintentional overdose deaths were considered preventable, as were the six cardiovascular condition deaths, four suicide deaths, three homicide deaths, and two thrombotic pulmonary embolism deaths. The six deaths considered unpreventable were medical causes of death, including cancer, amniotic fluid embolism, and infection.

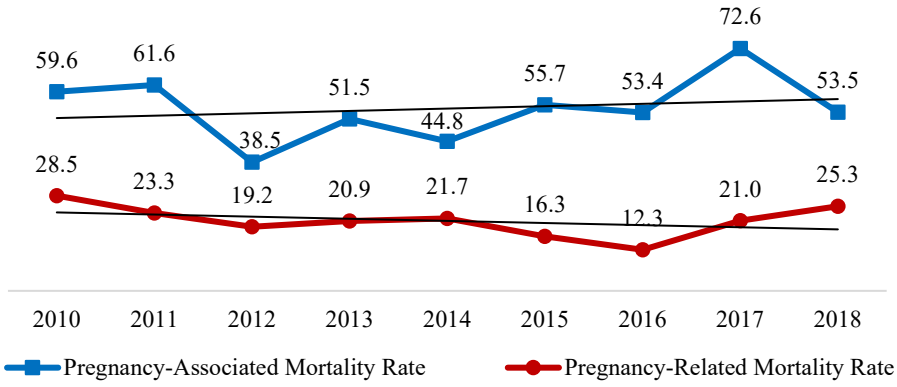
Trends in Pregnancy-Associated and Pregnancy-Related Deaths

As noted in Figure 1, the Maryland MMR has dropped over the past 10 years and is now below the national average. The MMR, however, is limited in both causes of death considered and the timeframe in relation to pregnancy. The MMR includes only deaths from pregnancy-related causes that can be identified by the death certificate alone and that occurred during pregnancy or within 42 days of pregnancy conclusion. The decrease in the Maryland MMR suggests that fewer early pregnancy-related deaths are occurring, and this decrease has occurred primarily among White maternal deaths.

The cases reviewed by the MMR Committee are more comprehensive and include all pregnancy-associated deaths, which include deaths from any cause that occur during pregnancy or up to 365 days after the conclusion of pregnancy. All pregnancy-associated deaths are reviewed for pregnancy-relatedness, creating a subgroup of pregnancy-related deaths. The trends in pregnancy-associated and pregnancy-related mortality rates from 2010 to 2018 are shown in Figure 12. The pregnancy-associated mortality rate shows considerable variability over the eight-year period, and the 2017 rate is the highest observed over this time. The increasing number of overdose deaths in the last several years has contributed to the upward trend in pregnancy-associated mortality rate. The pregnancy-related mortality rate, although higher in 2018, remains similar to previous years 2011 to 2017, and shows a decrease of 11 percent since 2010. Therefore, similar to the MMR, the pregnancy-related mortality rate is decreasing. An analysis of racial disparities in pregnancy-related deaths begins on page 19.

[7] Berg CJ, Harper MA, Atkinson SM, et al. Preventability of Pregnancy-Related Deaths - Results of a State-Wide Review. Obstet and Gynecol. 2005; 106:1228-1234.
https://journals.lww.com/greenjournal/Fulltext/2005/12000/Preventability_of_Pregnancy_Related_Deaths_.4.aspx.

Figure 12. Pregnancy-Associated and Pregnancy-Related Mortality Rates,* Maryland, 2010-2018



* Number of pregnancy-associated and pregnancy-related deaths per 100,000 live births.
Data Source: VSA and Maryland MMR Program.

Causes of pregnancy-related deaths are largely medical conditions directly related to pregnancy (such as postpartum hemorrhage, amniotic fluid embolus, or pre-eclampsia) or those exacerbated by pregnancy (such as pre-existing cardiovascular disease). There are some cases of homicide and suicide that are also determined to be pregnancy-related. The number of cases in Maryland from any individual cause is so small that determining trends for specific causes of pregnancy-related death is not possible.

Substance Use Disorder and Overdose Deaths

In 2018, for the sixth consecutive year, unintentional drug overdose was the leading cause of pregnancy-associated death in Maryland. Twelve of the 38 total deaths (32 percent) resulted from substance use and unintentional overdose, and one overdose death was determined to be a suicide. All but one of the unintentional overdose deaths were considered to be non-pregnancy-related. The 11 non-pregnancy-related overdose deaths accounted for 55 percent of the 20 non-pregnancy-related deaths. All of these deaths involved opioids. In nine of the 12 cases (75 percent), two or more drugs were found by postmortem toxicology testing. Of the overdose deaths, 92 percent involved the potent opioid fentanyl or one of its analogs. Cocaine was found in four cases. Alcohol was detected in three of the overdose cases.

The average age at death was 28.9 years (range 22-36 years). Nine overdose deaths (75 percent) were among non-Hispanic White women and two (17 percent) were among non-Hispanic Black women. One woman's race was classified as "Other" without any additional details. Nine of the 12 women (75 percent) had delivered live born infants and the average timing of death was 213 days postpartum. Three women (25 percent) were pregnant at the time of death, resulting in co-occurring maternal and fetal deaths. One of the overdose deaths occurred in the traditional postpartum period up to 42 days after the conclusion of pregnancy. Eleven of the 12 overdose victims had a known history of substance use and nine (75 percent) had received at least some treatment.

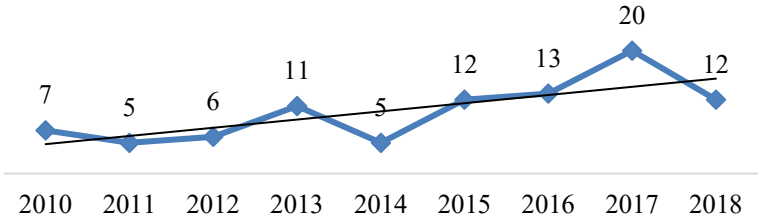
In addition to the 11 women with a history of substance use disorder who died from unintentional overdose in 2018, there were an additional nine women identified who had a

history of substance use disorder but died from other causes. Of those nine women, only two had received any treatment for substance use disorder. This means that in total, 53 percent of the women who died within a year of pregnancy in 2018 had some documented history of substance use disorder.

Multiyear Review of Overdose Deaths

To better understand factors involved in overdose deaths, a review of all pregnancy-associated deaths in Maryland from 2010 to 2018 was undertaken. Over this nine-year period, substance use and unintentional overdose was the leading cause of death, accounting for 91 (25 percent) of 357 pregnancy-associated deaths. Figure 13 shows the number of unintentional overdose deaths by year, with the highest number of cases occurring in 2017.

