



The Commonwealth of Massachusetts
Executive Office of Health and Human Services
Department of Public Health
250 Washington Street, Boston, MA 02108-4619

MAURA T. HEALEY
Governor

KIMBERLEY DRISCOLL
Lieutenant Governor

KATHLEEN E. WALSH
Secretary

Robert Goldstein, MD, PhD
Commissioner

Tel: 617-624-6000
www.mass.gov/dph

September 30, 2024


Steven T. James
House Clerk
State House Room 145
Boston, MA 02133

Michael D. Hurley
Senate Clerk
State House Room 335
Boston, MA 02133

Dear Mr. Clerk,

Pursuant to Section **4590-1503 Maternal and Child Health of the FY24 General Appropriations Act (GAA)**, please find enclosed a report from the Department of Public Health entitled *2020-2021 Report on Maternal Mortality in Massachusetts*.

Sincerely,


Robert Goldstein, MD, PhD
Commissioner
Department of Public Health

MAURA T. HEALEY
GOVERNOR

KIMBERLEY DRISCOLL
LIEUTENANT GOVERNOR



KATHLEEN E. WALSH
SECRETARY

ROBERT GOLDSTEIN, MD, PhD
COMMISSIONER

2020-2021 Report on Maternal Mortality in Massachusetts

October 2024

Contents

Legislative Mandate	5
Executive Summary	6
Key Findings.....	6
Recommendations	6
Purpose	8
Maternal Mortality and Morbidity in the United States and Massachusetts.....	8
Maternal Mortality Definitions.....	9
Inclusive language	10
The Massachusetts Maternal Mortality and Morbidity Review Committee (MMMRC)	11
History of Maternal Mortality Review in Massachusetts	11
Funding.....	11
The Maternal Mortality Review Process	12
Frequency of committee reviews.....	14
Limitations.....	14
Findings	15
Overall Findings.....	15
Findings by Sociodemographics	16
Race/ Ethnicity	16
Age	16
Insurance.....	16
Education	16
County of Residence.....	16
Causes of Death	18
Timing of Death.....	18
Pregnancy-Relatedness	20
Preventability of Deaths.....	21
Circumstances Surrounding Death and Manner of Death	21
Conclusions and Recommendations	22
Addendum: Maternal Mortality Review Committee and Team Members.....	28
Current Committee Members	28
MDPH Contributors.....	28

Legislative Mandate

The following report is hereby issued pursuant to **4590-1503 Maternal and Child Health of the FY24 GAA** as follows:

4590-1503 Maternal and Child Health

***provided further,** that not less than \$350,000 shall be expended for the operations of and hiring additional personnel for the Massachusetts maternal mortality and morbidity review committee to enhance the committee's ability to comprehensively review deaths and complications that occur during or within 1 year of pregnancy and make related remedial policy and practice recommendations; provided further, that the committee shall convene regularly to encourage consistent case review and reporting of findings and recommendations; provided further, that the department of public health shall submit to the committee, in a timely manner, aggregated and patient-level maternal morbidity and mortality data for review and utilization in developing recommendations to improve perinatal and maternal health outcomes; provided further, that not later than March 1, 2024, the committee shall submit a report to the joint committee on public health, the house and senate committees on ways and means, the pregnancy and birth equity task force of the Massachusetts caucus of women legislators and the commission on the status of women on its findings and recommendations; provided further, that the department shall publish the committee's report on its website.*

Executive Summary

Since 1997, the Massachusetts Department of Public Health (DPH) has convened the Maternal Mortality and Morbidity Review Committee (MMMRC) to review maternal deaths, study the incidence of pregnancy complications, and make recommendations to improve maternal outcomes and eliminate preventable maternal deaths. This document fulfills the requirements of Section 4590-1503 in the FY24 GAA.

The MMMRC, with support from the Maternal Mortality and Morbidity Review Team (MMMRT) at DPH, uses various data sources to identify all deaths of people while pregnant or within a year of the end of a pregnancy (pregnancy-associated deaths), regardless of the cause of death. The MMMRC reviews the deaths to identify the cause of death, determine if the death was pregnancy-related and/or preventable, identify contributing factors, and develop recommendations to prevent future deaths.

Key Findings

- The MMMRC identified 73 pregnancy-associated deaths during 2020-2021, including 25 deaths determined to be related to pregnancy.
- Pregnancy-associated deaths, whether related to pregnancy or not, are not equally experienced by all groups.
 - The Massachusetts pregnancy-associated mortality ratio (PAMR), defined as total number of pregnancy-associated deaths per 100,000 live births, was 53.8 overall, but was nearly twice as high for Black non-Hispanic people (93.8) as for White non-Hispanic people (46.6).
 - The overall pregnancy-related mortality ratio (PRMR), defined as the number of pregnancy-related deaths per 100,000 live births, was 18.4, but was nearly twice as high for Black non-Hispanic people (36.1) as for White non-Hispanic people (18.1) and more than twice as high as for Hispanic people (14.1).
- Nineteen percent of the pregnancy-associated deaths occurred during pregnancy, 23% occurred within 42 days after the end of pregnancy, and 58% percent occurred between 43 days and 1 year of the end of the pregnancy. Over half (60%) of pregnancy-related deaths occurred from end of pregnancy to 42 days after the end of pregnancy
- Eighty-four percent of pregnancy-related deaths were considered preventable.
- Discrimination contributed or probably contributed to 44% of pregnancy-related deaths.
- Mental health conditions also contributed or probably contributed to 44% of pregnancy-related deaths, while substance use disorder contributed or probably contributed to more than half (56%) of pregnancy-related deaths.
- Lack of care continuity and coordination were the largest contributing factors, impacting almost half (48%) of pregnancy-related deaths.

Recommendations

Based on their review of the 25 pregnancy-related deaths in 2020-2021, the MMMRC developed specific, actionable recommendations. These recommendations fall within the following general categories: increasing the availability and quality of autopsy information for MMMRC reviews; supporting efforts to promote and ensure respectful and trauma-informed

perinatal care; supporting efforts to improve continuity and coordination of care; and promoting and supporting integrated and risk-appropriate maternal care.

Purpose

The purpose of this report is to describe the work of the Massachusetts Maternal Mortality and Morbidity Review Committee (MMMRC), to provide an update on findings from MMMRC reviews of pregnancy-associated deaths occurring in 2020 and 2021, and to present a summary of recommendations from the MMMRC.

