

Maternal Mortality in Connecticut

Maternal Mortality Review Committee Data, 2015-2017

December 2020



CONNECTICUT
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Connecticut Department of Public Health

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Data from Connecticut Maternal Mortality Review Committee, 2015-2017

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Gender Referencing:

CT MMRC strives to be inclusive of all birthing people and acknowledges that not all individuals who get pregnant or go through childbirth are cisgender women. The term “maternal” is used in this report for the sake of historical continuity and consistency with the published literature on this topic.

Acknowledgements

Each medical record reviewed represents the death of a unique human being. The loss of a parent, wife, partner, daughter, sister, friend, or patient brings sadness to many people. The effort of the Connecticut Maternal Mortality Review Program is to honor those whose lives were lost and to promote healthy pregnancies and positive birth outcomes in the future.

We would also like to acknowledge the dedication of Connecticut Maternal Mortality Review Committee members, who volunteer their time and expertise to the review of pregnancy-associated deaths with the goal of identifying prevention strategies and facilitating their implementation.

Acronyms

ACOG	American College of Obstetricians and Gynecologists
CDC	Centers for Disease Control and Prevention
CSMS	Connecticut State Medical Society
CT	Connecticut
DPH	Department of Public Health
DSS	Department of Social Services
ERASE MM	Enhancing Reviews and Surveillance to Eliminate Maternal Mortality
MMR	Maternal Mortality Review
MMRIA	Maternal Mortality Review Information Application
MMRC	Maternal Mortality Review Committee
OCME	Office of the Chief Medical Examiner
PMSS	Pregnancy Mortality Surveillance System
PRMR	Pregnancy-Related Mortality Ratio
SAR	Surveillance Analysis and Reporting Unit, Department of Public Health
UConn	University of Connecticut
US	United States

Key Terms

Connecticut Maternal Mortality Review Committee (CT MMRC)	A multidisciplinary committee convened by the Connecticut Department of Public Health to review deaths that occur during pregnancy or within one year of the end of pregnancy in order to determine pregnancy-relatedness, identify contributing factors, and develop recommendations to prevent future deaths.
Connecticut Maternal Mortality Review (CT MMR) program	Situated within the Connecticut Department of Public Health, CT MMR program identifies pregnancy-associated deaths of Connecticut residents; obtains information from birth and death certificates, medical and hospital records, medical examiner reports, police reports, newspaper articles, and social media postings; prepares de-identified case narratives for committee review; conducts analyses of data on pregnancy-associated deaths; and supports the development and implementation of recommendations for action to prevent pregnancy-related deaths in the future.
Pregnancy-associated death	The death that occurs during pregnancy or within one year of the end of pregnancy, regardless of the cause.
Pregnancy-related death	The death that occurs during pregnancy or within one year of the end of pregnancy from any cause related to or aggravated by the pregnancy or its management.
Pregnancy-associated but not pregnancy-related death	The death that occurs during pregnancy or within one year of the end of pregnancy from a cause unrelated to pregnancy.
Pregnancy-associated mortality ratio	The number of pregnancy-associated deaths per 100,000 live births.
Pregnancy-related mortality ratio	The number of pregnancy-related deaths per 100,000 live births.
Maternal Mortality Review Information Application (MMRIA)	A data system designed to facilitate Maternal Mortality Review Committee functions through a common data language. MMRIA was developed by the Centers for Disease Control and Prevention in partnership with maternal mortality review subject experts throughout the United States. It is available, at no cost, to Maternal Mortality Review Committees in the United States.

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Key Findings

In Connecticut, the Department of Public Health (CT DPH) is the lead on initiatives that promote reproductive health. As such, CT DPH has coordinated the Connecticut Maternal Mortality Review (MMR) program since the early 2000s. For a number of years, CT DPH administered the MMR program on a limited budget or at no cost. Nonetheless, the MMR program was able to review pregnancy-associated deaths of state residents, with support from the Connecticut State Medical Society (CSMS), until 2017.

In 2018 the Connecticut General Assembly passed legislation granting statutory authority to CT DPH to convene a multidisciplinary Connecticut Maternal Mortality Review Committee (CT MMRC) in order to not only review pregnancy-associated deaths but also develop recommendations for action. The newly constituted CT MMRC held its first meeting in September 2018 and started reviewing cases under statutory protection in December 2018.

