Maryland Maternal Mortality Review

2021 Annual Report
Health – General Article §13-1212

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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 people who died during or after their pregnancy. Each death represents a person's life that ended too early.

Summary

Maryland's Maternal Mortality Review (MMR) in the most recent five-year average data is 16 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 2030 goal of 15.7 deaths per 100,000 live births, and significant racial disparities in maternal deaths persist.

Thirty-one pregnancy-associated deaths were identified in 2019. Seventeen deaths were pregnancy-related and fourteen deaths (45 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. Seventeen deaths (55 percent) were determined to be pregnancy-related, with the cause of death related to or aggravated by the pregnancy or its management. Hemorrhage, non-cardiovascular conditions, and pregnancy-induced hypertension were the leading causes of pregnancy-related death. The pregnancy-related mortality rate has decreased by 15 percent since 2010. A majority of 2019 deaths (86 percent of non-pregnancy-related deaths and 82 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.

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 health 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.[1]
- 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."[2]
- 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

[1] https://www.who.int/data/gho/indicator-metadata-registry/imr-details/4622
[2] https://reviewtoaction.org/learn/definitions

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 higher income 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 individuals 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 20.1 maternal deaths per 100,000 live births in 2019, the latest year for which national data are available.[3] It should be noted that in annual reports prior to the 2020 issuance of this report, a different definition of maternal death was used, which included all ICD-10 codes O00-O99, accounting for differences in reported numbers of maternal deaths and maternal mortality rate. 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 in Maryland that may vary considerably year to year.[4]

In previous years, the Maryland MMR had consistently been higher than the national rate. For the period from 2010 to 2014, the Maryland MMR was 29 percent higher than the national rate. However, for the period from 2015 to 2019, the Maryland MMR was 16 percent less than the national rate. Between the two 5-year periods shown (Figure 1), the U.S. MMR increased by 2.5 percent and the Maryland rate decreased by 33.1 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.[5]

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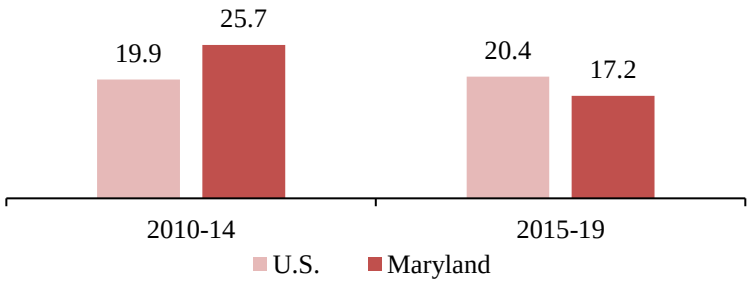
[3] /https://www.cdc.gov/nchs/data/hestat/maternal-mortality-2021/E-Stat-Maternal-Mortality-Rates-H.pdf

[4] As of the 2020 census, Maryland's population is 6,177,224. Source: https://msa.maryland.gov/msa/mdmanual/01glance/html/pop.html

[5] https://health.gov/healthypeople/objectives-and-data/browse-objectives/pregnancy-and-childbirth/reduce-maternal-deaths-mich-04

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

Figure 1. Maternal Mortality Rates*, U.S. and Maryland 2010-2014 and 2015-2019

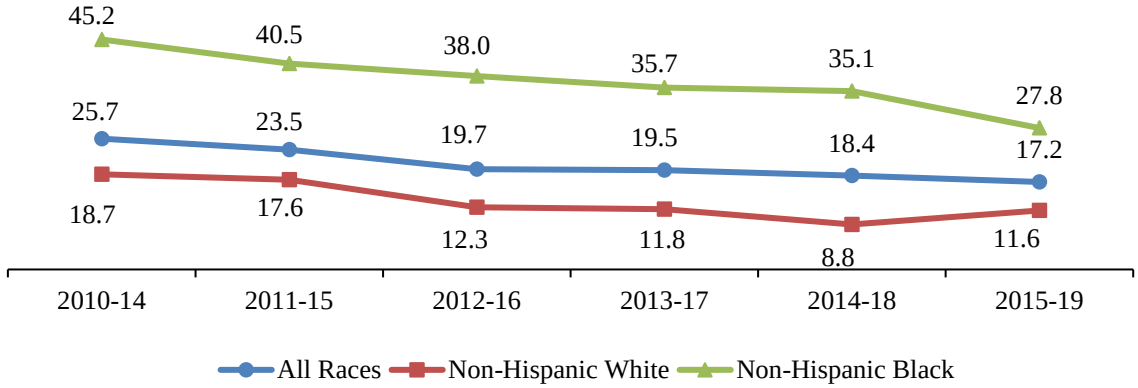


* Rate of maternal deaths per 100,000 live births. Data Source: CDC WONDER as of 3/24/2022.

Racial Disparity

In the U.S. between 2015 and 2019, non-Hispanic Black individuals had an MMR 2.4 times greater than non-Hispanic White individuals, a disparity that has persisted since the 1940s. In Maryland, there is also a large disparity between the rates among non-Hispanic Black and non-Hispanic White individuals. Figure 2 shows the MMR by race in Maryland for six overlapping five-year periods over the past decade. Compared to 2010-2014, the 2015-2019 non-Hispanic White MMR in Maryland decreased 38.0 percent and the non-Hispanic Black MMR decreased 38.5 percent. Although the rates are decreasing for both racial groups, disparities persist. Appendix C shows the five-year rolling average MMR by race in Maryland going back to the 2000-2004-year period.

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 3/24/2022.

Methodology

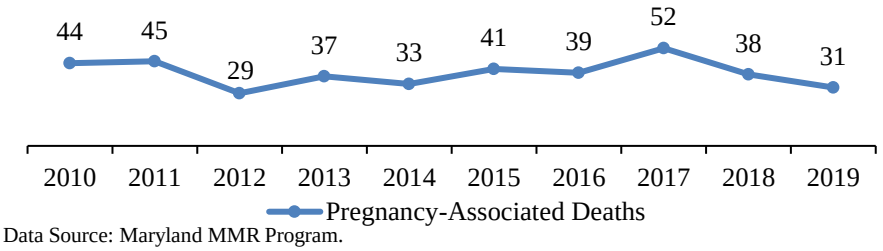
Case Identification

Cases for review are limited to individuals 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.[6, 7]

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 individuals 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 individuals.

The MMR Committee designates and further investigates all deaths occurring during pregnancy or within 365 days of pregnancy conclusion. Using the three methods above, 31 pregnancy-associated deaths were identified in 2019. These cases are reviewed in detail in this report. Figure 3 shows the numbers of pregnancy-associated deaths in Maryland from 2010 to 2019. An average of 39 pregnancy-associated deaths occurred per year during this period.

Figure 3. Number of Pregnancy-Associated Deaths,



Data Source: Maryland MMR Program.

[6] 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/.

[7] 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 2019 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-midwives, 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.[8] 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 prior to starting review.