Maternal Mortality and Morbidity in the United States and Massachusetts

Pregnancy-related death, defined as death while pregnant or within one year of the end of pregnancy from a cause related to or aggravated by pregnancy, has been increasing in the United States in recent decades. The CDC's [Pregnancy Mortality Surveillance System](#), which monitors the rate of pregnancy-related deaths nationally, shows an increase from 7.2 deaths per 100,000 live births in 1987 to 17.6 deaths per 100,000 live births in 2019 (the latest pregnancy-related data available nationally).¹ PMSS data reveal striking racial and ethnic inequities in pregnancy-related deaths: during 2017–2019, the pregnancy-related mortality ratios (PRMRs) stratified by race and ethnicity were: 62.8 deaths per 100,000 live births among non-Hispanic Native Hawaiian or Other Pacific Islander persons; 39.9 deaths per 100,000 live births among non-Hispanic Black persons; 32.0 deaths per 100,000 live births among non-Hispanic American Indian or Alaska Native persons; 14.1 deaths per 100,000 live births among non-Hispanic White persons, and 11.6 deaths per 100,000 live births among Hispanic persons.¹ Pregnancy-associated deaths have similarly increased in Massachusetts in recent years. Pregnancy-associated deaths, defined as deaths during pregnancy or within one year of the end of pregnancy from any cause, ranged between 23 and 30 deaths per 100,000 live births during 2002–2011 in Massachusetts, but increased to more than 35 deaths per 100,000 live births during 2016–2019.²

Severe maternal morbidity (SMM) is defined as unexpected complications of labor and delivery that result in significant short- or long-term consequences to the birthing person's health. SMM has increased nationally from 69.8 per 10,000 delivery hospitalizations in 2010 to 88.2 per 10,000 delivery hospitalizations in 2020.³ In 2020, the rate of SMM among Black, non-Hispanic individuals was 139.0 per 10,000 delivery hospitalizations, almost twice the rate observed for White, non-Hispanic individuals (69.9). A recent report from DPH demonstrated that SMM nearly doubled in Massachusetts from 2011 to 2020, from 52.3 per 10,000 deliveries in 2011 to

¹ Centers for Disease Control and Prevention. Pregnancy Mortality Surveillance System.

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

² Declercq ER, Cabral HJ, Liu CL, et al. Prior Hospitalization, Severe Maternal Morbidity, and Pregnancy-Associated Deaths in Massachusetts From 2002 to 2019. *Obstet Gynecol*. Dec 1 2023;142(6):1423-1430.

doi:10.1097/aog.0000000000005398

³ Health Resources and Services Administration. Severe Maternal Morbidity: Trends and Disparities. Available at: [Severe Maternal Morbidity: Trends and Disparities \(hrsa.gov\)](#).

100.4 per 10,000 in 2020, an average increase of 8.9 percent a year.⁴ Black non-Hispanic people consistently experienced the highest rates of labor and delivery complications among all races and ethnicities in Massachusetts. In 2011, the gap between SMM rates for Black non-Hispanic and White non-Hispanic individuals was two-fold. By 2020, the SMM rate for Black non-Hispanic people was 2.5 times higher than that of White non-Hispanic people, a 25 percent increase in the gap over the decade.⁶

Definitions

The MA MMMRC uses the Centers for Disease Control and Prevention (CDC) definitions as described in [Review to Action](#).⁵

- **A pregnancy-associated death** is a death during or within one year of pregnancy, regardless of the cause or outcome of the pregnancy. These deaths make up the universe of maternal mortality; within that universe are pregnancy-related deaths, pregnancy-associated but not related deaths, and deaths that are pregnancy-associated but undetermined if pregnancy-related. This is the number used as the numerator in the calculation of the pregnancy-associated mortality ratio (PAMR).
- **A pregnancy-related death** is a death during or within one year of pregnancy, from a pregnancy complication, a chain of events initiated by pregnancy, or the aggravation of an unrelated condition by the physiological effects of pregnancy. Included within this, a **preventable pregnancy-related death** is a pregnancy-related death for which the MMMRC determines there was at least some chance of the death being averted by one or more reasonable changes to patient, family, provider, facility, system, or community factors. This is the number used as the numerator in the calculation of the pregnancy-related mortality ratio (PRMR).
- **A pregnancy-associated, but not related death** is the death of a person during or within one year of pregnancy, from a cause that is not related to pregnancy or exacerbated by pregnancy.
- **A pregnancy-associated, but unable to be undetermined if pregnancy-related death** is the death of a person while pregnant or within one year of termination of pregnancy from a cause that cannot be determined or conclusively categorized by the MMMRC as either pregnancy-related or not pregnancy related. For example, a person dies at six months postpartum from a self-inflicted cause with an unknown mental health history.

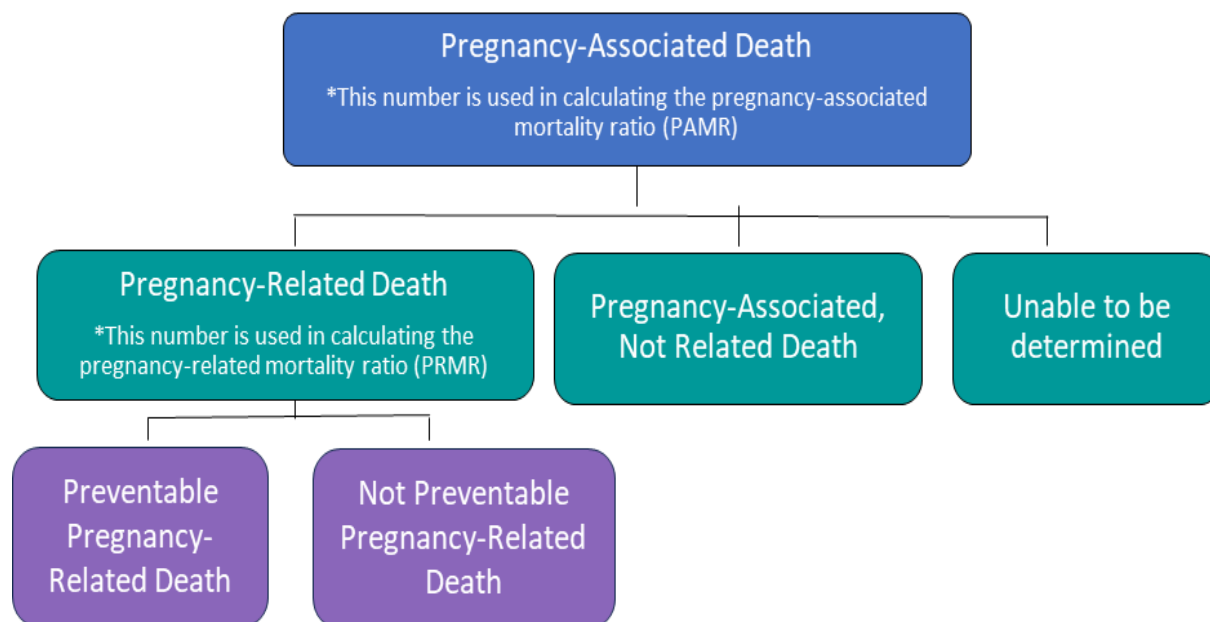
⁴ Data Brief: An Assessment of Severe Maternal Morbidity in Massachusetts: 2011-2020. <https://www.mass.gov/doc/an-assessment-of-severe-maternal-morbidity-in-massachusetts-2011-2020/download>