Figure 13. Number of Pregnancy-Associated Deaths From Unintentional Overdose, Maryland, 2010-2018



Data Source: VSA and Maryland MMR Program.

Of the 91 overdose deaths, 89 (98 percent) involved opioids. Table 1 shows the specific opioids identified by toxicology testing at the time of death in these cases.

Table 1. Opioid Identified Postmortem, Pregnancy-Associated Unintentional Overdose Deaths, Maryland, 2010-2018

Opioid	Number of cases (n=89)
Fentanyl/fentanyl analogs	43
Morphine (heroin)	33
Methadone	22
Oxycodone	15
Tramadol	9
Unspecified opioid	6
Codeine	5
Hydrocodone	2
Oxymorphone	2
Buprenorphine	1
Hydromorphone	1
Meperidine	1

Data Source: Maryland MMR Program. NOTE: Values in the table do not add up to the sample size of 89 because multiple drugs can be detected in a single case.

With the addition of the 2018 cases, the most frequently detected opioid was fentanyl (including fentanyl analogs). Fentanyl was not detected in any overdose death prior to 2014 but has contributed increasingly to these deaths each year since. In 81 (89 percent) of the 91 overdose deaths, two or more drugs were detected by postmortem testing. In 48 (59 percent) of the multiple drug cases, two to six different opioids were identified. Benzodiazepines were detected in 20 (22 percent), and alcohol in 17 (19 percent) of the 91 overdose death cases. The risk of fatal overdose is substantially increased when opioids are combined with other central nervous system depressants such as benzodiazepines or alcohol.

Among the 91 unintentional overdose deaths occurring from 2010 to 2018, the average age at death was 29 years. Sixty-nine (75 percent) of these deaths were among non-Hispanic White women and 18 (20 percent) among non-Hispanic Black women, with three cases (3 percent) among non-Hispanic women of other races and one case (1 percent) in a Hispanic woman.

Sixty-five (71 percent) of the 91 women who died of overdose had delivered live-born infants. Nineteen women (21 percent) were pregnant at the time of death and six (7 percent) had had an elective termination, spontaneous abortion, or fetal demise prior to death. In one case, pregnancy outcome was unknown. Only five deaths (6 percent) occurred at or before 42 days postpartum; 67 (74 percent) occurred between 43 and 365 days postpartum. The average timing of death was 198 days postpartum.

In 67 cases (74 percent), at least one mental health diagnosis was documented. Depression was diagnosed in 56 cases (62 percent), anxiety in 54 cases (59 percent), and bipolar disorder in 32 (35 percent). Eighty-six (95 percent) of the women who died of overdose had a known history of substance use and 46 of these (51 percent) had documentation of some substance use treatment.

In Table 2, the 91 overdose deaths are compared with the 266 non-overdose deaths that occurred between 2010 and 2018. Average age at death was comparable in both groups. However, the racial distribution is strikingly different, with a preponderance of non-Hispanic White women among the overdose deaths and overrepresentation of non-Hispanic Black women among the non-overdose deaths. A similar percentage of women were pregnant at the time of death in both groups, but deaths after the conclusion of pregnancy occurred on average much later among the overdose group. Pregnancy outcomes were similar in both groups, with 71 percent of pregnancies among the overdose group and 66 percent among the non-overdose group resulting in a live birth. Timing of prenatal care initiation was similar, with about half of women in both groups starting prenatal care in the first or second trimester.

There were large differences between the two groups related to several behavioral health factors. Women who died of overdose were more than four times as likely as women who died of other causes to have a known history of substance use (95 percent vs. 22 percent). Women who died of overdose were more than three times as likely to smoke (85 percent vs. 27 percent) and more than three times as likely to have one or more mental health diagnoses (74 percent vs. 21 percent). Also, 89 of 91 overdose deaths (98 percent) were considered preventable or potentially preventable, compared with 60 percent of the non-overdose deaths.

Table 2: Incident Characteristics of Pregnancy-Associated Deaths, Maryland, 2010-2018 Data presented as mean ± standard deviation, or number (%)		
Characteristic	**Overdose Deaths (n=91)**	**Non-overdose Deaths (n=266)**
Demographics		
Average age at death (years)	29±5	31±7
White non-Hispanic	69 (75)	91 (34)
Black non-Hispanic	18 (20)	135 (51)
Other non-Hispanic	3 (3)	17 (6)
Hispanic	1 (1)	23 (9)
Timing of death		
Pregnant at death	19 (21)	59 (22)
0-42 days postpartum	5 (6)	100 (36)
43-365 days postpartum	67 (74)	103 (39)
Unknown	0 (0)	4 (2)
Average days postpartum	198 ± 92	105 ± 116
Pregnancy outcome		
Live-born infant	65 (71)	174 (65)
Co-occurring maternal-fetal deaths	19 (21)	59 (22)
Fetal death	1 (1)	15 (6)
Elective termination	1 (1)	9 (3)
Spontaneous abortion	4 (4)	4 (2)
Ectopic pregnancy	0 (0)	3 (1)
Other outcome	0 (0)	1 (0)
Unknown	1 (1)	1 (0)
Prenatal care initiation		
1st trimester	25 (28)	105 (40)
2nd trimester	17 (19)	28 (11)
3rd trimester	7 (8)	7 (3)
No prenatal care	13 (14)	26 (10)
Termination or death in early pregnancy	6 (7)	13 (5)
Unknown	23 (25)	87 (33)
Behavioral health / social factors		
Known history of substance use	86 (95)	58 (22)
Any history of substance use treatment (among those with known history of substance use)	46 (51)	20 (36)
Smoking	77 (85)	71 (27)
Mental health diagnosis(es)	67 (74)	57 (21)
Intimate partner violence	12 (13)	28 (11)
Preventability		
Death preventable / potentially preventable	89 (98)	160 (60)

Data Source: Maryland MMR Program.

Mental Health Diagnoses

Among the 38 pregnancy-associated deaths in 2018, 15 (39 percent) had histories of mental health disorders, and 93 percent of those women had a diagnosis of depression. In six (50 percent) of the 12 unintentional overdose cases, there was a history of one or more mental health diagnoses, with both depression and anxiety documented in all six. Four (33 percent) of these 12 cases had a diagnosis of bipolar disorder, and three (25 percent) had a diagnosis of attention deficit hyperactivity disorder (ADHD).