2019 Case Findings

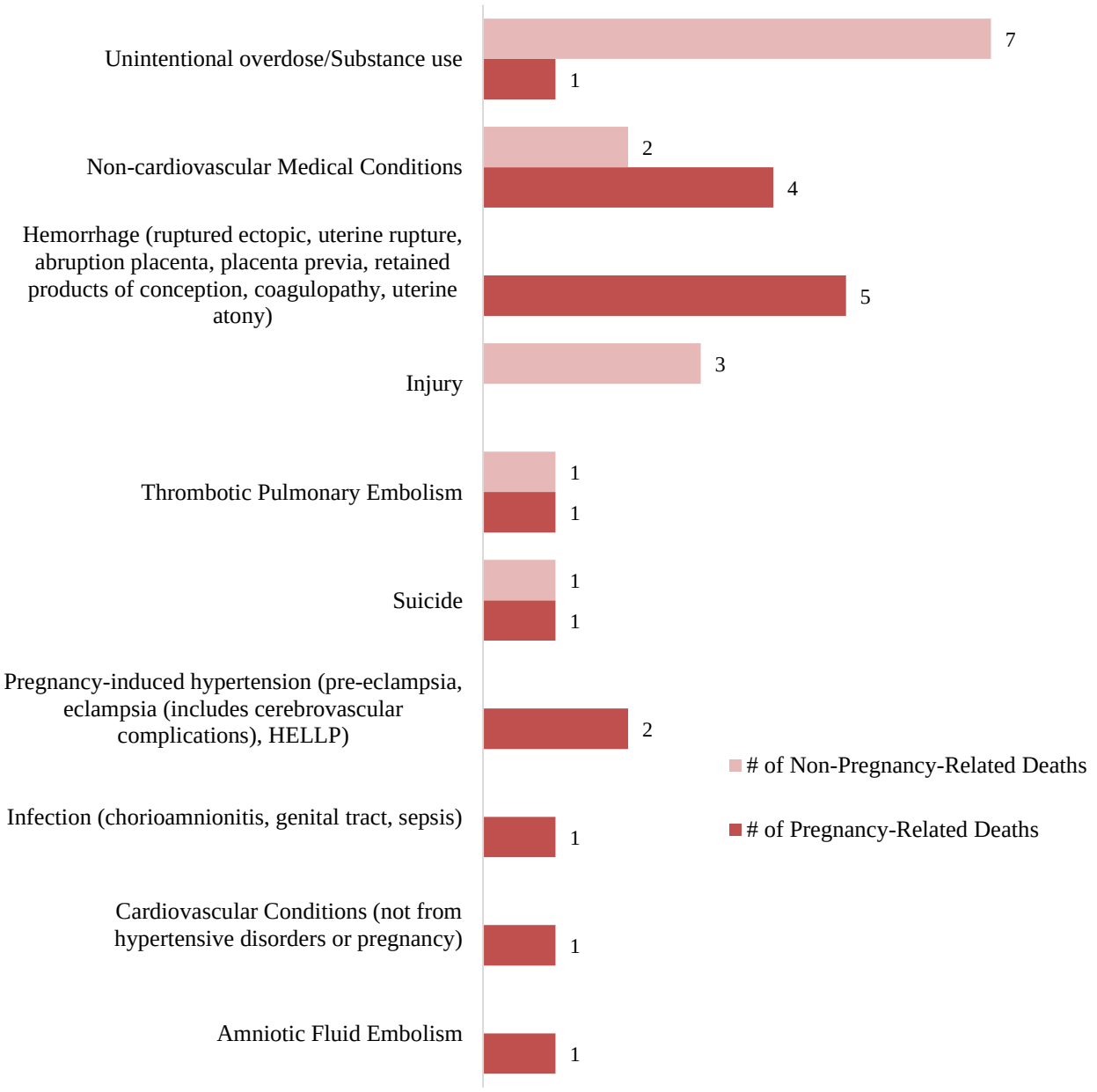
The MMR Committee identified a total of 31 pregnancy-associated deaths in 2019, resulting in a pregnancy-associated mortality rate of 44.2 deaths per 100,000 live births. For further analysis, the MMR Committee divided these deaths into pregnancy-related and non-pregnancy-related deaths, which represent two non-overlapping groups. Of the 31 pregnancy-associated deaths, 17 were determined to be pregnancy-related, for a pregnancy-related mortality rate of 24.2 deaths per 100,000 live births. The remaining 14 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 pregnancy-associated death was substance use with unintentional overdose, accounting for 8 deaths: seven non-pregnancy-related and one pregnancy-related unintentional overdose death (50 percent of non-pregnancy-related deaths and 6 percent of all pregnancy-related deaths in 2019). Other leading causes of non-pregnancy-related death were injuries and non-cardiovascular medical conditions.

[8] 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, 2019 (Total Deaths = 31)



Data Source: Maryland MMR Program.

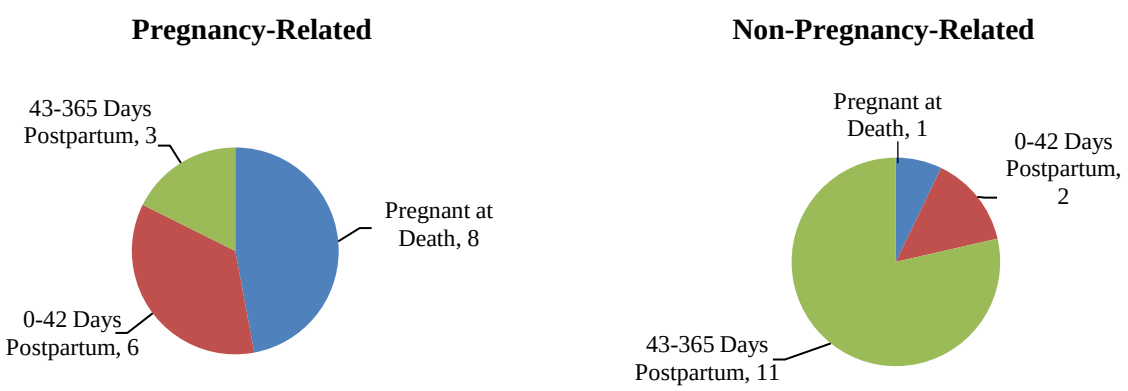
Among the 17 pregnancy-related deaths in 2019, the leading causes of death were hemorrhage and non-cardiovascular medical conditions, accounting for five and four deaths, respectively. Pregnancy-induced hypertension accounted for two deaths. Amniotic fluid embolism,

cardiovascular conditions, infection, suicide, thrombotic pulmonary embolism, and unintentional overdose each accounted for one pregnancy-related death.

Cases by Timing of Death in Relation to Pregnancy

Among the 17 pregnancy-related deaths in 2019, eight (47 percent) occurred during pregnancy, six (35 percent) occurred within 42 days postpartum and three (18 percent) occurred between 43 and 365 days postpartum. Of the 14 non-pregnancy-related deaths, one (seven percent) occurred during pregnancy, two (14 percent) occurred within 42 days postpartum and 11 (79 percent) occurred between 43-365 days postpartum (Figure 5). Pregnancy-related deaths were three times more likely to occur in the early postpartum period, before the traditional six-week postpartum visit, compared to non-pregnancy-related deaths.

Figure 5. Number of Pregnancy-Related and Non-Pregnancy-Related Deaths by Timing of Death, Maryland, 2019

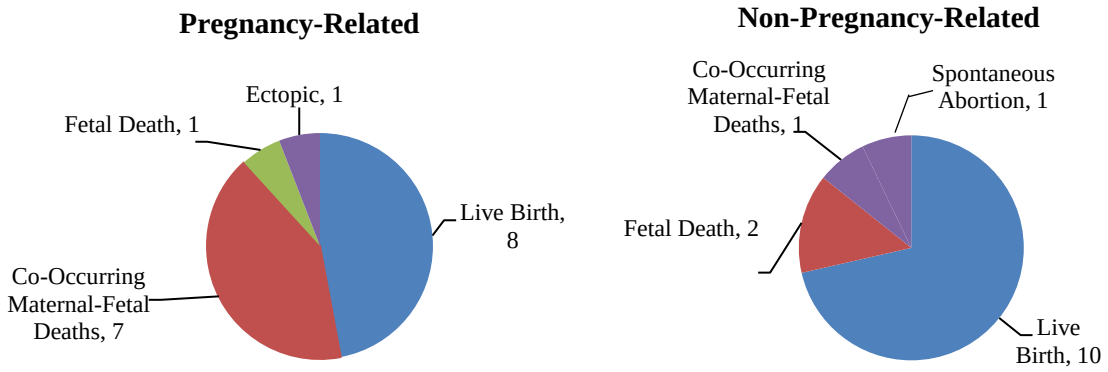


Data Source: Maryland MMR Program.

Cases by Outcome of Pregnancy

Among the 17 pregnancy-related deaths in 2019, eight (47 percent) had a live birth, seven (41 percent) involved co-occurring maternal and fetal deaths, one involved a fetal death that preceded the maternal death, and one involved an ectopic pregnancy. Among the 14 non-pregnancy related deaths, 10 (71 percent) had a live birth, two (14 percent) involved a fetal death that preceded the maternal death, one involved co-occurring maternal and fetal death, and one involved a spontaneous abortion. (Figure 6).