⁵ Review to Action: Working Together to Prevent Maternal Mortality. <https://reviewtoaction.org/learn/definitions>

As part of the review process, the MMMRC categorizes each pregnancy-associated death into one of the following sub-categories as defined above (see Figure 1):

- Pregnancy-related death
 - Pregnancy-related death that *was* preventable
 - Pregnancy-related death that was *not* preventable
- Pregnancy-associated, but not related death
- Unable to determine pregnancy-relatedness of the death

Figure 1. Maternal mortality definitions



Inclusive language

To be more inclusive, accurate, and equity-focused, we use gender-neutral terms such as “individuals” or “people” in this report wherever possible, rather than terms such as “women” or “mothers.” Some of our terminology is still gendered, such as “maternal,” which is in the review committee’s name and the larger field of this work. We include both “maternal” and “perinatal” in the report. “Perinatal” refers to the period around pregnancy, birth, and postpartum (or after pregnancy) and is most accurate not only for reasons of gender identity inclusion, but also because it includes situations in which a pregnancy doesn’t end in a birth and the pregnant person does not identify as a parent.

DPH acknowledges that multiple terms can be used to describe the Hispanic population, including Latino/Latina or Latinx. This report uses the DPH term Hispanic/Latinx, consistent with the DPH data standards for race, ethnicity, and language.

The Massachusetts Maternal Mortality and Morbidity Review Committee (MMMRC)

History of Maternal Mortality Review in Massachusetts

Since 1997, the Massachusetts Department of Public Health (DPH) has convened the MMMRC to review pregnancy-associated deaths, study the incidence of pregnancy complications and maternal morbidity, and make recommendations to improve maternal outcomes and eliminate preventable maternal death. The DPH Maternal Mortality and Morbidity Review Team (MMMRT) provides staffing support for the MMMRC. The goal of the MMMRC review is to determine whether the death was related to pregnancy, identify factors that contributed to the death, assess whether the death was preventable, and make recommendations to prevent future maternal mortality and morbidity.

Findings and recommendations in this report are based on reviews of deaths that occurred during 2020-2021. The process of identifying deaths that happen during pregnancy and up to one year postpartum and then gathering medical and related records needed for the MMMRC to review cases comprehensively can take several years, depending on the availability of records and staff capacity. This process is described in detail below. The MMMRC hopes these data and recommendations can help guide policymakers and other key partners in our shared work to end preventable maternal mortality and severe maternal morbidity, eliminate inequities in maternal health outcomes, and honor individuals and communities impacted by maternal death. Although the Legislature is the primary audience for this report, secondary audiences include all other agencies, institutions, and individuals working to address maternal and perinatal morbidity and mortality including medical, birth, and birth support providers; advocates for health equity and perinatal health; health systems; state agencies; local health departments; and the public—communities, families, and individuals.

Funding

Section [4590-1503 Maternal and Child Health](#) of the FY24 General Appropriations Act (GAA) allocated funds for the operations of and hiring of personnel for the Massachusetts MMMRC. These funds have provided much needed support for the committee to comprehensively review deaths and complications that occur during or within one year of pregnancy and make related remedial policy and practice recommendations. A report was required to be submitted by March 1, 2024 to the joint committee on public health, the house and senate committees on ways and means, the pregnancy and birth equity task force of the Massachusetts caucus of women legislators and the commission on the status of women. This document fulfills the requirements of Section 4590-1503.

The Maternal Mortality Review Process

The MMMRC conducts maternal mortality reviews through a multi-level process.



Level 1. Identification of pregnancy-associated deaths through data linkage and death certificate pregnancy checkboxes.

The DPH MMMRT, comprised of abstractors, quality improvement specialists, coordinators and epidemiologists, uses multiple methods to identify pregnancy-associated deaths for MMMRC review. These include the following:

- 1) The DPH Registry of Vital Records & Statistics (RVRS) sends daily feeds of death, birth, and fetal death files to the Centers for Disease Control and Prevention (CDC) via the State and Territorial Exchange for Vital Events (STEVE). CDC links birth and fetal death data to data on deaths of reproductive-aged people who were able to give birth and generates a list of people who died within one year of being pregnant or giving birth. CDC also uses information on the death certificate to identify potential pregnancy-associated deaths that did not link with a birth or fetal death record by searching all cause of death fields for pregnancy-related ICD-10 codes and identifying checkbox values indicating pregnancy at the time of death, within 42 days of death, or within 1 year of death.
- 2) RVRS follows-up on cases that were identified by the death certificate pregnancy checkbox (but did not link with a birth or fetal death record) to confirm whether there is an indication that the decedent was pregnant at the time of death or pregnant within the previous year.
- 3) RVRS conducts additional monthly linkages of birth and fetal death certificates to death certificates of reproductive-aged people who were able to give birth, generating an additional list of people who died within one year of being pregnant or giving birth.
- 4) DPH-licensed health care facilities are required to report to the DPH Bureau of Health Care Safety and Quality (BHCSQ) a “maternal death or serious injury associated with labor or delivery in a low-risk pregnancy while being cared for in a health care setting.” This regulatory requirement includes events that occur within 42 days post-delivery. All reports of maternal deaths provided by hospitals are sent by BHCSQ to the MMMRC.
- 5) A small number of pregnancy-associated deaths are also identified through newspaper articles, an annual report of people who died because of domestic violence, or informal reports from MMMRC members or members of the obstetric health care community.

Over the past year, the DPH MMMRT has enhanced the identification of pregnancy-associated deaths by working closely with RVRS and CDC. After validating the vital records, CDC imports all pregnancy-associated deaths directly into the Maternal Mortality Review Information Application (MMRIA) system monthly. MMRIA is a data system developed by CDC and designed to facilitate jurisdictional Maternal Mortality Review Committee functions through a common data language. The MMMRT's Data Quality Specialist oversees this process and addresses data discrepancies.

Level 2. Data collection and confirmation of pregnancy checkbox.

In 2003, a pregnancy-checkbox was added to the U.S. certificate of death in an attempt to improve the identification of maternal deaths. However, it has also been shown to increase maternal death misclassification.⁶ The MMMRT's Data Quality Specialist ensures the accuracy of the pregnancy checkbox on RVRS-identified pregnancy-associated deaths through records acquisition and review of available medical, legal, and social media records.

Level 3. Abstraction and review of pregnancy-associated death

For each identified pregnancy-associated death, the MMMRC team requests and obtains copies of all available hospital medical records, police records, Office of the Chief Medical Examiner records, and other records related to both the pregnancy and death. Acquisition of relevant records is necessary to help committee members make an informed decision about pregnancy-relatedness, contributing factors, and preventability. Each case is assigned to an abstractor and a MMMRC member reviewer. The assigned abstractor then abstracts the records and enters the information into MMRIA. The assigned MMMRC member reviewer analyzes all available documents and prepares to present the case to the Committee.

Level 4. Pregnancy-relatedness determination and preventability discussion.