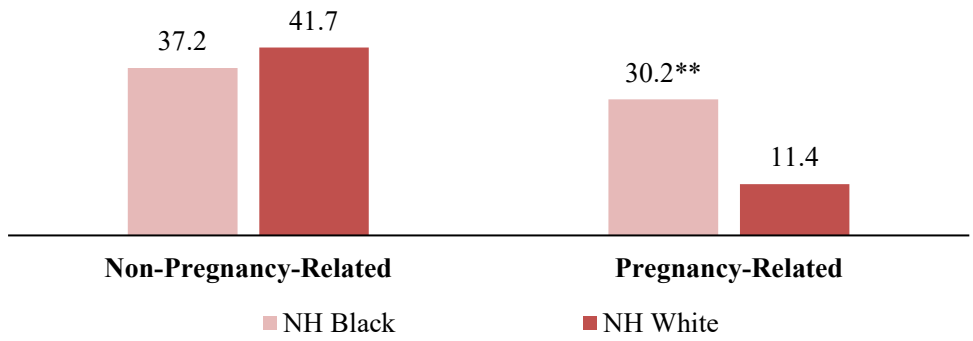
Of substance use with unintentional overdose deaths, three women had a documented history of Intimate Partner Violence (IPV), while seven women who died of non-overdose causes reported experiencing IPV. The data from 2018 cases continue to show that even if not the final cause of death, substance use disorders, depression and other mental health disorders, and intimate partner violence have a significant effect on women and their families, and are contributing factors to maternal health, morbidity, and mortality.

Racial Disparities in Pregnancy-Related Mortality

Figure 2, as seen on page 6, shows the ten-year trends and racial disparities in the Maryland MMR. As noted, the MMR has dropped over the past 10 years and is now below the national average, but the racial disparity has widened. The MMR, however, includes only deaths from pregnancy-related causes that can be identified by the death certificate and that occurred during pregnancy or within 42 days of pregnancy conclusion. The decrease in the Maryland MMR suggests that fewer early pregnancy-related deaths are occurring and this decrease primarily occurred among White women.

The rates of non-pregnancy-related and pregnancy-related death by race during the period from 2010 to 2018 are shown below in Figure 14. While non-Hispanic Black women had a slightly lower rate of non-pregnancy-related mortality than non-Hispanic White women, the pregnancy-related mortality rate was significantly higher among non-Hispanic Black women compared to non-Hispanic White women.

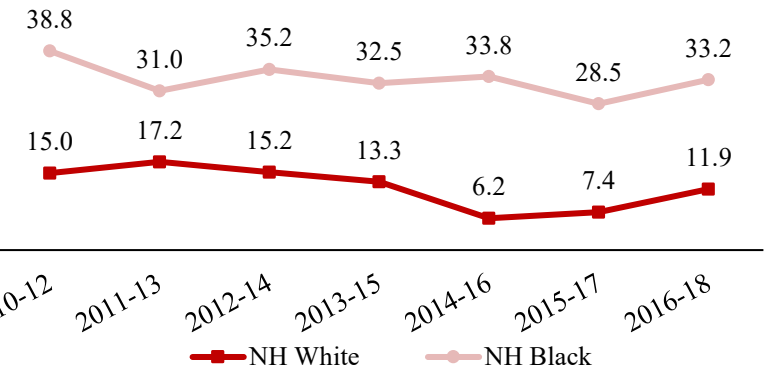
Figure 14. Rate* of Non-Pregnancy-Related and Pregnancy-Related Deaths by Race/Ethnicity, Maryland, 2010-2018



*Number of deaths per 100,000 live births. NH: non-Hispanic. Data Source: VSA and Maryland MMR Program.
** Denotes statistically significant difference in rates by race, $p<0.001$.

The trend over time in pregnancy-related mortality rate by race is shown in Figure 15. Rates are shown as rolling three-year averages because of the small number of cases in each category. Since 2010, the non-Hispanic Black pregnancy-related mortality rate was consistently higher than the non-Hispanic White rate, although the rates decreased in both racial groups. Comparing rates from 2010-2012 and 2016-2018, there was a 14 percent decrease in the non-Hispanic Black rate. The non-Hispanic White rate decreased by 21 percent during this same time period. In the most recent three-year average, the non-Hispanic Black rate is 2.8 times higher than the non-Hispanic White rate.

Figure 15. Pregnancy-Related Mortality Rates* by Race/Ethnicity, Maryland, 2010-2018



*Number of pregnancy-related deaths per 100,000 live births.
Data Source: VSA and MMR Program.

In Table 3, the racial and ethnic distribution of births in Maryland from 2010 to 2018 is compared with the distribution of non-pregnancy-related and pregnancy-related deaths. Again, the over-representation of non-Hispanic Black women among pregnancy-related deaths compared to live births is evident.

Table 3. Live Births, Non-Pregnancy-Related Deaths, Pregnancy-Related Deaths by Race and Ethnicity, Maryland 2010-2018
Data presented as number (%)

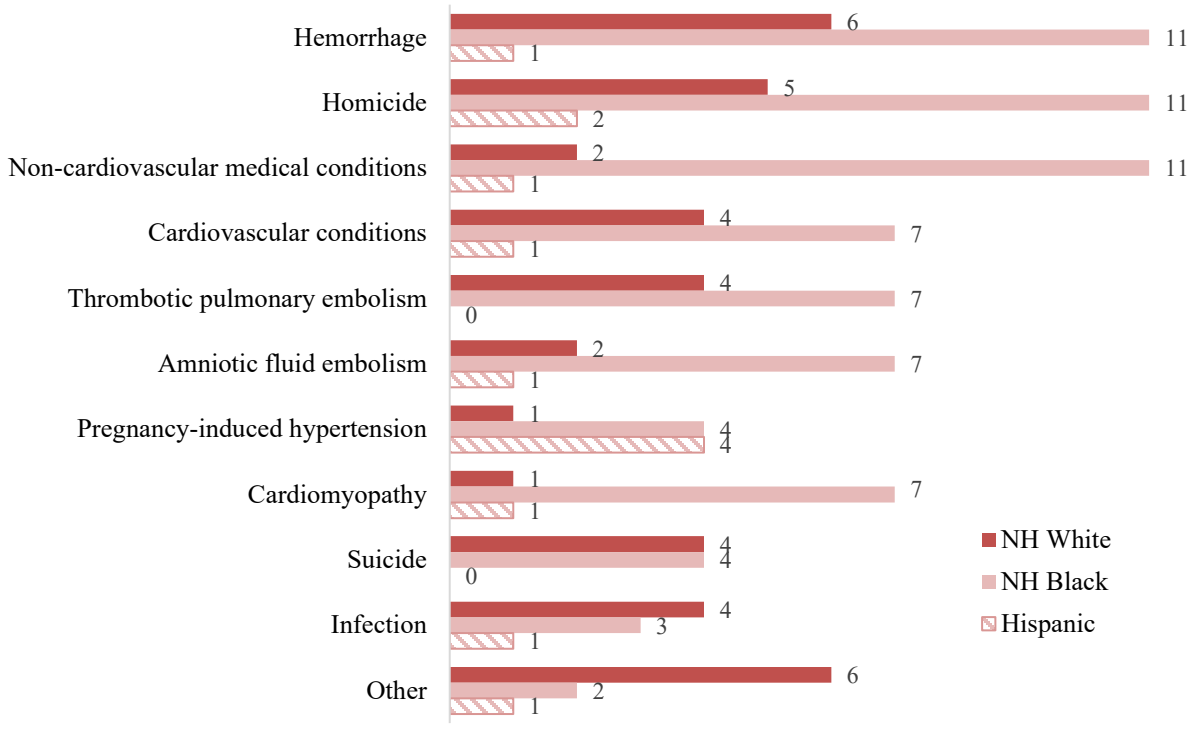
	Total (Maryland)	NH White	NH Black	Hispanic	Asian/Pacific Islander
Live births	654,223 (100)	290,502 (44)	212,172 (32)	100,507 (15)	48,564 (15)
Non-pregnancy-related deaths	220 (100)	121 (55)	79 (36)	11 (5)	5 (4)
Pregnancy-related deaths	137 (100)	39 (28)	74 (54)	13 (9)	10 (26)