In 2019 CT DPH received a grant from the Centers for Disease Control and Prevention (CDC) to identify and characterize pregnancy-associated deaths within two years of death. CDC funding and technical assistance have enabled the CT MMR program to expand its capacity and thereby reduce the lag between the occurrence of each death and its review by CT MMRC. Additionally, the CT MMR program has used CDC funding and technical support to develop recommendations for action, to monitor their implementation, and to report on the results of data analyses pertaining to pregnancy-associated deaths of Connecticut's residents.

This report summarizes the findings from CT MMRC's reviews of deaths that occurred between 2015 and 2017. During this period, there were 32 **pregnancy-associated deaths**. These were the deaths

that occurred during pregnancy or within one year of the end of pregnancy regardless of the cause.

Of 32 pregnancy-associated deaths, 11 (34%) were determined by CT MMRC to be **pregnancy-related**, which means that they were causally related to pregnancy or its management; 19 (59%) were determined to be pregnancy-associated but **not pregnancy-related**; and, the Committee was not able to determine pregnancy-relatedness in two cases.

The findings presented in this report are descriptive in nature and include breakdowns by decedents' medical and demographic background characteristics. In considering these breakdowns, it is important to keep in mind that they are based on a very small cohort. Slight changes in counts could have resulted in very different percentages, thus painting a substantially different picture of maternal mortality in the state.

Pregnancy-Associated Deaths

- ◆ There were 32 pregnancy-associated deaths of Connecticut residents in 2015-2017.
- ◆ There were between 8 and 13 pregnancy-associated deaths per year during this period.
- ◆ On average, there were 35,581 resident live births per year in 2015-2017.
- ◆ Roughly 41% of pregnancy-associated deaths were due to medical disorders such as cardiomyopathy, stroke, and malignancy.
- ◆ About 34% of pregnancy-associated deaths were due to accidental overdoses and mental health conditions.
- ◆ About 22% of pregnancy-associated deaths were due to homicides and unintentional injuries such as those stemming from motor vehicle accidents.
- ◆ About 80% of pregnancy-associated deaths occurred within a year after the end of pregnancy.

- ◆ About 37% of pregnancy-associated deaths occurred in hospital inpatient settings.

Pregnancy-Related Deaths

- ◆ There were 11 pregnancy-related deaths of Connecticut residents in 2015-2017.
- ◆ There were between 3 and 5 pregnancy-related deaths per year during this period.
- ◆ Pregnancy-related mortality ratio in 2015-2017 was 10.3 deaths per 100,000 live births, with a 95% confidence interval between 5.1 and 18.4. The confidence limits of 5.1 and 18.4 per 100,000 live births show the possible range of values for the estimate of pregnancy-related mortality in Connecticut.
- ◆ Over 80% of pregnancy-related deaths were determined by CT MMRC to be preventable. The chance to alter outcome was deemed “good” in a quarter of cases and “some” in over half of cases.
- ◆ Most pregnancy-related deaths (7 out of 11) were due to medical disorders; 3 deaths were due to mental health conditions; and cause of death could not be determined in one case.
- ◆ All pregnancy-related deaths occurred in the postpartum period or on the day of delivery. More specifically, 4 out of 11 persons died either on the day of delivery or within 6 days after delivery, and 7 out of 11 persons died in the delayed postpartum period.
- ◆ Persons of color were overrepresented among pregnancy-related deaths. About 64% of pregnancy-related deaths were those of black and Latinx people. By contrast, persons of color

accounted for about 45% of live births in Connecticut in 2015-2017.

CT MMRC Recommendations

Based on the reviews of pregnancy-related deaths of Connecticut residents in the period between 2015 and 2017, CT MMRC developed the following recommendations:

- 1) Promote CDC’s *Hear Her* communication campaign to obstetricians and other obstetrics providers (physician assistants, advance practice registered nurses, registered nurses, certified nurse midwives), hospital obstetrics units, and emergency departments.
- 2) Provide trainings to CT MMRC members on intimate partner violence.
- 3) Provide education to obstetric providers on available evidence-based screening tools for intimate partner violence, perinatal depression, and substance abuse, and also available resources.
- 4) Provide education in hospitals to emergency department staff and social work staff, as well as to obstetrics offices, on indicators of intimate partner violence.
- 5) Expand Medicaid coverage to one year postpartum.
- 6) Improve access to same day long-acting contraception in Federally Qualified Health Centers.