The MMMRC member reviewer summarizes the specific case for the entire Committee without identifying the patient, clinicians, or institutions where care was received. On occasion, ad hoc subject matter specialists in areas such as substance use disorders, oncology, neurology, infectious disease, and injury prevention are invited to attend Committee reviews to provide input on cases as needed.

After a case is presented by the MMMRC reviewer, the Committee deliberates until consensus on the following questions is reached:

- Was the death pregnancy-related?
- Was the death preventable?
- What factors contributed to the death?
- What public health and/or clinical strategies might prevent future deaths?

⁶ Catalano A, Davis NL, Petersen EE, et al. Pregnant? Validity of the pregnancy checkbox on death certificates in four states, and characteristics associated with pregnancy checkbox errors. *Am J Obstet Gynecol*. Mar 2020;222(3):269.e1-269.e8. doi:10.1016/j.ajog.2019.10.005

Deaths are considered “preventable” if reasonable changes to any provider, facility, patient, community, or system factors may have helped prevent the death. The definition of preventability is not limited to clinical factors, but also considers the social and community factors influencing the death.

Frequency of committee reviews

With additional resources provided through CDC and state funding, the MMMRT has increased the number of abstractors available and is hiring a dedicated coordinator for the review process. Prior to this increase in funding, the MMMRC met at most quarterly, for three hours each session, to review cases. The pace of review was limited by the availability of cases that had been sufficiently abstracted for review. The lengthy timing required for abstraction, along with an increase in cases due to the increase in deaths related to overdose, created a backlog of cases that was further exacerbated because of logistical challenges associated with transitioning to virtual committee meetings during the COVID-19 pandemic as well as competing clinical demands of members of the Committee. The MMMRT has transitioned from reviews of paper records to electronic files and increased the efficiency of the data collection and abstraction processes, allowing the MMMRT to prepare additional cases. With the additional CDC and state funding, since 2023, MMMRC has been meeting monthly. In 2023, the committee reviewed 63 cases, and is on track to complete review of deaths that occurred in 2022 by spring 2024.

Limitations

Records that may have provided additional information but were not available to the reviewers include ambulatory care records not part of the hospital medical records (including prenatal care records); hospital records for births or fetal deaths occurring outside of Massachusetts; autopsy reports and death scene investigations; and information about deaths or births occurring in non-hospital settings. Other limitations include lack of records from a transferring community hospital. The following language, included in the Governor’s FY25 budget, will enable to MMMRT to access needed records in a more timely manner:

Section 43 of Chapter 28 of the Acts of 2023 is hereby amended by inserting after the last paragraph the following paragraph:- (f) Notwithstanding any general or special law to the contrary, upon the determination of the committee’s chair that the review of any information or record is necessary to carry out the purpose of this section, any public or private agency or individual, including but not limited to a healthcare facility as defined in section 25B of chapter 111, a health care provider as defined in section 1 of chapter 111 and a professional licensed pursuant to chapter 112, shall provide all requested records. The committee may receive and solicit voluntary information, including oral or written statements, relating to any pregnancy-associated death and case of severe maternal morbidity, from any family member or other interested party (including the patient in a case of severe maternal morbidity) relating to any case that may come before the committee.

Findings

A note about interpreting small numbers:

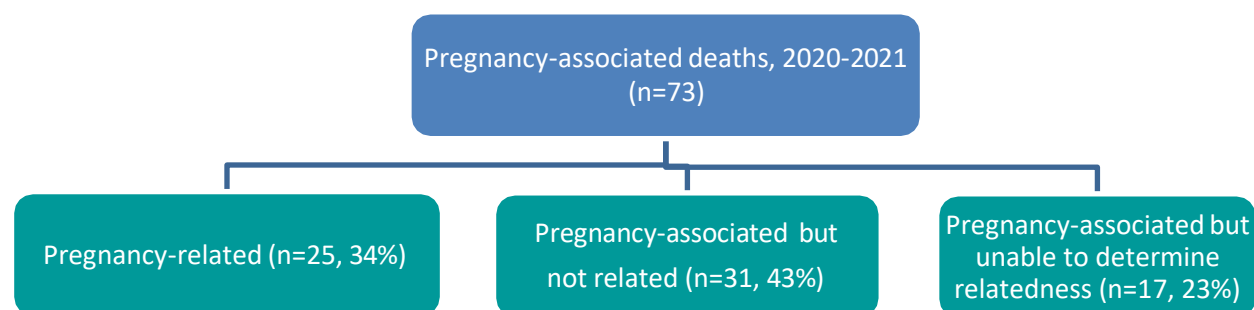
The MMMRT calculated mortality ratios for all pregnancy-associated and pregnancy-related deaths that occurred during January 1, 2020–December 31, 2021. The pregnancy-associated mortality ratio (PAMR) is defined as the total number of pregnancy-associated deaths per 100,000 live births in a given period, allowing comparisons of PAMR across groups and across time periods. The pregnancy-related mortality ratio (PRMR) is defined as the total number of pregnancy-related deaths per 100,000 live births in a given period. These rates are used to describe deaths in aggregate as well as for specific subgroups. The results presented in this report are purely descriptive in nature. Information on demographic characteristics presented in the report was obtained from birth certificates when possible, as those data are self-reported. In cases where information is not available from the birth certificate, available information from the medical record or death certificate was used. Cell sizes of 1-4 cases have been suppressed in the Tables that follow to conform to DPH cell suppression standards. Complementary cell suppression (suppression of another cell in the table to prevent back-calculation of suppressed cells) has been applied when needed to maintain privacy.

These data illustrate characteristics of the cohort of all pregnancy-associated deaths occurring in 2020–2021 and the findings presented in this report offer a snapshot of that two-year period. The last comprehensive report of maternal deaths in Massachusetts was released in 2014. Several cases that occurred prior to 2020 are still pending review, as the MMMRC prioritized more recent cases for review. As these earlier cases, and cases from 2022 and 2023 are reviewed, MMMRC will be better able to identify trends over time.

Overall Findings

During 2020–2021, 73 deaths occurred among pregnant or postpartum people. The MMMRC determined that 34% (n=25) of the cases were pregnancy-related, 43% (n=31) of the cases were pregnancy-associated but not related, and 23% (n=17) were pregnancy-associated but the MMMRC was unable to determine pregnancy-relatedness (Figure 2).

Figure 2, Pregnancy-associated deaths among Massachusetts Residents 2020-2021.



Findings by Sociodemographic Characteristics

Pregnancy-associated deaths, whether related to pregnancy or unrelated to pregnancy, are not equally experienced by all groups of pregnant and postpartum people. Table 1 shows mortality ratios for 2020–2021 according to select demographic characteristics. The PAMR was 53.8, and the PRMR was 18.4 overall. There were substantial differences in PAMR and PRMR based on race/ethnicity, age, insurance payor, and education level.