Data Source: VSA and Maryland MMR Program. Births and deaths to non-Hispanic mothers of other races are not included in table but are included in totals in the second column.

Review of the causes of death by race and ethnicity revealed that among pregnancy-related deaths, hemorrhage was the leading cause of death for both non-Hispanic White and non-Hispanic Black women (Figure 16) until 2015. The number of hemorrhage deaths was nearly twice as high among Black women compared to White women. Although total numbers were small, the leading cause of pregnancy-related death among Hispanic women was pregnancy-induced hypertension.

Homicide was the second leading cause of pregnancy-related deaths overall between 2010 - 2018. The number of homicide deaths among non-Hispanic Black women was 2.2 times the number among non-Hispanic White women. Non-cardiovascular medical conditions were the third leading cause of pregnancy-related death overall, with the vast majority occurring among non-Hispanic Black women. This category includes medical conditions such as seizure disorders, asthma, cancer, and collagen vascular diseases such as lupus. Cases listed as "other" causes include cases from causes not otherwise listed, and cases in which the cause of death was unknown.

Figure 16. Number of Pregnancy-Related Deaths, by Cause of Death and Race/Ethnicity, Maryland, 2010-2018

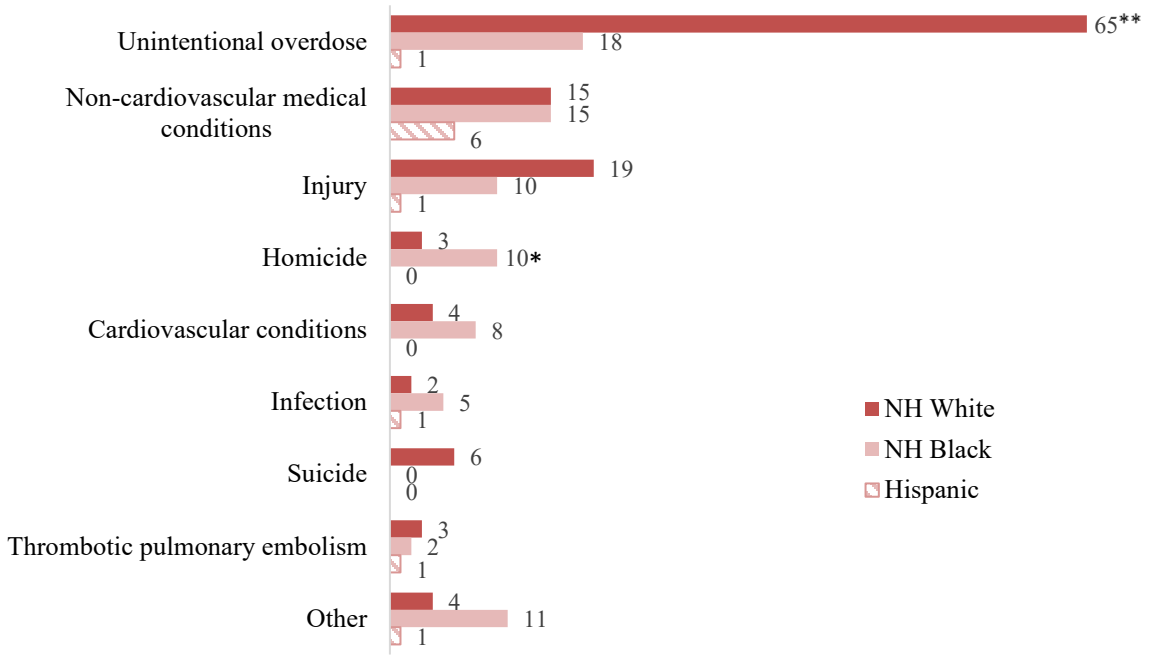


Data Source: Maryland MMR Program.

For non-pregnancy-related deaths (Figure 17), the leading cause was unintentional overdose, representing 40 percent of these deaths overall. Overdose was significantly more common among non-Hispanic White women, the number of overdose deaths being 3.6 times higher than

among non-Hispanic Black women. The second leading cause of non-pregnancy-related death was non-cardiovascular medical conditions, the most frequent being cancer. Injury was the third leading cause.

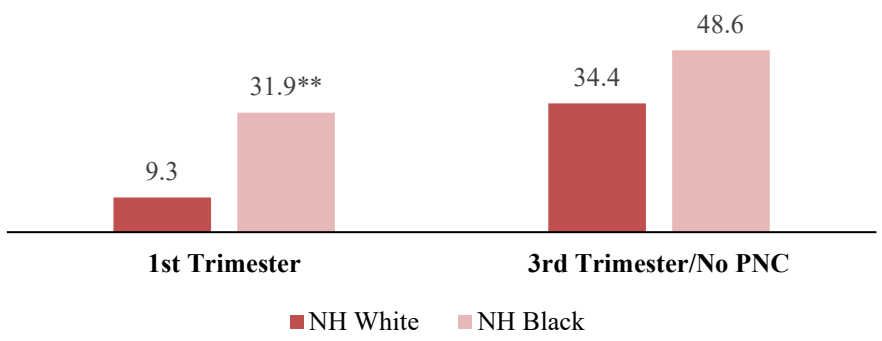
Figure 17. Number of Non-Pregnancy-Related Deaths, by Cause of Death and Race/Ethnicity, Maryland, 2010-2018



* Denotes statistically significant difference between non-Hispanic Black and non-Hispanic White, $p<0.05$.
** Denotes statistically significant difference between non-Hispanic Black and non-Hispanic White, $p<0.001$.
Data Source: Maryland MMR Program.