Figure 6. Number of Pregnancy-Related and Non-Pregnancy-Related Deaths by Pregnancy Outcome, Maryland, 2019

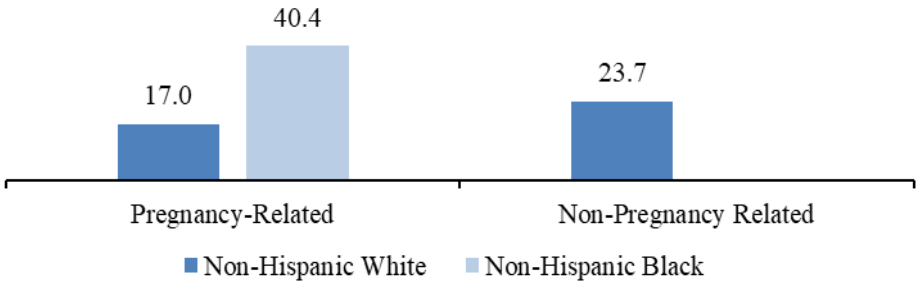


Data Source: Maryland MMR Program.

Cases by Maternal Race and Ethnicity

Of the 17 pregnancy-related deaths occurring in 2019 five cases (29 percent) involved non-Hispanic White individuals, nine cases (53 percent) involved non-Hispanic Black individuals, two cases (12 percent) involved Hispanic individuals, and one case was an unknown race. Among the 14 non-pregnancy-related deaths, seven cases (50 percent) involved non-Hispanic White individuals, three cases (21 percent) involved Hispanic individuals, two cases involved non-Hispanic Black individuals, and two cases involved non-Hispanic Asian/Pacific Islander individuals. Pregnancy-related and non-pregnancy-related mortality rates among non-Hispanic Black and non-Hispanic White individuals in 2019 are shown in Figure 7.

Figure 7. Pregnancy-Related and Non-Pregnancy-Related Mortality Rates* by Selected Race/Ethnicity, Maryland, 2019



* Number of deaths per 100,000 live births. The Non-Hispanic Black non-pregnancy related rate supporessed due to low case numbers. Data Source: VSA and Maryland MMR Program.

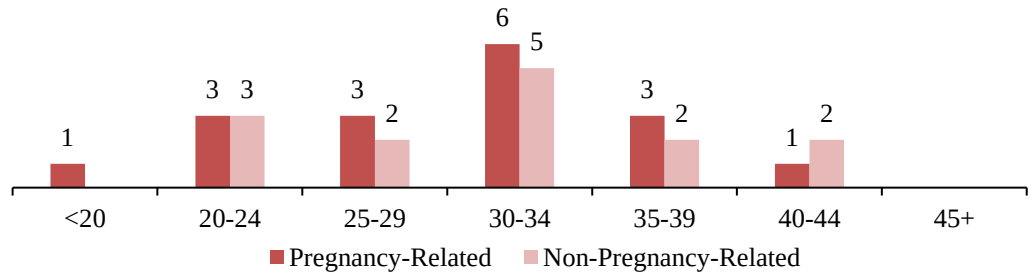
The rate of non-pregnancy related deaths among non-Hispanic White individuals was 2.6 times higher than that of non-Hispanic Black individuals. Conversely, the rate of pregnancy-related deaths in non-Hispanic Black individuals was 2.4 times higher than that of non-Hispanic Black

individuals, illustrating that the preponderance of pregnancy-related deaths is occurring among non-Hispanic Black individuals.

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, 2019

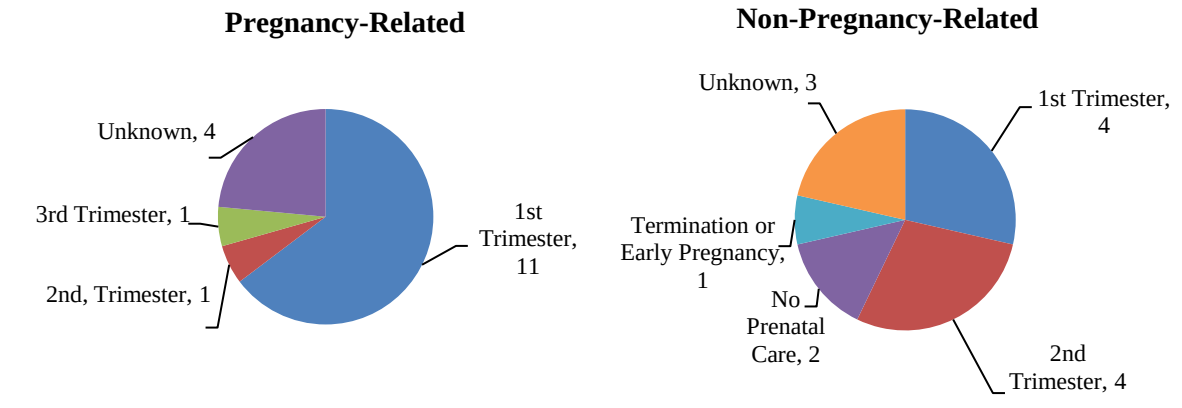


Data Source: VSA and Maryland MMR Program.

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 17 pregnancy-related deaths, 12 (71 percent) were among pregnant individuals who initiated care in the first or second trimester of pregnancy. Among the 14 non-pregnancy-related deaths, eight (57 percent) began prenatal care in the first or second trimester. In four pregnancy-related and three 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, 2019

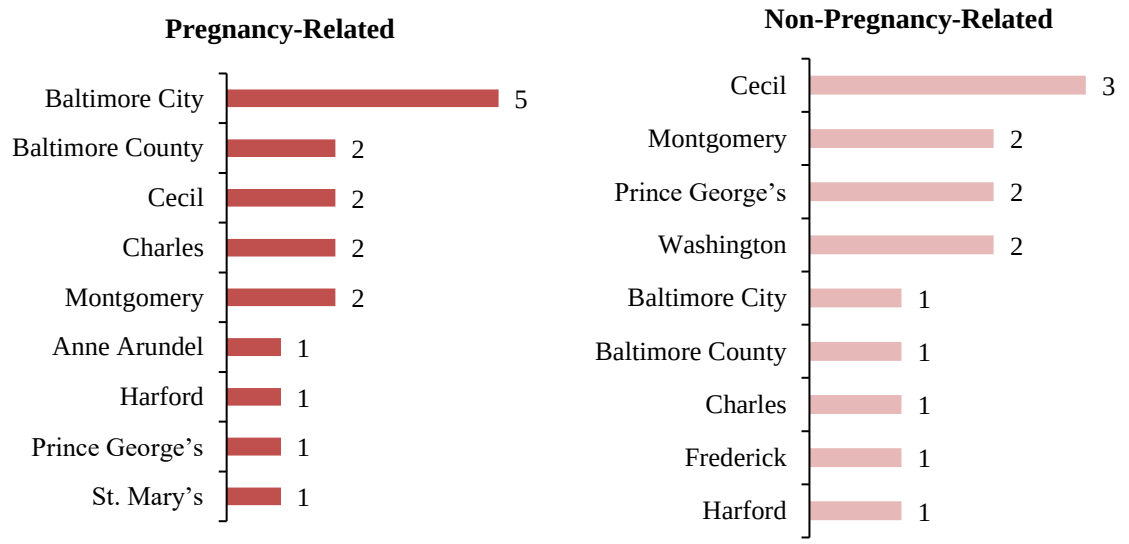


Data Source: Maryland MMR Program.

Cases by Jurisdiction of Residence and Occurrence

Figure 10 shows pregnancy-related and non-pregnancy-related deaths by jurisdiction of residence. Five (29 percent) of the 17 pregnancy-related deaths were among residents of Baltimore City. Baltimore County, Cecil, Charles, and Montgomery counties each had two deaths. There were single deaths among residents of Anne Arundel, Harford, Prince George's and St. Mary's counties. Of the 14 non-pregnancy-related deaths, three (21 percent) were among residents of Cecil County. Montgomery, Prince George's and Washington counties each had two deaths. There were single deaths among residents of Baltimore City, Baltimore County, Charles, Frederick, and Harford counties.