Race/ Ethnicity

Black non-Hispanic individuals had the highest PAMR, at 93.8 deaths per 100,000 live births, nearly twice the ratio of White non-Hispanic individuals (46.6). When looking at the PRMR, Black non-Hispanic individuals had nearly twice the PRMR of White non-Hispanic and more than twice the PRMR of Hispanic individuals (36.1 vs 18.1 and 14.1, respectively).

Age

Younger individuals, those under 25 years of age, had the highest PAMR (PAMR= 95.0 for ages 20-24) followed by people older than 40 years at 90.8. Among pregnancy-related deaths, older people, those more than 40 years of age, had the highest PRMR at 68.1, while individuals aged 25-30 had the lowest PRMR (7.8).

Insurance

Compared to those with private insurance and with other types of payment, people who had Medicaid/MassHealth insurance had the highest PAMR (113.4 vs 9.2 and 3.4 respectively) and the highest PRMR (41.6 vs 4.6 and 18.1 respectively).

Education

Those with less than a high school degree or GED had the highest PAMR and PRMR at 148.1 and 49.4, respectively, compared to all other education categories. The PRMR among those with a high school degree was 46.0, while the PRMR among individuals with at least a bachelor's degree was 5.8.

County of Residence

While Nantucket County had the highest PAMR and PRMR at 355.9 per 100,000, these ratios should be interpreted with caution since the calculation is based on a relatively small number of deaths in a county with a small population, which can result in more variability and fluctuations from year to year. Essex County had 16% (n=12) of the cases, with a PAMR of 72.1 and PRMR of 18.0. Hampden County has a PAMR of 114.4 and a PRMR of 52.0.

Maternal characteristics	Number of pregnancy-associated deaths	Pregnancy-associated mortality ratio (PAMR)		Number of pregnancy-related deaths	Pregnancy-related mortality ratio (PRMR)
State Overall	73	53.8		25	18.4
Race/Hispanic Ethnicity					
White non-Hispanic	36	46.6		14	18.1
Black non-Hispanic	13	93.8		5	36.1
Hispanic	15	52.8		<5	14.1
Other non-Hispanic	9	56.1		<5	12.5
Age					
<20	<5	89.0		0	n/a
20-24	11	95.0		<5	34.6
25-29	17	44.3		<5	7.8
30-34	16	37.5		5	11.7
35-40	21	61.6		10	29.3
40+	<5	90.8		<5	68.1
Education					
Less than a high school graduate	15	148.1		5	49.4
High school graduate or GED	28	128.8		10	46.0
Some college or associate's degree	20	64.2		6	19.3
Bachelor's or advanced degree	<10	13.0		<5	5.8
Unknown	<5	†		<5	†
Insurance					
Private insurance	8	9.2		<5	4.6
Medicaid	49	113.4		18	41.6

All other types, including self-pay, other government,	<5	36.4		<5	18.1
Unknown	<15*	†		†	†
County of residence at time of death					
Barnstable	<5	68.8		<5	34.4
Berkshire	<5	158.3		0	††
Bristol	<5	35.3		<5	8.8
Essex	12	72.1		<5	18.0
Hampden	11	114.4		5	52.0
Hampshire	<5	53.4		<5	53.4
Middlesex	11	34.6		5	15.7
Nantucket	<5	355.9		<5	355.9
Norfolk	5	35.5		<5	14.2
Plymouth	8	76.8		<5	28.8
Suffolk	9	54.2		<5	12.0
Worcester	6	35.7		<5	5.9

*Complementary suppression required to maintain privacy; †Not able to calculate ratios; †† No pregnancy-related deaths.

Causes of Death

The MMMRC reviews cases to come to consensus on the underlying cause(s) and manner of death. The single greatest cause of death among all 73 pregnancy-associated deaths was overdose, and involved 31 cases, representing 42% of the deaths. Another 35% (n=26) had a medical cause of death. Medical causes included thrombotic embolism, malignancies (cancers), uterine hemorrhage, pulmonary disease, liver failure, aneurysm, necrotizing pancreatitis, coronary artery disease, diabetic ketoacidosis, complications of HIV/AIDS, Ehlers-Danlos Syndrome, and COVID-19. Medical causes did not vary by race or Hispanic ethnicity. The remaining cases were due to homicide, suicide and other injuries such as motor vehicle accidents, with several of the overdose cases likely to be death by suicide. Overdose was also the largest single cause of death among pregnancy-related deaths (nine of the 25 cases).

Timing of Death

Deaths described in this report occurred during pregnancy or up to a year after the end of pregnancy. The circumstances surrounding these deaths varied depending, in part, on whether an individual was pregnant, had just delivered, or was in the period of time after pregnancy at time of death—including the length of time since the end of pregnancy or delivery.

Understanding this variation helps to identify opportunities to reduce the risk for such deaths in the future. Among all 73 pregnancy-associated deaths, 58% (n=42) occurred between 43 days and one year of the end of pregnancy and 23% (n=17) occurred within 42 days of the end of

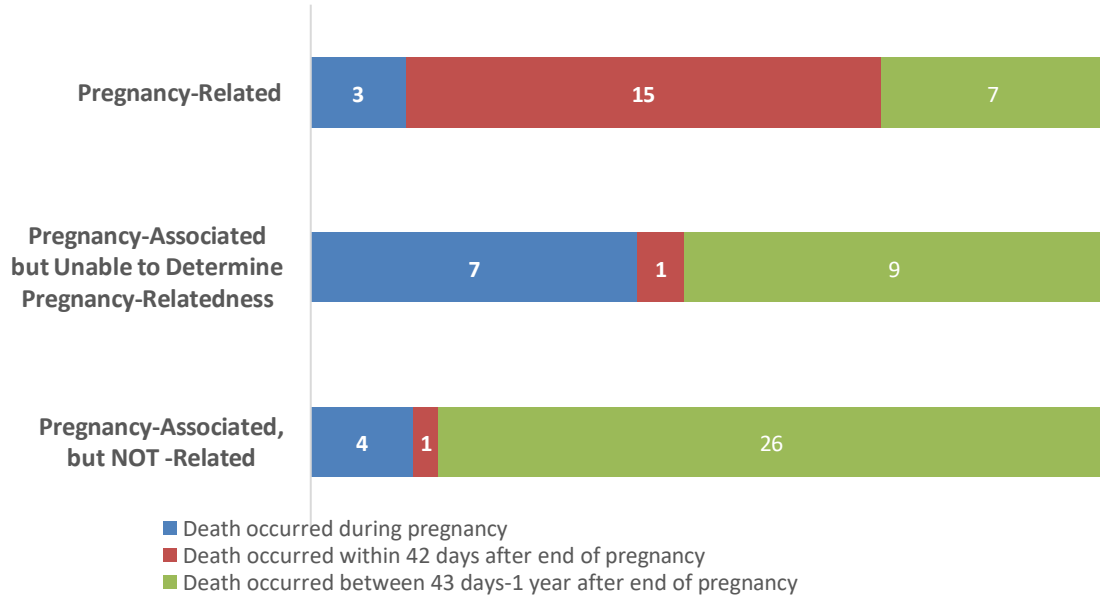
pregnancy. The remaining 14 cases (19%) occurred during pregnancy. Figure 3 illustrates the timing of pregnancy-associated deaths.