Background

With only 3.5 million residents, Connecticut is one of the smallest states in the United States (US).¹ It is also one of the healthiest.² According to America's Health Rankings, an annual report by the United Health Foundation,² in 2019 Connecticut ranked

- ◆ fourth in the nation in the health of its residents,
- ◆ fifth in the quality of clinical care,*
- ◆ fifth in the health of women and children,
- ◆ seventh in policy, and
- ◆ eighth in health outcomes.

Only three states had a lower rate of premature death, and only four states had a lower rate of cardiovascular death in 2019.²

Each year, there are about 36,000 live births in Connecticut.¹ And each year there are between 3 and 5 pregnancy-related deaths of Connecticut's residents.³ The state's small population numbers preclude analyses by racial and socioeconomic groupings and by the cause of death. Therefore, in terms of assessing Connecticut's maternal mortality, two contributing factors must be considered: income inequality and substance use.

First, Connecticut is characterized by considerable income inequality. In 2015, the state ranked third in the nation in income inequality, with the top 1% of families earning, on average, 37.2 times as much as the bottom 99% of families, according to a recent report by Economic Policy Institute.⁴ Only two states, New York and Florida, had greater income inequality than Connecticut in 2015.

Income inequality is linked with inequalities in health and longevity.⁵ A recent ecological study showed that state-level income inequality was

significantly associated with pregnancy-related mortality among black women, thus suggesting that "income inequality may contribute to the persisting racial inequality in maternal death."⁶ Indeed, national analyses of maternal mortality data have shown that black and American Indian/Alaska Native women have higher rates of pregnancy-related death than all other racial groups in the US.^{7,8}

Although data on racial disparities in pregnancy-related deaths are not available for Connecticut, disparities by race and ethnicity in other health outcomes,^{9,10} in conjunction with high income inequality as a contributing factor, suggest that structural racism plays a role in maternal health and maternal mortality in Connecticut.

Second, in 2019 Connecticut had the tenth highest rate of drug-related deaths in the US.² Between 2012 and 2018, accidental drug overdose deaths in Connecticut rose 188%, from 9.9 to 28.5 deaths per 100,000 residents.¹¹ These numbers have continued to increase in 2019.¹² The rise of overdose deaths has largely been associated with fentanyl, a synthetic opioid.¹¹

In the recent years, on the heels of a longstanding increase in opioid use in the US, maternal opioid overdose has become a public health concern. Although there are no national estimates of pregnancy-related deaths due to accidental overdose, analyses from several states have shown that drug use is a factor in a large percentage of non-overdose pregnancy-associated deaths and a frequent cause of pregnancy-related deaths.¹³ The scale of the opioid epidemic in Connecticut suggests the need to consider its impact on pregnancy-associated deaths in the state.

* Quality of clinical care was defined as a function of the following factors: 1) the rate of dentists per 100,000 population, 2) the rate of mental health providers per 100,000 population, 3) the rate of

primary care physicians per 100,000 population, 4) percentage of live births that are low birthweight, and 5) preventable hospitalizations per 1,000 Medicare enrollees.

Connecticut Maternal Mortality Review Program

In Connecticut, the Department of Public Health (CT DPH) is the lead on initiatives that promote reproductive health, and has, as such, coordinated the Connecticut Maternal Mortality Review (MMR) program since the early 2000s. For a number of years, CT DPH administered the MMR program on a limited budget or at no cost. Scarce funds notwithstanding, in the period between late 2014 and 2016, the MMR program was able to, with support from the Connecticut State Medical Society (CSMS), review pregnancy-associated deaths that occurred between 2011 and 2013. The work of the MMR program stalled in 2017 because of staffing changes within CT DPH, the retirement of a physician who volunteered her time to abstract medical records, and administrative hurdles involved with contracting a new physician. Deaths that occurred in 2014 were not reviewed, and deaths that occurred in 2015 were reviewed only much later, in the winter of 2018/2019.