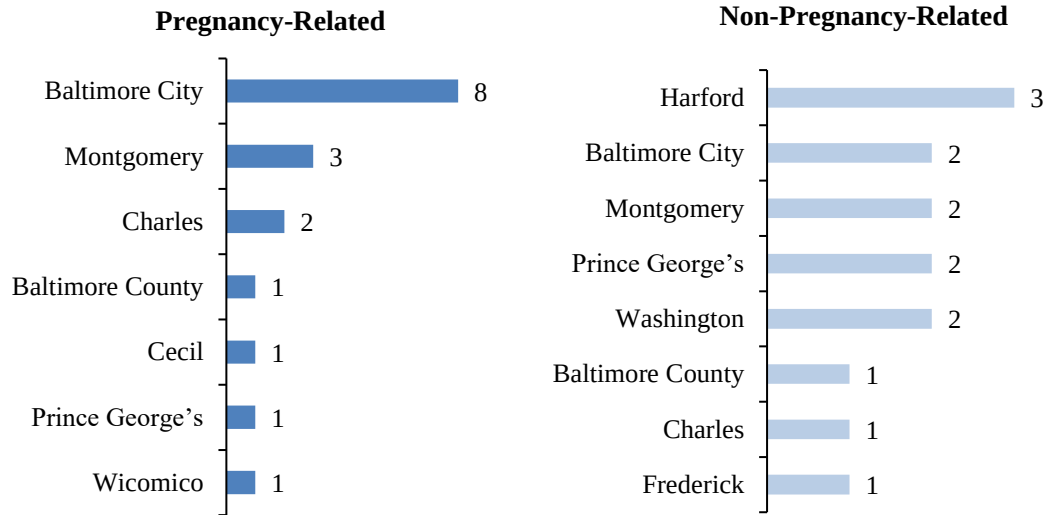
Figure 10. Number of Pregnancy-Related and Non-Pregnancy-Related Deaths by Jurisdiction of Residence, Maryland, 2019



Data Source: Maryland MMR Program.

Figure 11 shows pregnancy-related and non-pregnancy-related deaths by jurisdiction in which the death occurred. Eight (47 percent) of the 17 pregnancy-related deaths occurred in Baltimore City, three (18 percent) occurred in Montgomery County, and two (12 percent) occurred in Charles County. There were single deaths that occurred in Baltimore County, Cecil, Prince George's, and Wicomico counties. Among the 14 non-pregnancy-related deaths, three (21 percent) occurred in Harford County, two (14 percent) each occurred in Baltimore City, Montgomery, Prince George's and Washington counties. There were single deaths that occurred in Baltimore, Charles, and Frederick counties.

Figure 11. Number of Pregnancy-Related and Non-Pregnancy-Related Deaths by Jurisdiction of Occurrence, Maryland, 2019



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."[9] Whether the death was clearly preventable or only potentially preventable by some intervention is a decision made by the MMR Committee. Of the 17 pregnancy-related deaths, 14 (82 percent) were judged to be preventable. The MMR Committee was unable to determine preventability for three pregnancy-related deaths. Among the 14 non-pregnancy-related deaths, 12 (86 percent) were judged to be preventable. The MMR Committee was unable to determine preventability for two non-pregnancy-related deaths. All eight of the unintentional overdose deaths were considered preventable, as were the five hemorrhage death, three non-cardiovascular deaths, three injury deaths, two pregnancy-induced hypertension deaths, two suicide deaths, one thrombotic fluid embolism death, one amniotic fluid embolism death, and one cardiovascular condition death. The four deaths where preventability was undetermined were medical causes of death including three non-cardiovascular medical conditions and one infection. One thrombotic pulmonary embolism did not have a determination made.

Trends in Pregnancy-Associated and Pregnancy-Related Deaths

As noted in Figure 1, the Maryland MMR has decreased 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

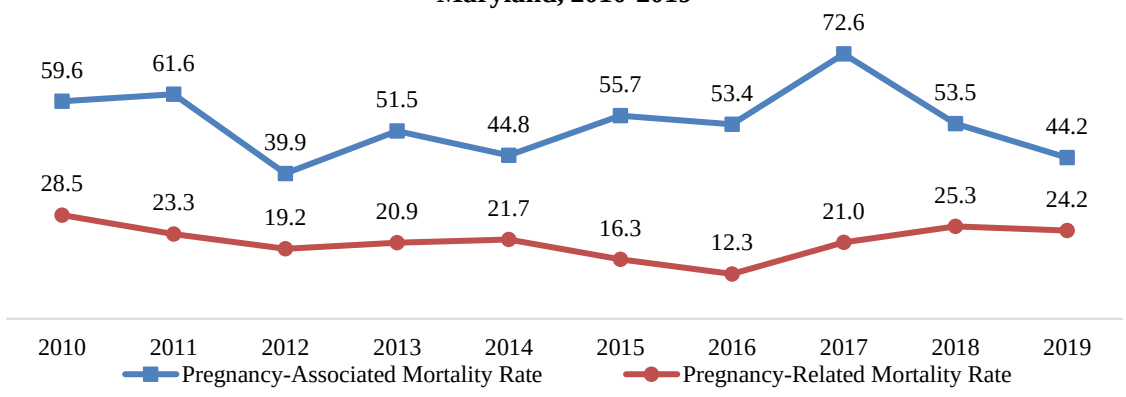
[9] Berg CJ, Harper MA, Atkinson SM, et al. Preventability of Pregnancy-Related Deaths - Results of a State-Wide Review. Obstet and Gynecol. 2005; 106:1228-1234. https://journals.lww.com/greenjournal/Fulltext/2005/12000/Preventability_of_Pregnancy_Related_Deaths_.4.aspx.

within 42 days of pregnancy conclusion. The decrease in the Maryland MMR suggests that fewer deaths during pregnancy or the early postpartum period are occurring.

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. Pregnancy-associated deaths are reviewed for pregnancy-relatedness, creating a subgroup of pregnancy-related deaths. Of note, one pregnancy-associated death which occurred in 2012 did not undergo full review by the MMR Committee. Therefore, the MMR Committee did not designate a cause of death or assess the pregnancy-relatedness of this case. This case is excluded from any cause-specific or relatedness-specific trends presented in this section.

The trends in pregnancy-associated and pregnancy-related mortality rates from 2010 to 2019 are shown in Figure 12. The pregnancy-associated mortality rate shows considerable variability over the ten-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 remains similar to previous years and shows a decrease of 15 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.

Figure 12. Pregnancy-Associated and Pregnancy-Related Mortality Rates*, Maryland, 2010-2019



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

The Pregnancy-Related Mortality Rate (red line) in Figure 12 excludes a pregnancy-associated death from 2012 for which the MMR Committee did not assign a cause of death or determine pregnancy-relatedness. This death is included in the Pregnancy-Associated Mortality Rate (blue line) in Figure 12.

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 2019, for the seventh consecutive year, unintentional drug overdose was the leading cause of pregnancy-associated death in Maryland. Eight of the 31 total deaths (26 percent) resulted from substance use and unintentional overdose. All but one of the unintentional overdose deaths were considered to be non-pregnancy-related. The 7 non-pregnancy-related overdose deaths accounted for 50 percent of the 14 non-pregnancy-related deaths. The majority (75 percent) of these deaths involved opioids. In six of the eight overdose deaths (75 percent), two or more drugs were found by postmortem toxicology testing. Of the overdose deaths, 63 percent involved the potent opioid fentanyl or one of its analogs. Cocaine was found in four cases. Alcohol was detected in two of the overdose cases.

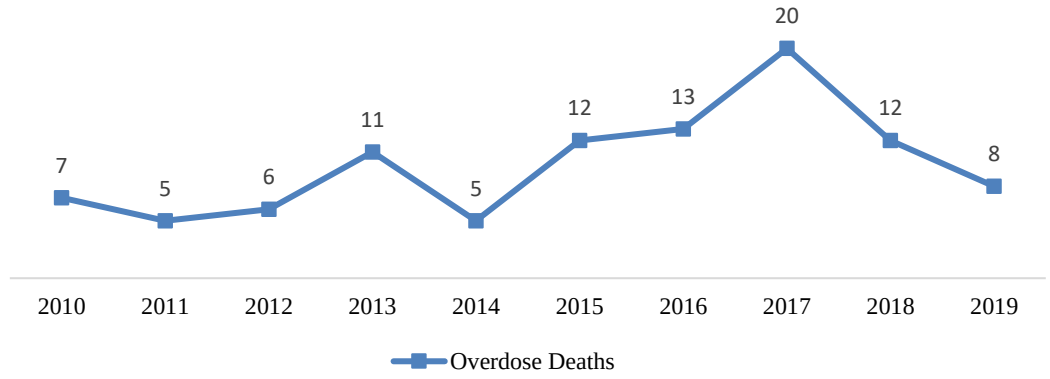
The average age at death was 32 years (range 24-43 years). Five overdose deaths (63 percent) were identified as non-Hispanic White individuals, two (25 percent) were identified as Hispanic individuals, and one (12 percent) was identified as a non-Hispanic Black individual. Seven of the eight individuals (87 percent) had delivered live born infants and the average timing of death was 178 days (5.9 months) postpartum. Two of the overdose deaths occurred in the traditional postpartum period up to 42 days after the conclusion of pregnancy. All of the overdose victims had a known history of substance use and six had received some sort of substance use disorder treatment.