Figure 3. Timing of pregnancy-associated deaths, 2020-2021



Timing of death, however, differed by pregnancy-relatedness (Figure 4). Among the 25 cases determined to be pregnancy-related, 12% (n=3) occurred during pregnancy, 60% (n=15) within 42 days of the end of pregnancy, and 30% (n=7) between 43 days and one year of the end of pregnancy. Among deaths that were determined to be pregnancy-associated but not pregnancy-related, the vast majority (81%) occurred between 43 days and 1 year of the end of pregnancy.

Figure 4. Timing of deaths by pregnancy-relatedness, 2020-2021



Pregnancy-Relatedness

Pregnancy-related deaths are deaths for which the MMMRC determined that the cause of death, during or within one year of pregnancy, was from a pregnancy complication, a chain of events initiated by pregnancy, or the aggravation of an unrelated condition by the physiological effects of pregnancy. Table 2 provides the mortality rates for the 73 deaths according to pregnancy-relatedness.

Table 2. Death rates by pregnancy-relatedness among 73 pregnancy-associated death cases, 2020-2021

Pregnancy-relatedness	Cases (n)	Rate (deaths per 100,000 live births)
Pregnancy-related	25	18.4
Pregnancy-associated, but not related	31	22.9
Pregnancy-associated, unable to determine relatedness	17	12.5

In 17 cases, the MMMRC did not have sufficient information to make a determination of pregnancy-relatedness. Autopsies are not always performed, and when they are, there is no standard reporting for cases involving death while pregnant.

Preventability of Deaths

For each pregnancy-related death, the MMMRC also makes a determination of whether the death was preventable. A death is considered preventable if the committee determines that there was at least some chance of the death being averted by one or more reasonable changes to patient, family, provider, facility, system and/or community factors. Among the 25 pregnancy-related deaths, 84% (n=21) were considered preventable. The remaining four pregnancy-related deaths involved medical causes of death and were determined to be not preventable.

Circumstances Surrounding Death and Manner of Death

The MMMRC also identifies factors that contributed to the death when the committee has sufficient information to do so. Tables 3 and 4 provide information on circumstances surrounding the 25 pregnancy-related deaths. “Discrimination” is defined here as treating someone less or more favorably based on the group, class or category they belong to resulting from biases, prejudices, and stereotyping. For determination of circumstances, “mental health conditions” refer to those other than substance use disorder. Discrimination and mental health conditions each contributed or probably contributed to 44% of cases, while substance use disorder contributed or probably contributed to more than half (56%) of the deaths. The majority of the deaths in which substance use disorder contributed involved fentanyl.

Table 3. MMMRC determination of circumstances surrounding death for 25 pregnancy-related deaths, 2020-2021

Circumstances surrounding death	Yes/Probably	No/Unknown
Did obesity contribute to the death?	16%	84%
Did discrimination contribute to the death?	44%	56%
Did mental health conditions contribute to the death?	44%	56%
Did substance use disorder contribute to the death?	56%	44%

Table 4. MMMRC determination of manner of death among 25 pregnancy-related deaths, 2020-2021

Manner of death	Yes/Probably	No/Unknown
Was this death by suicide?	12%	88%
Was this death by homicide?	4%	96%

During MMMRC deliberations, the committee identifies additional contributing factors and makes recommendations for prevention. Problems with continuity of care, care coordination, and lack of access to care were the largest contributing factors, affecting 68% of pregnancy-related deaths. Lack of continuity of care occurred when providers did not have access to

individual's complete records, did not communicate the severity of the patient's condition sufficiently to the referred/next provider, or did not recognize the severity of the patient's situation. Lack of continuity can occur between prenatal, labor and delivery, and postpartum providers. Problems with care coordination occurred when care was fragmented (i.e., uncoordinated or not comprehensive) among or between healthcare facilities or units (e.g., records not available between inpatient and outpatient or among units within the hospital, such as Emergency Department and Labor and Delivery). Lack of care coordination cut across pregnancy and the postpartum period, with missed opportunities for treatment for mental health conditions and substance use, as well as late referral to Maternal Fetal Medicine specialists for high-risk patients. Lack of access to care includes systemic barriers (e.g., lack or loss of healthcare insurance or other financial duress, as opposed to noncompliance), and impacted patients' ability to care for themselves (e.g., patients did not seek services because they were unable to miss work or afford postpartum visits after insurance expired). Other barriers to accessing care include insurance non-eligibility, provider shortage in their geographical area, and lack of public transportation.

Clinical skill and quality of care, such that health care personnel were not appropriately skilled for the situation or did not exercise clinical judgment consistent with standards of care, contributed to six pregnancy-related deaths. Mental health conditions contributed to five pregnancy-related cases. These contributing factors were further impacted by challenges to continuity of care and care access, particularly in the early months of the COVID-19 pandemic when mental health services and substance use treatment services were severely curtailed. Chronic disease and lack of knowledge regarding the importance of symptoms or of treatment and follow-up each contributed to almost a quarter (24%) of the deaths. Other contributing factors included trauma, violence, and unstable housing.

Conclusions and Recommendations

In summary, the MMMRC identified 73 pregnancy-associated deaths during 2020-2021, more than a third (25) of which were determined to be related to pregnancy. Pregnancy-associated deaths, whether related to pregnancy or not, are not equally experienced by all groups. Black non-Hispanic people experienced the highest ratios of pregnancy-associated and pregnancy-related deaths, almost double that of White, non-Hispanic people. More than half (58%) of pregnancy-associated deaths occurred between 43 days and one year of the end of pregnancy, 23% occurred within 42 days of the end of pregnancy, and 19% occurred during pregnancy. Among pregnancy-related deaths, more than half (60%) occurred within 42 days of the end of pregnancy and 84% were considered preventable.

The single greatest cause of death among all 73 pregnancy-associated deaths was overdose, representing 42% of the deaths. Overdose was also the largest single cause of death among pregnancy-related deaths (nine of the 25 cases). Discrimination and mental health conditions each contributed or probably contributed to 44% of pregnancy-related deaths, while substance use disorder contributed or probably contributed to more than half of all pregnancy-related

deaths. Lack of care continuity and coordination were the largest contributing factors, impacting 48% of pregnancy-related deaths.