In 2018 the Connecticut General Assembly passed legislation granting statutory authority to CT DPH to convene a multidisciplinary Connecticut Maternal Mortality Review Committee (CT MMRC) for the purpose of not only reviewing pregnancy-associated deaths of state residents but also developing recommendations for preventative action (CGS §19a-25, Appendix A). The legislation stipulated that CT MMRC be co-chaired by the Commissioner of CT DPH, or the Commissioner's designee, and a representative designated by the CSMS. The legislation additionally listed the suggested Committee membership as follows:

- ◆ an obstetrician/gynecologist,
- ◆ a pediatrician,
- ◆ a community health worker,
- ◆ a nurse-midwife,
- ◆ a clinical social worker,

- ◆ a psychiatrist,
- ◆ a psychologist,
- ◆ the Chief Medical Examiner, or a designee,
- ◆ a member of the Connecticut Hospital Association,
- ◆ a representative of a community or regional program or facility providing services for persons with psychiatric disabilities or persons with substance use disorders, and
- ◆ a representative of The University of Connecticut-sponsored Health Disparities Institute.

Furthermore, the legislation included a provision for any additional members whose expertise might contribute to the death review process, as determined by the CT MMRC co-chairs.

The newly constituted CT MMRC first convened in September 2018 and started reviewing pregnancy-associated deaths in December of the same year. Committee meetings were held quarterly through the first half of 2020, bi-monthly in the summer of 2020, and monthly thereafter in an effort to reduce the lag between the occurrence of each death and its review, as well as to develop timely recommendations for preventative action. Consistent with state legislation, Committee members included, and continue to include, CT DPH and CSMS co-chairs, as well as a number of clinical and non-clinical providers representing a variety of professional disciplines. Meetings are held in the evenings to accommodate the work schedules of Committee members who volunteer their time and expertise for the benefit of Connecticut's families. The Committee's scope, mission, goals, and vision are listed in Appendix B.

CDC GRANT

In the spring of 2019, the Centers for Disease Control and Prevention (CDC) issued a request for

applications for funds to support the work of Maternal Mortality Review Committees (MMRC) across the country. The purpose of this funding opportunity was to assist MMRCs with obtaining the most detailed, complete data on causes and circumstances surrounding pregnancy-associated deaths in order to develop actionable recommendations to prevent such deaths in the future. CDC's expectations for grant recipients were as follows:

- 1) to identify all pregnancy-associated deaths within one year of death;
- 2) to abstract all relevant data and compile detailed case summaries;
- 3) to enter data on all pregnancy-associated deaths into a standard data system (Maternal Mortality Review Information Application, or MMRIA for short);
- 4) to conduct multidisciplinary reviews in accordance with CDC's guidelines;
- 5) to enter committee decisions into MMRIA within two years of death;
- 6) to conduct quality assurance processes to ensure data quality, completeness, and timeliness; and
- 7) to analyze data and share findings with stakeholders to inform policy and practice.

Connecticut Department of Public Health MMR program applied for CDC funds in May of 2019 and was granted an award in August of 2019 for the period between October 2019 and September 2023. As of this writing, Connecticut's MMR program is using the funds to support CT DPH staff and to contract with a nurse abstractor, an evaluator, and marketing support.

Prior to the CDC grant, the CT MMRC CSMS co-chair, a maternal-fetal medicine specialist, volunteered a considerable amount of time to abstract medical records and other relevant information related to pregnancy-associated deaths of Connecticut residents and to write detailed case

summaries. With CDC funding, Connecticut's MMR program has been able to contract with a nurse abstractor, who has taken over this set of tasks. It is worth noting at this point that detailed case summaries are essential for the Committee's review of pregnancy-associated deaths. They have allowed for more accurate discernment of factors that contribute to pregnancy-associated deaths, and therefore, better-informed recommendations for preventing, and ultimately eliminating, maternal mortality in the state.

As the CDC funds became integrated into the daily operations of Connecticut's MMR program, CT DPH staff and the nurse abstractor started entering abstracted information on pregnancy-associated deaths into MMRIA, the CDC's data system for monitoring maternal mortality in the US. An evaluator was contracted to perform data quality assurance checks in order to assess completeness, accuracy, and timeliness of data entered into MMRIA. Additionally, the evaluator was tasked with analyzing data on pregnancy-associated deaths, assessing the work of the CT MMRC, and reporting on the findings.

Throughout the project period, the MMR program has and will continue to work with a media company to develop educational materials aimed at both the medical community and the general public. Media support will be utilized to build awareness of CT MMRC's recommendations and to educate the general public on the efforts to eliminate maternal mortality in Connecticut.

Lastly, with CDC's support, Connecticut's MMR program was able to prepare this report and will continue to issue annual reports, as mandated by the state statute, to inform policy makers on the Committee's findings and recommendations.

CT MMRC REVIEW PROCESS

CT MMRC reviews all deaths of Connecticut residents that occur during pregnancy or within one year of the end of pregnancy, regardless of the cause.