In addition to the eight individuals with a history of substance use disorder who died from unintentional overdose in 2019, there were an additional six individuals identified who had a history of substance use disorder but died from other causes. Of those six individuals, only one received treatment for substance use disorder. Thus overall, 45 percent of the individuals who died within a year of pregnancy in 2019 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 2019 was undertaken. Over this ten-year period, substance use and unintentional overdose was the leading cause of death, accounting for 99 (26 percent) of the 388 pregnancy-associated deaths where a cause of death was determined. Figure 13 shows the number of pregnancy-associated 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, 2010-2019



Data Source: VSA and Maryland MMR Program.

Figure 13 excludes a pregnancy-associated death from 2012 for which the MMR Committee did not assign a cause of death or determine pregnancy-relatedness.

Of the 99 overdose deaths, 95 (96 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, 2010-2019

Opioid	Number of cases (n=95)
Fentanyl/fentanyl analogs	48
Morphine (heroin)	35
Methadone	23
Oxycodone	16
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 95 because multiple drugs can be detected in a single case.

From 2010 to 2019, 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 87 (88 percent) of the 99 overdose deaths, two or more drugs were detected by postmortem testing. In 53 (61 percent) of the multiple drug cases, two to six different opioids were identified. Benzodiazepines were detected in 20 (20 percent), and alcohol in 19 (20 percent) of the 99 overdose death cases.

In Table 2, the 99 overdose deaths are compared with the 289 non-overdose deaths that occurred between 2010 and 2019. Average age at death was comparable in both groups. However, the racial distribution is strikingly different, with a preponderance of non-Hispanic White individuals among the overdose deaths and overrepresentation of non-Hispanic Black individuals among the non-overdose deaths. A similar percentage of individuals 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 72 percent of pregnancies among the overdose group and 64 percent among the non-overdose group resulting in a live birth. Timing of prenatal care initiation was similar, with about half of the individuals in both groups starting prenatal care in the first or second trimester.

Among the 99 unintentional overdose deaths occurring from 2010 to 2019, the average age at death was 29 years. Seventy-four (75 percent) of these deaths were among non-Hispanic White individuals and 19 (19 percent) among non-Hispanic Black individuals, with three cases (3 percent) among non-Hispanic individuals of other races and three cases (3 percent) in a Hispanic individual.

Seventy-two (73 percent) of the 99 individuals who died of overdose had delivered live-born infants. Nineteen individuals (19 percent) were pregnant at the time of death and seven (7 percent) had had an elective termination, spontaneous abortion, or fetal demise prior to death. In one case, pregnancy outcome was unknown. Only seven deaths (7 percent) occurred at or before 42 days postpartum; 73 (74 percent) occurred between 43 and 365 days postpartum. Among overdose deaths, the average timing of death was 196 days postpartum.

In 77 cases (77 percent), at least one mental health diagnosis was documented. Depression was diagnosed in 60 cases (60 percent), anxiety in 59 cases (60 percent), and bipolar disorder in 33 (33 percent). Ninety-four (95 percent) of the individuals who died of overdose had a known history of substance use and 52 of these (52 percent) had documentation of some substance use treatment.

There were large differences between the two groups related to several behavioral health factors. Individuals who died of overdose were more than four times as likely as individuals who died of other causes to have a known history of substance use (95 percent vs. 21 percent). Individuals who died of overdose were more than three times as likely to smoke (84 percent vs. 26 percent) and more than three times as likely to have one or more mental health diagnoses (78 percent vs. 26 percent). Also, 97 of 99 overdose deaths (98 percent) were considered preventable or potentially preventable, compared with 62 percent of the non-overdose deaths.

Table 2: Incident Characteristics of Pregnancy-Associated Deaths, Maryland, 2010-2019 Data presented as mean ± standard deviation, or number (%)		
Characteristic	**Overdose Deaths (n=99)**	**Non-overdose Deaths (n=289)**
Demographics		
Average age at death (years)	29±5	31±7
Non-Hispanic White	74 (75)	98 (34)
Non-Hispanic Black	19 (19)	145(50)
Non-Hispanic Other	3 (3)	20 (7)
Hispanic	3 (3)	26 (9)
Timing of death		
Pregnant at death	19 (19)	68 (24)
0-42 days postpartum	7 (7)	106 (37)
43-365 days postpartum	73 (74)	111 (38)
Unknown	0 (0)	4 (1)
Average days postpartum	196 ± 96	105 ± 116
Pregnancy outcome		
Live-born infant	72 (73)	185 (64)
Co-occurring maternal-fetal deaths	19 (19)	67 (23)
Fetal death	2 (2)	17 (6)
Elective termination	1 (1)	9 (3)
Spontaneous abortion	4 (4)	5 (2)
Ectopic pregnancy	0 (0)	3 (1)
Other outcome	0 (0)	1 (0)
Unknown	1 (1)	2 (1)
Prenatal care initiation		
1st trimester	27 (27)	118 (41)
2nd trimester	20 (20)	30 (10)
3rd trimester	7 (7)	8 (3)
No prenatal care	14 (14)	27 (9)
Termination or death in early pregnancy	6 (6)	14 (5)
Unknown	25 (25)	92 (32)
Behavioral health / social factors		
Known history of substance use	94 (95)	62 (21)
Any history of substance use treatment (among those with known history of substance use)	52 (53)	21 (7)
Smoking	83 (84)	75 (26)
Mental health diagnosis(es)	(78)	74 (26)
Intimate partner violence	15 (15)	29 (10)
Preventability		
Death preventable / potentially preventable	97 (98)	178 (62)

Data Source: Maryland MMR Program.

Table 2 excludes a pregnancy-associated death from 2012 for which the MMR Committee did not assign a cause of death or determine pregnancy-relatedness.

Mental Health Diagnoses

Among the 31 pregnancy-associated deaths in 2019, 12 individuals (39 percent) had histories of mental health disorders, and 75 percent of them had a diagnosis of depression. In six (75 percent) of the eight unintentional overdose cases, there was a history of one or more mental health diagnoses, with one experiencing only depression, two experiencing only anxiety, and three experiencing both. One (13 percent) of the eight cases had a diagnosis of bipolar disorder.

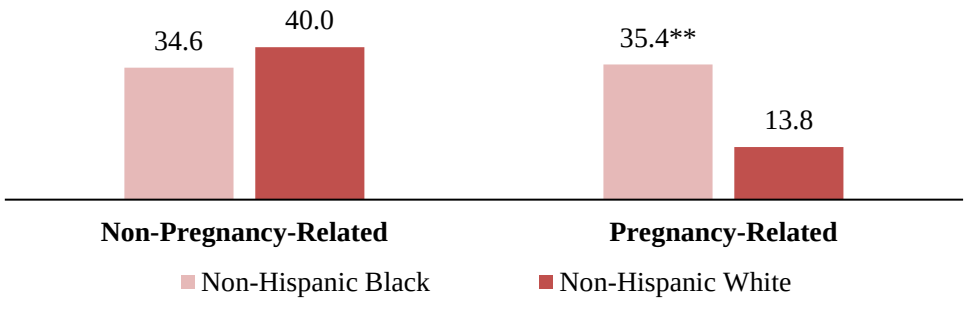
Two individuals who died from an unintentional overdose had a documented history of Intimate Partner Violence (IPV) and two individuals who died of non-overdose causes reported experiencing IPV. The data from 2019 cases continue to show that substance use disorders, intimate partner violence, depression, and other mental health disorders have a significant effect on pregnant individuals and their families, and are contributing factors to maternal health, morbidity, and mortality even if not the final cause of death.

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 racial disparities persist. 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 Maryland MMR suggests that fewer pregnancy-related deaths are occurring during pregnancy and in the immediate postpartum period.