Calculation of the pregnancy-related mortality rates by race and selected maternal characteristics revealed notable differences. Figure 18 shows pregnancy-related mortality rates among non-Hispanic White and non-Hispanic Black women by timing of prenatal care initiation. Among women initiating prenatal care during the first trimester, the pregnancy-related mortality rate was over three times higher in non-Hispanic Black women compared to non-Hispanic White women. Early initiation of prenatal care did not eliminate the racial disparity in pregnancy-related deaths. The pregnancy-related mortality rate increased by 270% with late or no prenatal care for non-Hispanic White women, and 52% for non-Hispanic Black women.

Figure 18. Pregnancy-Related Mortality Rates* by Prenatal Care Initiation and Race/Ethnicity, Maryland, 2010-2018



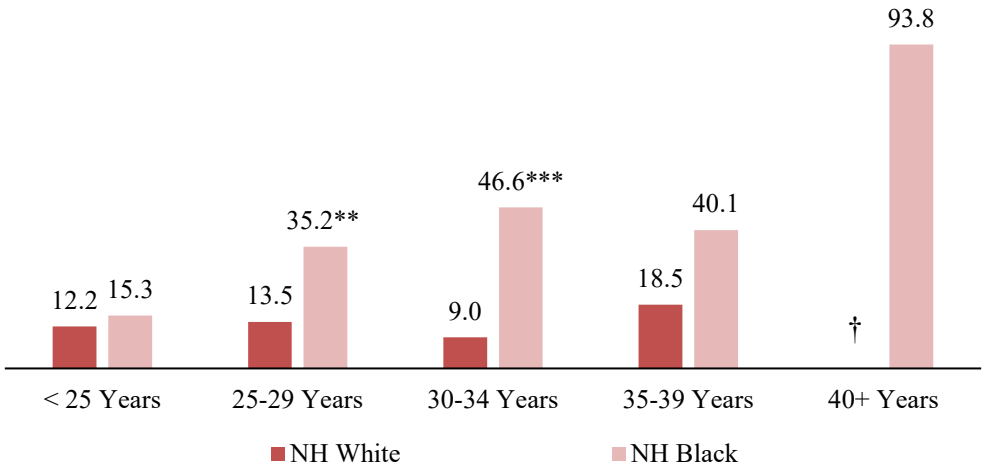
* Number of pregnancy-related deaths per 100,000 live births.
** Denotes statistically significant difference between non-Hispanic Black and non-Hispanic. White, p<0.001. Data Source: VSA and Maryland MMR Program. PNC: Prenatal Care

As shown in Figure 19, racial differences also appeared when examining pregnancy-related mortality rates by maternal age. The non-Hispanic Black mortality rate was higher than that in non-Hispanic White women at all ages, reaching statistical significance in the 25-29 year and 30-34 year age groups. In the 25-29 year age group, the pregnancy-related mortality rate was more than twice as high in non-Hispanic Black women compared to non-Hispanic White women. The mortality rate among non-Hispanic Black women between 30 and 34 years of age was more than five times higher than that among non-Hispanic White women in the same age range.

The pregnancy-related mortality rate among non-Hispanic White women shows little change with increasing age, although a rate cannot be calculated for this racial group over age 40 due to the small number of cases. Among non-Hispanic Black women, the rate shows a clear trend up with age, reaching a rate of 93.8 deaths per 100,000 live births above age 40. These data suggest that increasing maternal age has a greater impact on pregnancy-related mortality among non-Hispanic Black women. The impact of maternal age may be related to the "weathering" hypothesis, which proposes that Black women experience earlier deterioration of health because of the cumulative impact of exposure to psychosocial, economic, and environmental stressors.[8]

[8] Geronimus AT, Hicken M, Keene D, Bound J. "Weathering" and Age Patterns of Allostatic Load Scores among Blacks and Whites in the United States. Am J Public Health 2006;96:826–33. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1470581/.

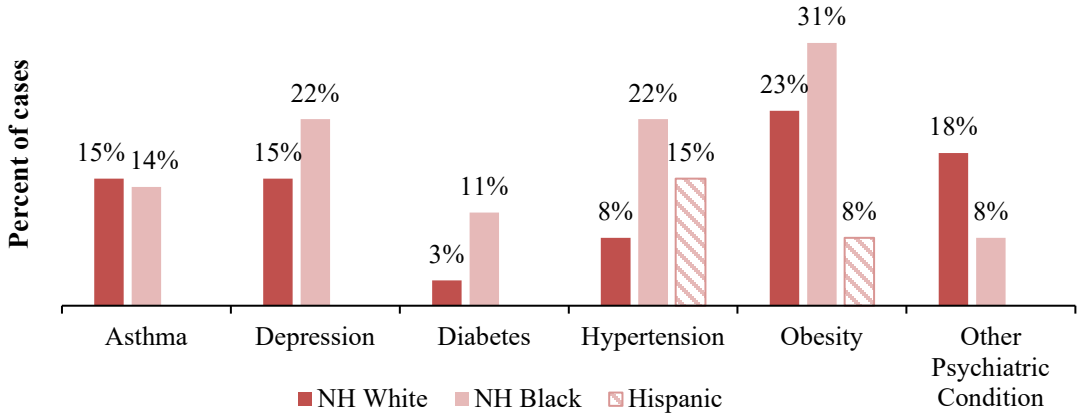
Figure 19. Pregnancy-Related Mortality Rates* by Age Group and Race/Ethnicity, Maryland, 2010-2018



*Number of pregnancy-related deaths per 100,000 live births. **Denotes statistically significant difference between non-Hispanic Black and non-Hispanic White, p<0.05. *** Denotes statistically significant difference, p<0.001
† Rate suppressed due to fewer than 5 deaths. Data Source: Maryland MMR Program.

The prevalence of pre-existing medical conditions was also determined by race among pregnancy-related death cases (Figure 20). Every condition evaluated, except asthma and other (non-depression) psychiatric conditions, was more prevalent among non-Hispanic Black women than among non-Hispanic White and Hispanic women. The greatest differences were seen in hypertension and obesity, although no differences reached statistical significance. The higher prevalence of pre-existing medical conditions among non-Hispanic Black women is likely to be a contributing factor in the higher pregnancy-related mortality rate in this racial group.

Figure 20. Prevalence of Pre-Existing Medical Conditions by Race/Ethnicity, Pregnancy-Related Deaths, Maryland, 2010-2018



Data Source: Maryland MMR Program. Percentages add up to more than 100% due to some women having more than one pre-existing condition.