During the review of each death, the MMMRC developed recommendations to prevent future maternal morbidity and mortality. This section summarizes recommendations from reviews of the 25 pregnancy-related deaths. We focus on recommendations for the pregnancy-related deaths specifically, since prevention of pregnancy-related deaths is the specific purview of the MMMRC, and the Committee is uniquely qualified to provide population-based recommendations for prevention of deaths related to pregnancy. The MMMRT reviewed these recommendations to identify common themes, which are summarized below:

Increase Supports for Pregnant and Postpartum Individuals with Substance Use Disorder

Both nationally and in Massachusetts, pregnant individuals with a substance use disorder (SUD) are at increased risk of being screened for substance use, referred to child welfare services, and having their parental rights taken away, with disproportionate risk among individuals of color.^{7,8} When separated from their children, the risk of fatal overdose in parents increases.⁹ Regulatory and statutory requirements that result in providers reporting to the Department of Children and Families (DCF) and the fear of child separation among pregnant individuals using substances or taking medications for substance use disorder treatment negatively impacts willingness to initiate or maintain treatment and delays entry to prenatal care. The MMMRC recommends that Massachusetts prioritize efforts to stop the automatic filing of DCF 51-A reports for individuals receiving medication for substance use disorder therapy. As described in the [Review of Maternal Health Services Report](#), DPH and DCF, in collaboration with the Executive Office of Health and Human Services, plan to update guidance for healthcare providers to share best practices and document the establishment of a dual reporting system whereby substance exposed newborns with no indication of neglect or abuse can be identified for support but not investigated for neglect or abuse. Massachusetts is also receiving In-Depth Technical Assistance (IDTA) from the National Center on Substance Abuse and Child Welfare (NCSACW) to support the implementation of a statewide strategy supporting families impacted by substance use. Through this project, MA will receive guidance to support collaborative practice between DCF and DPH, specifically on developing and implementing Plans of Safe Care and system improvements to move toward a public health approach.

Increase the availability and quality of autopsy information

⁷ Identification of Substance-Exposed Newborns and Neonatal Abstinence Syndrome Using ICD-10-CM — 15 Hospitals, Massachusetts, 2017

⁸ Lloyd Sieger MH. Reunification for young children of color with substance removals: an intersectional analysis of longitudinal national data. *Child Abuse Negl.* 2020; White House Office of National Drug Control Policy, Substance Use Disorder in Pregnancy: Improving Outcomes for Families (2021).

⁹ Thumath, Meaghan, et al. "Overdose among mothers: The association between child removal and unintentional drug overdose in a longitudinal cohort of marginalised women in Canada." *International Journal of Drug Policy* 91 (2021): 102977.

Medical Examiner reports, including autopsy and toxicology findings, are critical sources of information that the MMMRC uses to determine pregnancy-relatedness and make prevention recommendations. In some of the deaths reviewed by the MMMRC, the death was not referred for autopsy or the available information on the autopsy or toxicology report was incomplete. The MMMRC recommends exploring ways to ensure all deaths of people who are pregnant or have been pregnant in the past 42 days are referred for autopsy by a qualified perinatal pathologist using a standard maternal death autopsy template, regardless of apparent cause of death.

Support efforts to promote and ensure equitable, respectful and trauma-informed perinatal care

Respectful maternity care is a component of quality care that includes preventing harm and mistreatment, engaging in effective communication, and providing care equitably. The World Health Organization's "Standards for improving quality of maternal and newborn care in health facilities" include respectful maternity care, defined as "care organized for and provided to all women in a manner that maintains their dignity, privacy, and confidentiality, ensures freedom from harm and mistreatment, and enables informed choice and continuous support during labor and childbirth."¹⁰ The MMMRC determined that discrimination, defined as treating someone less or more favorably based on the group, class or category they belong to resulting from biases, prejudices, and stereotyping, was a factor contributing to 40% of the deaths. In response, the MMMRC recommends efforts to promote respectful, trauma-informed care and healing-centered care delivery. The MMMRC endorses the implementation of tools and trainings, such as the Maternal Equity Safety Bundle developed by the Perinatal Neonatal Quality Improvement Network (PNQIN)¹¹, the state's perinatal quality collaborative, to address discrimination and racism in healthcare settings. For the past 4 years, PNQIN has partnered with the Institute for Perinatal Quality Improvement to provide 13 SPEAK Up against Racism trainings. Each training is an 8 hour interactive workshop that outlines strategies to help healthcare providers dismantle racism, provide quality equitable care, and reduce perinatal health disparities. To date, 561 Massachusetts providers and staff have completed the SPEAK Up training.

Support efforts to improve continuity and coordination of care

Care coordination is a patient- and family-centered, team-based approach designed to assess and meet the needs of patients, while helping them navigate effectively and efficiently through the health care system in order to achieve optimal health outcomes. Continuity of care is how individual patients experience integration of services and coordination. Issues with continuity of care and care coordination contributed to more than 80% of pregnancy-associated deaths and

¹⁰ World Health Organization. Standards for improving quality of maternal and newborn care in health facilities. Geneva, Switzerland: World Health Organization; 2016. <https://www.who.int/publications/i/item/9789241511216>

¹¹ Kheifets A, Vitek K, Conklin C, et al. Development of a Maternal Health Safety Bundle to Eliminate Inequities in Massachusetts. Obstetrics & Gynecology 2023; Available at: file:///C:/Users/SEManning/Downloads/development_of_a_maternal_equity_safety_bundle_to.867-2.pdf.

almost half of pregnancy-related deaths. To address this need, the MMMRC recommends leveraging healthcare navigators to improve care coordination and manage patients who have complex medical needs and those who do not attend scheduled appointments or leave hospital care against medical advice. The MMMRC further recommend efforts to ensure warm hand-offs and follow up when transitioning care from one provider to another to ensure that the patient has received the care needed and that necessary medical information is shared between care providers (especially including mental health and substance use treatment providers).

Improving care continuity and coordination of care in the community context can involve connecting patients to home visiting services and other specialized support services, like peer recovery support specialists for people with substance use disorder. Home visiting provides voluntary, strengths-based, flexible, and individualized support to pregnant and parenting families to identify families' strengths and needs, offer parenting education, provide material support and connections to community systems of care, and promote health equity by removing early barriers to health care and services.^{12,13} A variety of home visiting services available throughout the state promote improved maternal/parental and child health and well-being. Home-based service delivery mitigates the impact of typical barriers to office-based services, including lack of transportation, and childcare.

Coordination of care emerged as a particular concern for people experiencing substance use disorder. The FIRST (Families In Recovery Support) Steps Together program, administered by the Department of Public Health, provides recovery and parenting supports to families affected by parental substance use, who are either expecting a child or have a child aged five years or younger. Services include peer recovery and parenting support, clinical services (for parents and the parent-child dyad), and care coordination. The MMMRC recommends expanding the availability of programs such as the FIRST Steps Together program to fully serve families in all parts of the state.