The rates of non-pregnancy-related and pregnancy-related death by race during the period from 2010 to 2019 are shown below in Figure 14. While non-Hispanic Black individuals had a slightly lower rate of non-pregnancy-related mortality than non-Hispanic White individuals, the pregnancy-related mortality rate was significantly higher among non-Hispanic Black individuals compared to non-Hispanic White individuals.

Figure 14. Rate* of Non-Pregnancy-Related and Pregnancy-Related Deaths by Race/Ethnicity, Maryland, 2010-2019

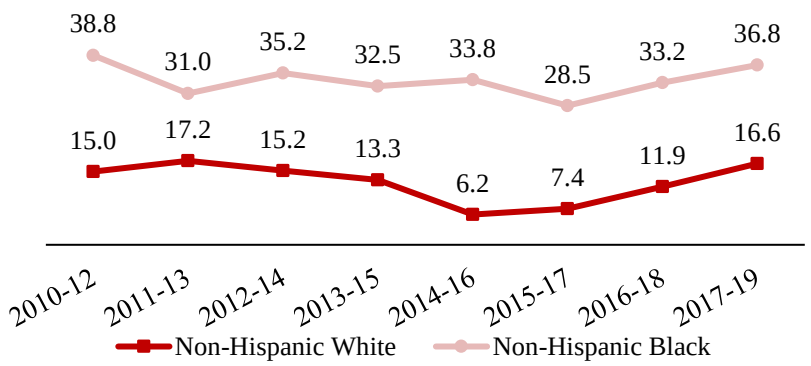


*Number of deaths per 100,000 live births. Data Source: VSA and Maryland MMR Program.
** Denotes statistically significant difference in rates by race, p<0.001.

Figure 14 excludes a pregnancy-associated death from 2012 for which the MMR Committee did not assign a cause of death or determine pregnancy-relatedness.

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. Comparing rates from 2010-2012 and 2017-2019, there was a five percent decrease in the non-Hispanic Black rate. The non-Hispanic White rate increased by 10 percent during this same time period. In the most recent three-year average, the non-Hispanic Black rate is 2.2 times higher than the non-Hispanic White rate. Both rates have increased for the last three years.

Figure 15. Pregnancy-Related Mortality Rates* by Race/Ethnicity, Maryland, 2010-2019



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

Figure 15 excludes a pregnancy-associated death from 2012 for which the MMR Committee did not assign a cause of death or determine pregnancy-relatedness.

In Table 3, the racial and ethnic distribution of births in Maryland from 2010 to 2019 is compared with the distribution of non-pregnancy-related and pregnancy-related deaths. Again, the over-representation of non-Hispanic Black individuals 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 2010-2019
Data presented as number (%)

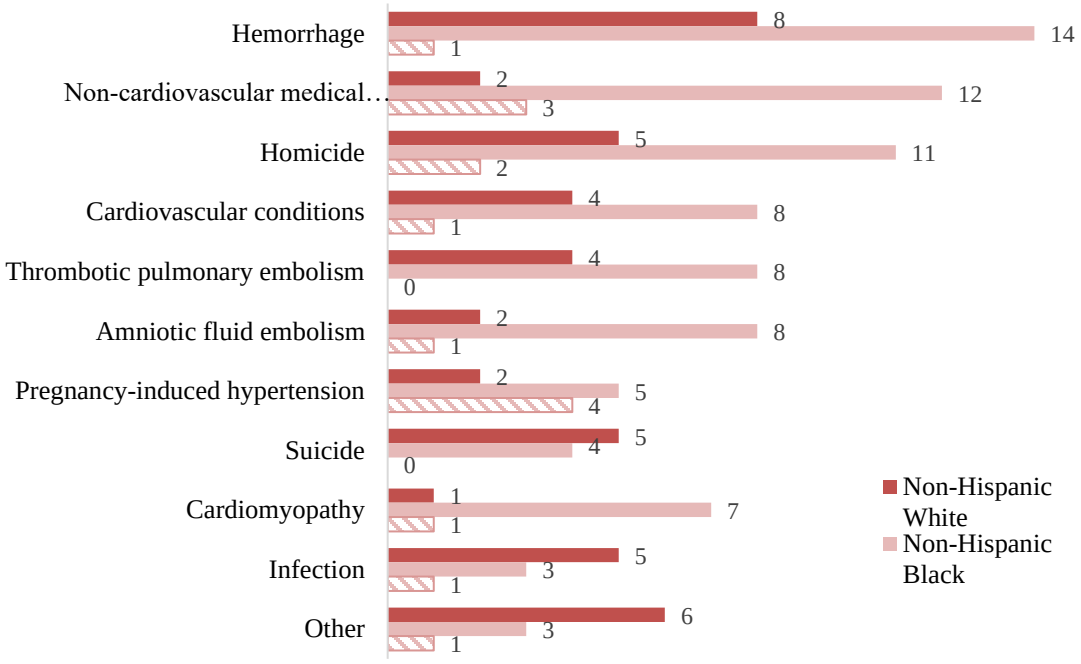
	Total (Maryland)	NH White	NH Black	Hispanic	Asian/Pacific Islander
Live births	724,353 (100)	319,988 (44)	234,441 (32)	113,367 (16)	53,691 (7)
Non-pregnancy-related Deaths	234 (100)	128 (55)	81 (35)	14 (6)	7 (5)
Pregnancy-related Deaths	154 (100)	44 (29)	83 (54)	15 (10)	10 (6)

Data Source: VSA and Maryland MMR Program. Births and deaths to non-Hispanic (NH) mothers of other races are not included in the table but are included in totals in the second column.
Table 3 excludes a pregnancy-associated death from 2012 for which the MMR Committee did not assign a cause of death or determine pregnancy-relatedness.

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 pregnant individuals (Figure 16) until 2015. The number of hemorrhage deaths was nearly fifty percent higher among Black pregnant individuals compared to White pregnant individuals. But from 2015 to 2019, the leading causes of pregnancy-related death have been non-cardiovascular conditions (15 percent) followed by cardiovascular conditions and hemorrhage, both at 13 percent. Although total numbers were small, the leading cause of pregnancy-related death among Hispanic pregnant individuals from 2010 to 2019 was pregnancy-induced hypertension.

Between 2010-2019, non-cardiovascular medical conditions were the second leading cause of pregnancy-related death overall, with the vast majority occurring among non-Hispanic Black individuals. This category includes medical conditions such as seizure disorders, asthma, cancer, and collagen vascular diseases such as lupus. Homicide was the third leading cause of pregnancy-related deaths overall between 2010 - 2019. The number of homicide deaths among non-Hispanic Black pregnant individuals was 2.2 times the number among non-Hispanic White pregnant individuals. 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, 2010-2019



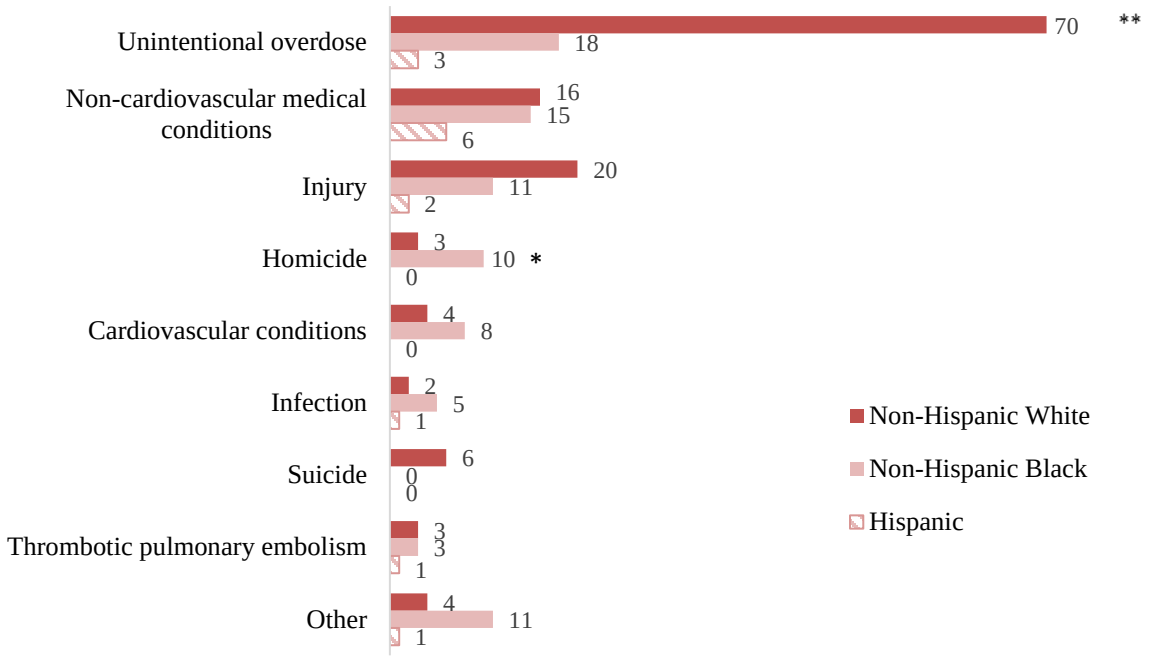
Data Source: Maryland MMR Program.