Although pregnancy-related mortality rates have decreased in Maryland in recent years, racial disparities have persisted. In addition to medical and health care factors, there is increasing recognition of the importance of social determinants of health in shaping health outcomes. Social determinants of health are the conditions in which people are born, grow, live, work, and age that impact health.[9] Social determinants include factors such as socioeconomic status, education, neighborhood, physical environment, employment, and social support networks, as well as access to health care. There has been increasing recognition that improving health, preventing morbidity and mortality, and achieving health equity require broad approaches that address not only health care, but also social, economic, and environmental factors that influence health.[10, 11, 12, 13]

[9] "About Social Determinants of Health," World Health Organization, accessed October 3, 2019, https://www.who.int/social_determinants/sdh_definition/en/.
[10] Artiga S, Hinton E. Beyond Health Care: The Role of Social Determinants in Promoting Health and Health Equity. Issue Brief. Henry J. Kaiser Family Foundation; 2018. https://www.kff.org/disparities-policy/issue-brief/beyond-health-care-the-role-of-social-determinants-in-promoting-health-and-health-equity/.
[11] Importance of Social Determinants of Health and Cultural Awareness in the Delivery of Reproductive Health Care. ACOG Committee Opinion No. 729. American College of Obstetricians and Gynecologists. Obstet Gynecol 2018;131:e43–8.
[12] "Healthy People 2020: Social Determinants of Health," Office of Disease Prevention and Health Promotion, accessed October 3, 2019, https://www.healthypeople.gov/2020/topics-objectives/topic/social-determinants-of-health.
[13] Petersen EE, Davis NL, Goodman D, et al. Racial/Ethnic Disparities in Pregnancy-Related Deaths — United States, 2007–2016. MMWR Morb Mortal Wkly Rep 2019;68:762–765. http://dx.doi.org/10.15585/mmwr.mm6835a3.

Summary

Maryland's MMR in the most recent five-year average data is 12 percent below the national rate. While the U.S. MMR continued to increase, the Maryland rate has decreased slightly; however, both rates remain above the Healthy People 2020 goal of 11.4 deaths per 100,000 live births, and significant racial disparities in maternal deaths persist.

Thirty-eight pregnancy-associated deaths were identified in 2018. Twenty deaths (53 percent) were determined to be non-pregnancy-related. The leading cause of non-pregnancy-related death for the sixth consecutive year was substance use and unintentional overdose. Eighteen deaths (47 percent) were determined to be pregnancy-related, with the cause of death related to or aggravated by the pregnancy or its management. Cardiovascular conditions, non-cardiovascular medical conditions, and suicide were the leading causes of pregnancy-related death. The pregnancy-related mortality rate has decreased by 11 percent since 2010. A majority of deaths (85 percent of non-pregnancy-related deaths and 83 percent of pregnancy-related deaths) were considered preventable or potentially preventable.

Recommendations from the MMR Committee and the MMR Stakeholder Group are included as appendices to this report. The recommendations address evaluation and close follow-up for chronic medical disease as well as behavioral and mental health issues, needed improvements in postpartum care and cross-disciplinary communications, and strengthening community-based initiatives while identifying and addressing racial disparities in maternal mortality. The MMR Committee will continue to disseminate the findings of this review process and promote collaboration among all providers caring for pregnant and postpartum women in an effort to reduce pregnancy-associated deaths in Maryland.

Appendix A: Maternal Mortality Review Committee

MATERNAL MORTALITY REVIEW COMMITTEE

The Honorable Larry Hogan
Governor
State of Maryland
Annapolis, MD 21401-1991

The Honorable Bill Ferguson
President of the Senate
Maryland General Assembly
H-107 State House
Annapolis, MD 21401-1991

The Honorable Adrienne Jones
Speaker of the House
Maryland General Assembly
H-101 State House
Annapolis, MD 21401-1991

RE: Health-General Article, §§13-1207-13-1208, Annotated Code of Maryland - 2020 Annual Report – Maryland Maternal Mortality Review

Dear Governor Hogan, President Ferguson, and Speaker Jones:

Pursuant to Health-General Article, §13-1207 and §13-1208; Senate Bill 459, Chapter 74 of the Acts of 2000; and House Bill 1518, Chapter 308 of the Acts of 2018, and based on the report of the Maternal Mortality Review Program, the Maternal Mortality Review Committee submits these recommendations related to maternal mortality in Maryland. The Committee thanks the Governor and the General Assembly of Maryland for their leadership and interest in maternal mortality in Maryland, and looks forward to working with you for continued improved outcomes in this important public health issue.

If you have questions concerning this report, please contact Dr. Shelly Choo, Director, Maternal and Child Health Bureau, at (443) 571-3424.

Sincerely,

Clark Johnson, MD, MPH
Maternal Mortality Committee Chair

Enclosure

Cc: Webster Ye, JD, Assistant Secretary of Health Policy
Heather Shek, JD, Director, Office of Governmental Affairs
Jinlene Chan, MD, MPH, FAAP, Acting Deputy Secretary, Public Health Services
Donna Gugel, MHS, Director, Prevention and Health Promotion Administration
Shelly Choo, MD, MPH, Director, Maternal and Child Health Bureau
Sarah T. Albert, MSAR #8248

Maternal Mortality Review Committee, 2019-2020

Maryland Department of Health, Maternal Mortality Review Program Director *Linda Alexander, MD, MPP *****	**University of Maryland St. Joseph Medical Center** *Cristina Aquia, RN*
University of Maryland Baltimore Washington Medical Center *Pablo Argeles, MD*	**Sinai Hospital** *Pedro Arrabal, MD*
Mercy Medical Center *Robert Atlas, MD*	**University of Maryland St. Joseph Medical Center** *Carol Ator, RN*
University of Maryland Medical System *Shobana Bharadwaj, MD*	**Holy Cross Hospital** *Ann Burke, MD*
Maternal Mortality Review Abstractor *Diana Cheng, MD*	**Johns Hopkins Bloomberg School of Public Health** *Andreea Creanga, MD, PhD*
University of Maryland Medical System *Andrea Desai, MD†*	**Johns Hopkins Hospital** *Deborah Doerfer, CNM*
Johns Hopkins Bayview Medical Center, Maternal Mortality Review Abstractor *Jill Edwardson, MD*	**University of Maryland Medical System** *Jen Fahey, CNM*
University of Maryland Medical System *Stacy Fisher, MD*	**University of Maryland Medical System** *Katherine Goetzinger, MD******
Maternal Mortality Review Abstractor *Lorraine Goldstein, CNM*	**Community Representative** *Desiree Israel, LCSW-C*
Anne Arundel Medical Center, Maternal Mortality Review Committee Chair *Clark Johnson, MD, MPH*	**Maternal Mortality Review Abstractor** *Jan Kriebs, CNM*
Anne Arundel Medical Center *Christine Laky, MD*	**Johns Hopkins Bayview Medical Center, Center for Addiction and Pregnancy, Maternal Mortality Review Abstractor** *Lorraine Milio, MD*
University of Maryland St. Joseph Medical Center *Judith Rossiter, MD*	**Community Representative** *Maxine Reed-Vance, PhD, MS, RN*
Maryland Department of Health, Maternal Mortality Review Program Director *S. Lee Woods, MD, PhD**	**Staff to the Committee** *Shayna Banfield*

** Retired effective October 2019.*

*** Added to Committee November 2019 and left Committee December 2020.*

**** Left Committee January 2020.*

† Added to Committee January 2020.