Increasing access to doula support is another opportunity to improve continuity and coordination of care in a community context. A doula is a trained professional who provides continuous emotional and physical support to families before, during, and after birth based on evidence-based practices and with cultural humility. In addition to improving maternal and infant health outcomes, including a 39% reduction in cesarean deliveries, reduced use of pain medications, higher Apgar scores for newborns, and increased breastfeeding rates, doulas improve connection to resources postpartum for birthing people.¹⁴ In December 2023,

¹² Azzi-Lessing L. Home visitation programs: Critical Issues and Future Directions. *Early Childhood Research Quarterly*. 2011/10/01/ 2011;26(4):387-398. doi:<https://doi.org/10.1016/j.ecresq.2011.03.005>

¹³ Goldberg J, Greenstone Winestone J, Fauth R, Colón M, Mingo MV. Getting to the Warm Hand-Off: A Study of Home Visitor Referral Activities. *Matern Child Health J*. Oct 2018;22(Suppl 1):22-32. doi:10.1007/s10995-018-2529-7

¹⁴ Laurie Zephyrin et al., Community-Based Models to Improve Maternal Health Outcomes and Promote Health Equity (Commonwealth Fund, Mar. 2021). <https://doi.org/10.26099/6s6k-5330>

MassHealth began reimbursing for doula services. In addition, Governor Healey's FY25 proposed budget included \$1 million in funding for the Department of Public Health to develop a voluntary doula certification program and workforce initiatives that will support insurance coverage, expand the doula workforce and enable all birthing people to select doulas who have been vetted by a trusted state agency.

Promote and support integrated and risk-appropriate maternal care

Risk-appropriate care is a key strategy to improve maternal morbidity and mortality rates by ensuring high-risk pregnant people receive care at a birth facility that is best prepared to meet their needs. The American College of Obstetricians and Gynecologists (ACOG) and the Society for Maternal-Fetal Medicine (SMFM) developed and published a framework for levels of maternal care in 2015 (updated in 2019)¹⁵ that are designed to promote collaboration among maternal facilities and health care providers with the goal that pregnant patients receive care at a facility appropriate for their risk. Levels of maternal care (LoMC) establish a common understanding of each facility's level of care and promote a collaborative system of care, building relationships in a state or region that facilitate maternal transport, outreach, and education. LoMC are defined based on both facility characteristics and the type of patients that are appropriate for each level. The MMMRC recommends that obstetric providers consult with and transfer complicated patients to higher levels of care as soon as problems are identified, and the patient is stabilized when the treating hospital does not have the resources and expertise to provide the needed level of care. The Department of Public Health, in collaboration with the Perinatal Neonatal Quality Improvement Network (PNQIN) and the Betsy Lehman Center for Patient Safety and Medical Error Reduction, has been engaged over the past five years in an effort to plan for the implementation of LoMC in MA as a tool to support safer maternal care. Integration of LoMC into DPH's hospital licensure regulations was also a recommendation in the ["Review of Maternal Health Services, 2023"](#) report.¹⁶

Screen for and address the social determinants of health

There is a vast inequity in the burden of loss, with Black non-Hispanic individuals having the highest rates of pregnancy associated and pregnancy related mortality in Massachusetts. These inequities reflect, in part, structural and institutional racism, which drive barriers to health care access and marginalization among persons from some racial and ethnic groups. When reviewing cases, the MMMRC made recommendations around social determinants of health by assessing the social and environmental conditions in which the decedents lived that may have been drivers of maternal mortality. By examining the social determinants of health, the MMMRC aims to identify root causes of inequities and make recommendations for structural changes.

¹⁵ The American College of Obstetricians and Gynecologists. Levels of Maternal Care. Available at: <https://www.acog.org/clinical/clinical-guidance/obstetric-care-consensus/articles/2019/08/levels-of-maternal-care>

¹⁶ Review of Maternal Health Services, 2023. [download \(mass.gov\)](#)

The MMMRC recognizes the importance of engaging representatives of communities disproportionately affected by maternal morbidity and mortality in the Committee review process to help frame deliberations in the context of historical and current policies and to identify system factors that impact the health of communities. In the coming months, the MMMRC will be welcoming two community representatives with lived experience on the Committee to provide this crucial perspective.

In addition, the MMMRC made recommendations aimed at addressing barriers to health care access, including improving access to transportation for perinatal visits and postpartum care, particularly for residents in rural areas. The MMMRC also offered recommendations related to housing that included the following: hospitals should screen for housing instability and confirm addresses and phone numbers, as well as emergency contacts prior to discharge; providers should screen at multiple visits for housing instability and provide referrals to supportive community resources; and homeless shelters should prioritize accommodating pregnant individuals.

Identify and address risk factors for pregnant and postpartum Medicaid beneficiaries

Medicaid beneficiaries had a disproportionate burden of both pregnancy-associated and pregnancy-related mortality. In Massachusetts, approximately 40% of births are covered by Medicaid each year. However, of the 73 maternal deaths described in this report, 49 cases (67%) were people with Medicaid coverage. The underlying reasons for this disparity need to be better understood and characterized. Until April 2023, in Massachusetts Medicaid coverage ended at 60 days postpartum which caused a gap in coverage in the critical 12 months after pregnancy for some beneficiaries. Additionally, there may be challenges with continuity of care and care coordination unique to this vulnerable population. The MMMRC recommends that the risk factors and contributors to the higher rate of maternal mortality in the Medicaid population be explored and defined with subsequent policy recommendations.

The MMMRC continues to review cases on a regular basis. Pursuant to [MA ST 111 § 24O](#), the MMMRC will submit another report by December 31, 2024, reviewing maternal mortality and severe maternal morbidity in Massachusetts, and will include deaths that occurred in 2022. The December report will contain additional recommendations for any legislation or other changes to policy to reduce maternal mortality and severe maternal morbidity or otherwise improve the delivery of health care in the Commonwealth.

Addendum: Maternal Mortality Review Committee and Team Members

Current Committee Members

Allison Bryant, MD, MPH (Chair), Mass General Brigham Health System
Gene Declercq, PhD, MS, Boston University School of Public Health
Colette Dieujuste, MSN, PhD, Wheaton College
Michaela Farber, MD, MS, Brigham and Women's Hospital
Jill Fieleke, CNM, WHNP, PMHNP, Community private practice
Andrew Healy, MD, Baystate Medical Center
Michele Helgeson, DNP MPH CNM, American College of Nurse Midwives, MA Affiliate
Leena Mittal, MD, Brigham and Women's Hospital
Drucilla Roberts, MD, Massachusetts General Hospital
Tonja Santos, CNM, Baystate Medical Center
Alison Seketsky, MSN, RNC, Anna Jaquest Hospital
Sara Shields, MD, MS, UMass Worcester, Family Health Center of Worcester
Anne Marie Valente, MD, Brigham and Women's Hospital
James Wang, MD, Baystate Medical Center
Viveka Zawisza, MD, MBA, MS, MassHealth

DPH Contributors

Margi Coggins, CNM, MSN
Xiaohui Cui, ScD
Katherine Fillo, PhD, MPH, RN-BC
Marsha Grabau
Ruth Jacobson-Hardy, MA
Adriana Jean Louis
Laura J. Kattan, CNM, DNP
Brooke M. LaMere, MPH
Jean MacBarron, CNM, MPH
Susan E. Manning, MD, MPH
Sharon Pagnano, MPH
Katrina Plummer, MPH
Sarah L. Stone, PhD, MPH
Stephen Sullivan DNP, MS, RN