Figure 16 excludes a pregnancy-associated death from 2012 for which the MMR Committee did not assign a cause of death or determine pregnancy-relatedness.

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 pregnant individuals, the number of overdose deaths being 3.9 times higher than among non-Hispanic Black pregnant individuals. 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, most of which were categorized as "multiple injuries".

Figure 17. Number of Non-Pregnancy-Related Deaths, by Cause of Death and Race/Ethnicity, Maryland, 2010-2019

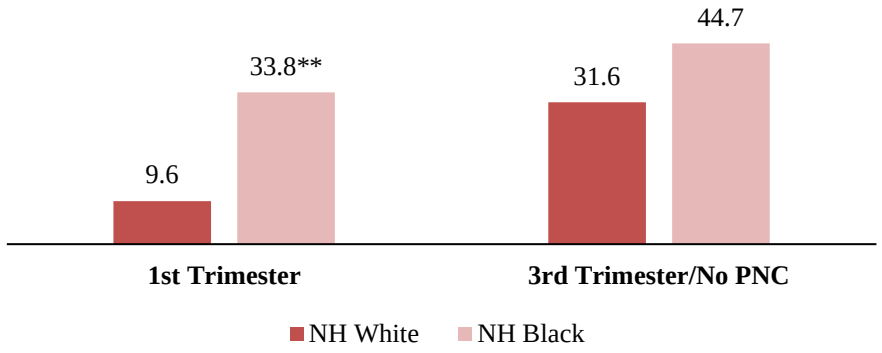


* Denotes statistically significant difference between non-Hispanic Black and non-Hispanic White, p<0.05.
** Denotes statistically significant difference between non-Hispanic Black and non-Hispanic White, p<0.001.
Data Source: Maryland MMR Program.

Figure 17 excludes a pregnancy-associated death from 2012 for which the MMR Committee did not assign a cause of death or determine pregnancy-relatedness.

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 individuals by timing of prenatal care initiation. Among pregnant individuals initiating prenatal care during the first trimester, the pregnancy-related mortality rate was over three times higher in non-Hispanic Black individuals compared to non-Hispanic White individuals between 2010-2019. Early initiation of prenatal care did not eliminate the racial disparity in pregnancy-related deaths. Between individuals who had prenatal care in the first trimester and those with late or no prenatal care, the pregnancy-related mortality rate was 3.3 times greater for non-Hispanic White individuals and 1.3 times greater for non-Hispanic Black individuals.

Figure 18. Pregnancy-Related Mortality Rates* by Prenatal Care Initiation and Race/Ethnicity, Maryland, 2010-2019

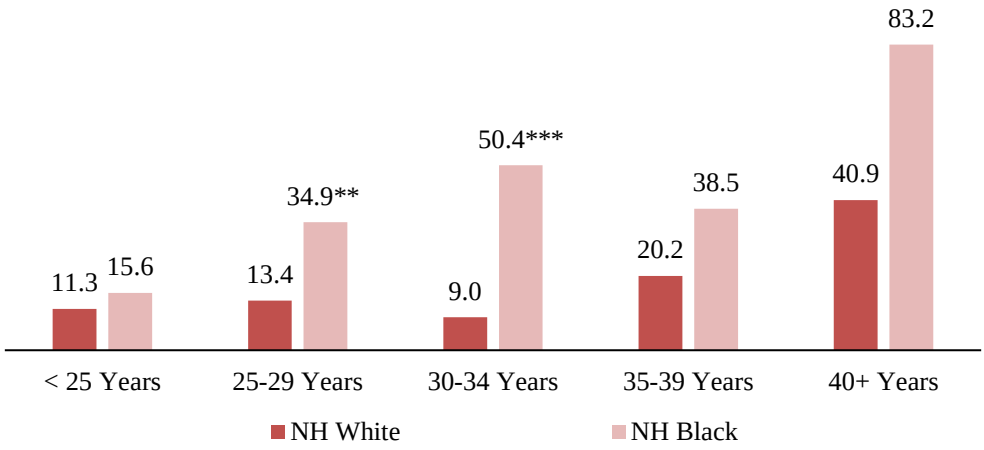


* Number of pregnancy-related deaths per 100,000 live births.
** Denotes statistically significant difference between non-Hispanic Black and non-Hispanic. White, p<0.001. Data Source: VSA and Maryland MMR Program. PNC: Prenatal Care

Figure 18 excludes a pregnancy-associated death from 2012 for which the MMR Committee did not assign a cause of death or determine pregnancy-relatedness.

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 of non-Hispanic White individuals at all ages, with significantly higher rates in the 25-29 year and 30–34-year age groups. In the 25-29 year age group, the pregnancy-related mortality rate was 2.6 times higher in non-Hispanic Black individuals compared to non-Hispanic White individuals. The mortality rate among non-Hispanic Black individuals between 30 and 34 years of age was 5.6 times higher than that among non-Hispanic White individuals in the same age range.

Figure 19. Pregnancy-Related Mortality Rates* by Age Group and Race/Ethnicity, Maryland, 2010-2019

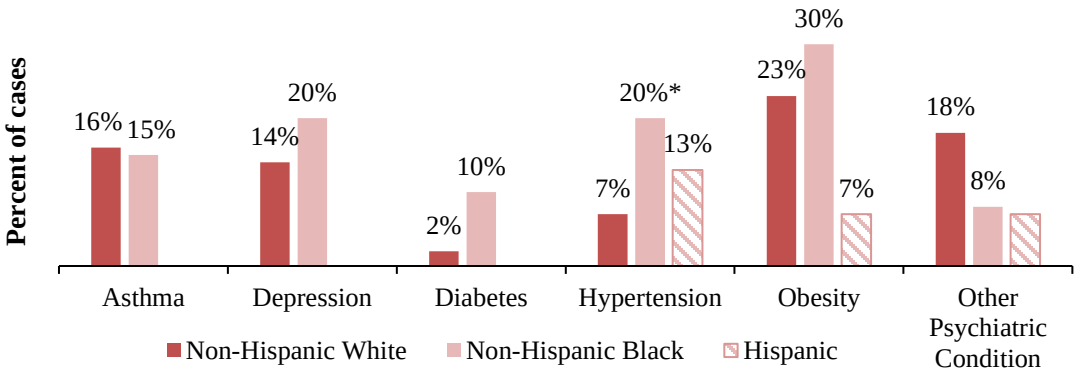


*Number of pregnancy-related deaths per 100,000 live births. **Denotes statistically significant difference between non-Hispanic Black and non-Hispanic White, p<0.05. *** Denotes statistically significant difference, p<0.001
† Rate suppressed due to fewer than 5 deaths. Data Source: Maryland MMR Program.

Figure 19 excludes a pregnancy-associated death from 2012 for which the MMR Committee did not assign a cause of death or determine pregnancy-relatedness.

The prevalence of pre-existing medical conditions was also determined by race among pregnancy-related death cases (Figure 20). Most conditions evaluated were more prevalent among non-Hispanic Black individuals than among non-Hispanic White and Hispanic individuals. The greatest differences were seen in hypertension and obesity, with hypertension proving to be statistically significant.

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



*Denotes statistically significant difference between non-Hispanic Black and non-Hispanic White, p<0.05.
Data Source: Maryland MMR Program.
Percentages add up to more than 100% due to some women having more than one pre-existing condition.

Figure 20 excludes a pregnancy-associated death from 2012 for which the MMR Committee did not assign a cause of death or determine pregnancy-relatedness.