Maternal Mortality Review Committee Recommendations, 2020

Substance use with unintentional overdose remains the leading cause of pregnancy-associated death for the sixth consecutive year in Maryland. Twelve of the 38 total deaths (32 percent) resulted from substance use and unintentional overdose, and one overdose death was determined to be a suicide. In addition, among all the 38 pregnancy-associated deaths in 2018, 15 (39 percent) had histories of mental health disorders, and 93 percent of those women had a diagnosis of depression. The MMR Committee makes the following recommendations based on the findings in this report.

Recommendations for Improved Care in Substance Use and Behavioral or Mental Health Disorders:

- Optimize behavioral and mental health services for pregnant or postpartum women through validated tools and universal screening during pregnancy, at delivery, and postpartum; encourage the continued use of these tools to screen for substance use, mental health, and intimate partner violence (IPV) conditions at regular primary care visits.
- Update hospital and practice Electronic Medical Records (EMR) systems to streamline documentation of screening results and include information on patient referrals, with detailed follow-up plans and recommendations.
- Increase provider awareness of the contribution of substance use disorder (SUD), depression and other mental health disorders, as well as IPV to maternal mortality in Maryland.
- Promote interdisciplinary communication and collaboration efforts among substance use, mental health, and IPV programs with obstetric institutions and providers.
- Support and expand available behavioral health programs and services offered to pregnant and parenting women.
- Create and disseminate a comprehensive list of available referral service programs and options for the treatment of substance use, mental health conditions, and intimate partner violence to both primary care and obstetric providers.
- Encourage obstetric and primary care providers to obtain training for medications for addiction treatment (MAT) waivers to optimally treat pregnant and parenting women with Opioid Use Disorder.
- Encourage safe opioid prescribing practices, including naloxone co-prescribing, and promote education on Naloxone use by patients, families, and health care practitioners.

Recommendations for Improved Care Coordination and Warm Handoffs

- Make readily-accessible to health care providers and families information about resources such as mental health and substance use programs, as well as resources to address social needs.

- Develop protocols for "warm" hand-offs for high-risk patients and create a system to improve coordination of care for Emergency Departments (ED), Obstetric Emergency Triages (OBED), and health care providers across obstetric and non-obstetric specialties.
- Improve documentation of a patient's chronic medical or behavioral health issues and referrals for care, including any social services needs involving IPV or housing insecurity, in the prenatal, delivery, postpartum, and general medical records.
- Establish guidelines to improve internal hospital communications between units, specifically emergency departments and labor and delivery units, in the care of pregnant and postpartum patients.
- Develop mechanisms where hospitals can more easily access records from outside behavioral health and substance use health care providers and other specialists.
- Ensure that patients at higher risk with physical or mental health conditions have follow-up appointments scheduled, as well as necessary social work or medical specialist referrals, as part the standard discharge process.
- Develop policies and procedures to improve identification of and referral to services during any ED or OBED visit for patients with:
    - Behavioral health risks such as suicidal ideation, gestures, or attempts;
    - Physical health risks, including cardiovascular disease and hypertension, obesity, pre-gestational diabetes mellitus, and auto-immune disorders; or
    - Risks of housing instability, intimate partner violence, or lack of social supports.
- Encourage prenatal care providers to create robust office processes to contact higher risk patients directly in order to improve follow-up and compliance with care plans.
- Encourage non-obstetric providers to actively evaluate pregnant women who are presenting for care for non-pregnancy related complaints for other disease processes at work, whether surgical or non-surgical. Do not delay investigation or diagnosis and treatment of urgent or chronic disease solely because of pregnancy.
- Optimize maternal health, especially in chronic disease management, during and following pregnancy.

Recommendations for Interpregnancy Interval Care

- Reduce unintended pregnancies by encouraging reproductive life planning in primary care with comprehensive, patient-centered contraceptive counseling.
- Increase awareness that the majority of pregnancy-associated deaths occur well beyond 42 days postpartum and that this transitional period of care can create increased mental and physical health vulnerability for women as well as gaps in care.
- Extend Medicaid and other insurance coverage to provide postpartum care to one year, including coverage for primary care, specialty care, medications, mental health, and substance use treatment services.

- Create resources and guidelines, and provide ongoing education, for hospital-based and private providers and staff on systemic racism within health care and its effect on access and utilization of care systems.
- Investigate methods to encourage and empower providers, patients, and their families to press for improved continuity of care in their interactions with the health care system.
- Work with internal and external resources, including community-based resources, to create and sustain safe spaces for pregnant or parenting women in crisis and improve the health of pregnant and parenting women.

Appendix B: Maternal Mortality Review Stakeholder Group

Maternal Mortality Review Stakeholder Group Background

House Bill 1518, enacted during the 2018 Maryland General Assembly, established a Maternal Mortality Review Stakeholder Group in Md. Ann. Code Health – General Art. §13-1208. The statute requires the Stakeholder Group to meet at least twice a year to review the findings and recommendations in the annual Maternal Mortality Review Report. This group includes representatives of the Maryland Office of Minority Health and Health Disparities, the Maryland Patient Safety Center, the Baltimore Healthy Start Program, women's health advocacy organizations, community organizations engaged in maternal health and family support issues, family members that have experienced a maternal death, local health departments, and health care providers that provide maternal health services (a full membership listing is included in this Appendix). The Stakeholder Group was convened for the first time on March 25, 2019 and decided to meet quarterly with meetings open to the public. Information and upcoming meeting dates can be found on the Stakeholder Group website.

The Stakeholder Group is charged with reviewing and adding to the recommendations of the Maternal Mortality Review report, examining issues resulting in disparities in maternal deaths, and identifying new recommendations with a focus on initiatives to address disparities in maternal deaths. Recommendations from the Stakeholder Group follow those put forward by the MMR Committee.

Maternal Mortality Review Stakeholder Group, 2020

Maryland Department of Health *Linda Alexander, MD, MPP, FACOG** *Maisha DouyonCover, MPH*	**Baltimore Healthy Start, Inc.** *Teneele Bailey, MBS*
Maryland Commission for Women *Amanda L. Costley, Esq.*	**Maryland Patient Safety Center** *Blair Eig, MD*
Black Mamas Matter Alliance *Elizabeth Dawes Gay, MPH*	**Community Representative** *Pastor Meldon Dickens*
Healthy New Moms/Mental Health Association of Maryland *Kari J. Gorkos, MS*	**Office of Minority Health and Health Disparities** *David Mann, MD, PhD*
Black Women's Health Initiative *Angela Marshall, MD, FACP*	**House of Ruth Maryland** *Janice Miller, LCSW-C*
Women's Healthcare Provider *Meghana Rao, MD*	**Baltimore Healthy Start** *Maxine Reed Vance, PhD, RN*
Family Representative *Rosemarie DiMauro Satyshur, PhD, RN*	**Community Representative and Pediatric Physician** *Toni Thompson-Chittams, MD, FAAP*
Community Representative *Doris Titus-Glover, PhD, MSN*	**Maryland Association of County Health Officers** *Vacant*

**Left group in December 2020.*

Maternal Mortality Review Stakeholder Group Recommendations, 2020

Additions to the recommendations in the Maternal Mortality Review 2020 Annual Report

Adolescents and Young Adults

- Improve teen and young adult health by expanding education about the benefits of healthy, balanced diets and exercise at schools and primary care visits.
- Discuss the long-term risks of obesity, hypertension, and diabetes with teens and young adults at primary care visits.
- Screen all women considering pregnancy for cardiovascular disease risks, mental and behavioral health risks, and social support needs, and refer as needed to medical and behavioral health specialists and community support programs to optimize health prior to pregnancy.
- Investigate efforts to reduce obesity rates in Maryland, particularly for African American women. These steps should include:
    - Implementing a strategy following the Healthy People 2030 goals with local/regional targets consistent with national population goals;
    - Creating a state law requiring menu labeling and calorie content according to the FDA's menu labeling law published in 2010;
    - Developing grants for primary care practices to address weight loss programming for adolescents and adult women of color; and
- Support programs and expand resources for stress management and access to community mental health for women of color.
- Primary care and specialist practices should examine how these recommendations can be incorporated into their practice transformation processes.
- Maryland payers and hospitals should analyze how to incorporate these recommendations into their quality assurance and value-based purchasing programs.

Prenatal Care and Care During Delivery

- Increase surveillance of pregnant and postpartum women with hypertension or other cardiovascular risks, and coordinate care with perinatology and cardiology specialists.
- Promote universal screening every trimester and postpartum for behavioral and mental health issues such as substance use, depression, and anxiety, and social risk factors such as IPV.
- Identify the key organization to investigate the use and financial support of perinatal navigators to coordinate prenatal and postpartum care and reduce barriers for high-risk patients and their families.
- Support formal and informal community-based prenatal support groups and share information about these programs with obstetric providers.

- Encourage Maryland hospitals to create an emergency support system, mobilizing an appropriate on-call staff member when a parenting woman presents for a medical emergency without family or other support to care for her children.
- Counsel pregnant women and their families about the early detection and recognition of danger signs and complications as part of prenatal birth and emergency planning. (https://safehealthcareforeverywoman.org/council/patient-safety-tools/urgent-maternal-signs/)
- Maryland payers, hospitals, and professional organizations should analyze how to incorporate these recommendations into their quality assurance and value-based purchasing programs.

Postpartum and Interpartum Care

- Support close follow-up for postpartum women who experienced high-risk pregnancy and/or delivery through home visiting programs, peer mentoring and support teams, and community-based programs.
- Require postpartum blood pressure screenings within 5 days of discharge for high-risk patients with a history of chronic hypertension, preeclampsia, or other high-risk conditions.
- Promote warm handoffs and communication between pediatric and obstetric providers to optimally address the mother-infant dyad and possible gaps in maternal care.
- Provide cultural competency and implicit bias education to providers to inform and improve their communications and relationships with patients of color.
- Develop guidelines and train providers in primary care, and obstetric and specialist care, to ask patients about social determinants of health, including IPV, housing instability, and transportation needs, at every clinical visit.
- Invest in training and deployment of diverse teams of community health workers to extend care coordination and contact with postpartum patients that are high risk and/or women of color, and help them to navigate the healthcare system and connect with other community resources.
- Coordinate patient follow-up with peer counseling and mom-to-mom support groups to provide culturally competent and community-based care.
- Extend all financial coverage to provide postpartum medical or behavioral health services to parenting women for one year postpartum.
- Synchronize statewide initiatives, working groups, and programs to work toward common maternal health goals through clear and specific interventions and metrics.

Appendix C: Five-Year Rolling Maternal Mortality Rates by Race, Maryland and United States, 2000-2018

Appendix C shows the five-year rolling average MMR by race in Maryland going back to the 2000-2004 year period.

Table C1: Five-Year Rolling Average Maternal Mortality Rate* by Race/Ethnicity, Maryland and United States, 2000-2018

	Maryland			United States		
Year	**All Races**	**White NH**	**Black NH**	**All Races**	**White NH**	**Black NH**
2000-2004	18.9	13.7	29.8	10.8	7.3	27.8
2001-2005	18.6	11.4	33.2	11.8	8.3	31.2
2002-2006	19.4	12.1	38.5	12.5	8.8	33.3
2003-2007	21.6	13.3	41.1	13.3	9.8	33.9
2004-2008	21.2	13.0	38.1	13.9	10.5	34.6
2005-2009	21.9	14.5	38.6	14.6	11.4	35.5
2006-2010	24.1	17.6	40.2	15.0	11.7	35.1
2007-2011	25.7	20.9	37.5	16.1	13.3	36.7
2008-2012	25.5	20.6	39.8	17.6	14.5	40.4
2009-2013	24.5	20.4	39.8	18.9	16.0	43.5
2010-2014	25.7	18.7	45.2	19.9	17.0	45.2
2011-2015	23.5	17.6	40.5	20.7	18.1	47.2
2012-2016	19.7	12.3	38.0	21.2	18.6	48.3
2013-2017	19.5	11.8	35.7	21.6	19.1	48.2
2014-2018	18.4	8.8	35.1	20.7	18.2	45.4

*Rate of maternal deaths per 100,000 live births. NH: Non-Hispanic. Source: CDC WONDER as of 8/27/2021.