Conclusion

The recommendations made by the MMR Committee and MMR Stakeholder Group address various critical aspects including evaluation and close follow-up for chronic medical disease and behavioral health issues. They also emphasize the need for improvements in postpartum care and cross-disciplinary communications, and the strengthening of 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 individuals in an effort to reduce pregnancy-associated deaths in Maryland.

Appendix A: Maternal Mortality Review Committee

MATERNAL MORTALITY REVIEW COMMITTEE

The Honorable Wes Moore
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 (MSAR #8248)

Dear Governor Moore, 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 Sarah Case-Herron, Director, Office of Governmental Affairs at sarah.case-herron@maryland.gov.

Sincerely,

Clark Johnson, MD, MPH
Maternal Mortality Committee Chair

Enclosure

Cc: Sarah Case-Herron, JD, Director of Governmental Affairs
Dr. Nilesh Kalyanaraman, MD, FACP, Deputy Secretary, Public Health Services
Dr. Elizabeth Kromm, PhD, MSc, 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)

Maternal Mortality Review Committee, 2019-2020

Maryland Department of Health, Maternal Mortality Review Program Director *Benjamin Wormser, MD, MPH**	**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*	**Holy Cross Hospital** *Ann Burke, MD*
University of Maryland Medical System *Shobana Bharadwaj, 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*	**Community Representative** *Desiree Israel, LCSW-C*
Maternal Mortality Review Abstractor *Lorraine Goldstein, CNM*	**Maternal Mortality Review Abstractor** *Jan Kriebs, CNM*
Anne Arundel Medical Center, Maternal Mortality Review Committee Chair *Clark Johnson, MD, MPH*	**Johns Hopkins Bayview Medical Center, Center for Addiction and Pregnancy, Maternal Mortality Review Abstractor** *Lorraine Milio, MD*
Anne Arundel Medical Center, Maternal Mortality Review Committee Chair *Clark Johnson, MD, MPH*	**Community Nursing Representative** *Maxine Reed-Vance, PhD, MS, RN*
University of Maryland St. Joseph Medical Center *Judith Rossiter, MD*	**Staff to the Committee** *Shayna Banfield*

** Added to Committee June 2021.*

Maternal Mortality Review Committee Recommendations, 2021

Strategic Priority One: Substance Use

1. Utilize the Alliance for Innovation on Maternal Health (AIM) Substance Use Disorder Bundle for training residents, advanced practice learning, and annual grant rounds.
    - https://saferbirth.org/psbs/care-for-pregnant-and-postpartum-people-with-substance-use-disorder/
    - https://saferbirth.org/psbs/obstetric-care-for-women-with-opioid-use-disorder/
2. Promote services of Maryland Addiction Consultation Service for MOMs (MACS for MOMs).
    - https://www.medschool.umaryland.edu/macsformoms/

Strategic Priority Two: Pre-conception Health

1. Support the implementation of Maryland Department of Health Maternal Child Health Improvement Plan and develop a campaign to make early prenatal care a cultural norm.
2. Achieve health using the life course model.
    - Achieve maternal health (preconception, prenatal and birth, postpartum, and interpartum periods) using the life course model to support Maryland birthing individuals through advocacy and implementation of effective policies.
3. Preconception and interconception health: Address conditions that prevent healthy pregnancy outcomes for individuals of reproductive age.
    - Increase access to comprehensive, quality family planning and reproductive health services across Maryland through the Maryland Family Planning Program.
    - Improve prevention, diagnosis, and treatment of cardiovascular disease and hypertension through counseling, medical evaluations, medical and non-medical therapies.
    - Address the prevention, diagnosis, and treatment of diabetes through screening, counseling, medical evaluations, medical and non-medical therapies.
    - Address the diagnosis and treatment of behavioral health conditions including depression, anxiety and substance use disorders through screening (including Screening, Brief Intervention, Referral to Treatment, or SBIRT), counseling, medical and non-medical therapies.
4. Develop messages aimed at adolescent and young adults to inform and promote participation in healthy life choices (nutrition, contraception, avoiding substance use) in order to increase the number of intended pregnancies without medical co-morbidities.
5. Increase access to mental health resources.

Strategic Priority Three: Hemorrhage

1. Ensure that all hospitals with birthing units can respond to an emergent need for massive transfusion protocol and are familiar with management of immediate postpartum hemorrhage complicated by DIC.
2. Promote the AIM Hemorrhage Bundle and use in grand rounds.
    - https://saferbirth.org/psbs/obstetric-hemorrhage/

Strategic Priority Four: Disparities

1. Healthcare disparities are an underlying factor in the Three identified strategies. Although listed as a separate Fourth Strategic Priority, the work to reduce disparities should be built into all 3 identified strategies.

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 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, 2021

Maryland Department of Health *Benjamin Wormser, MD, MPH*	**Baltimore Healthy Start, Inc.** *Teneele Bruce, MBS*
Maryland Commission for Women *Jenny Pena-Dias, PhD, MPH, MS*	**Maryland Patient Safety Center** *Blair Eig, MD*
Black Mamas Matter Alliance *Elizabeth Dawes Gay, MPH*	**Community Representative** *Pastor Meldon Dickens*
Comprehensive Women's Health, Inc. *Angela Marshall, MD, FACP*	**Office of Minority Health and Health Disparities** *David Mann, MD, PhD*
Women's Health Care Provider *Meghana Rao, MD*	**Baltimore Healthy Start** *Maxine Reed Vance, PhD, RN*
Family Representative, University of Maryland School of Nursing *Rosemarie DiMauro Satyshur, PhD, RN*	**Community Representative and Pediatric Physician** *Toni Thompson-Chittams, MD, FAAP*
Community Representative *Doris Titus-Glover, PhD, MSN*	**Prince George's County Health Department** *Diane Young*
Chrysalis House, Inc. *Christopher McCabe*	**Maryland Association of County Health Officers** *Vacant*
Queen Anne's County Health Department *Melissa Aftoora*	**Black Women's Health Initiative** *Vacant*
House of Ruth Maryland *Vacant*	**Healthy New Moms/Mental Health Association of Maryland** *Vacant*

Maternal Mortality Review Stakeholder Group Recommendations, 2021

Additions to the recommendations in the Maternal Mortality Review 2021 Annual Report

The Maternal Mortality Review Stakeholder Group believes that public health programming and policy should focus on increasing the accessibility of health care before a pregnancy, during a pregnancy, and after a pregnancy to prevent maternal mortality.

- Support policies and programs to expand access to essential medications and durable medical equipment, such as home blood pressure monitoring cuffs, during and after pregnancy.

- Adopt presumptive Medicaid eligibility for pregnant and postpartum individuals in Maryland.

- Investigate strategies to better coordinate connections between eligible individuals and the Maryland health exchange.

- In addition to the State's efforts to expand postpartum paid family leave, develop policies that provide paid time off during the course of a pregnancy to attend pregnancy-related and other necessary appointments.

- Partner with school-based health centers, school nurses, healthcare providers, community organizations, faith-based organizations, and other entities that regularly engage with adolescents and young adults to support comprehensive health education, screening, and promotion. This may include assessing blood pressures, BMI, food insecurity, mental health, and reproductive health/family planning needs so that Marylanders are healthy and prepared to become pregnant at a time of their choosing.

- Expand programs that reduce transportation as a barrier to prenatal and postpartum care, including the utilization of transportation subsidies, increased telemedicine capacity, and mobile clinics.

- Leverage trained community members (such as community health workers) to provide health education, conduct routine screenings, breastfeeding support, well-baby care, and to support telemedicine visits for pregnant and postpartum individuals.

- Empower families and caregivers to support pregnant and postpartum individuals. Specifically, provide education and information about recognizing and acting on urgent warning signs.

- Leverage existing data to identify high-risk patients before, during, and after pregnancy and to connect them with resources to reduce their risk of poor outcomes

Appendix C: Five-Year Rolling Maternal Mortality Rates by Race, Maryland and United States, 2000-2019

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, 2000-2019

	Maryland			United States		
Year	**All Races**	**NH White**	**NH Black**	**All Races**	**NH White**	**NH Black**
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
2015-2019	17.2	11.6	27.8	20.4	17.9	44.1

*Rate of maternal deaths per 100,000 live births. Source: CDC WONDER as of 4/26/2022.