These are known as **pregnancy-associated deaths**. The process of reviewing pregnancy-associated deaths comprises four distinct phases:

- 1) identification of pregnancy-associated deaths,
- 2) abstraction of information,
- 3) multidisciplinary discussion of pregnancy-associated deaths, and
- 4) development of recommendations.

Identification of Pregnancy-Associated Deaths

The review of pregnancy-associated deaths starts with their identification. In Connecticut, Surveillance Analysis and Reporting (SAR) Unit in the Health Statistics and Surveillance section at CT DPH is responsible for generating a list of potential pregnancy-associated deaths. The SAR staff members do so by linking deaths certificates of women under 61 years of age to infants' birth certificates and fetal death certificates, using string similarity functions to assign a matching score based on social security number, date of birth, and the decedent's first, last, and maiden name. Matched pairs with matching scores above a pre-specified cutoff are then manually reviewed by the SAR staff to verify the linkage.[†] Additional deaths are identified from death certificates using information from the pregnancy checkbox or the underlying cause of death ICD-10 codes related to pregnancy (O00-O99).^{*}

For deaths that occurred in 2015 through 2018, SAR provided MMR staff with final or near-final lists of potential pregnancy-associated deaths. For deaths that occurred in 2019 and later, the SAR Unit will provide both provisional and final lists, which will increase the timeliness of the death review process. An additional facilitating factor is the transition from paper to electronic death records, which will be completed by December 2021; electronic death records will allow for death certificates to be linked to

infants' birth certificates or fetal death certificates before the annual death file is finalized, which will further decrease the lag between deaths and their review by CT MMRC. What is more, electronic death records will allow for a search of key terms in the literal cause of death field, which will, possibly, further expand the pool of potential pregnancy-associated deaths.

Having compiled the list of potential pregnancy-associated deaths, the SAR staff send it, via a secure transmission protocol, to the MMR program staff and the nurse abstractor, who, in turn, work on obtaining death and birth certificates, medical examiner reports, and hospital and medical records, in accordance with the *Connecticut Maternal Mortality Review Program Procedures* (Appendix C). Based on the information from medical examiner reports, medical records, and other sources, the MMR program staff then determine which cases from the SAR list are veritable pregnancy-associated deaths and which are included on the list because of pregnancy checkbox errors or ICD-10 code errors.

Abstraction of Information

The second phase of the review process involves obtaining additional information on each pregnancy-associated case—emergency room records, medical transport records, obituaries, funeral home records, social media network postings, and as necessary, police reports—and entering all information into MMRIA, a data system for monitoring maternal mortality in the US. A nurse abstractor reviews and abstracts information from all available records and compiles detailed narratives for pregnancy-associated deaths. The narratives include not only medical data but also any available information on decedents' supports, challenges, housing, resources, and relationships. The CSMS CT MMRC co-chair, a

[†] As of this writing in December 2020, CT DPH SAR staff members were in the process of updating their matching algorithm to account for cases with missing data on the birth/death certificate

number field, and will be, going forward, able to cast a wider net in their search of pregnancy-associated deaths.

[‡] Going forward, the ICD-10 code A34 will be added to the search.

maternal-fetal medicine specialist, reviews the case narratives for completeness and clarity, and provides feedback to the nurse abstractor, who then makes revisions and sends them to the MMR program staff. To ensure confidentiality of the process, the DPH CT MMRC co-chair removes all personally identifying information from the narratives prior to distributing them to Committee members, and additionally, collects signed confidentiality pledges from all members at least once a year. Per *Connecticut Maternal Mortality Review Program Procedures*, case narratives are sent to Committee members within a week before each CT MMRC meeting.

Discussion of Pregnancy-Associated Deaths

The third phase of the review process involves multidisciplinary discussion of pregnancy-associated deaths during CT MMRC meetings. Meetings are held bi-monthly or more frequently, if needed, and are scheduled in the evenings to accommodate Committee members' professional commitments. The goal is to review 5 cases at each meeting.

In accordance with CDC's guidelines, the *Committee Decisions Form*¹⁴ is used as an organizing principle for case discussions. Each discussion starts with the CSMS co-chair reading the case summary aloud, followed by Committee members' questions and an exchange of opinions. The CSMS co-chair then guides the conversation toward decision-making on three key questions:

- 1) what was the underlying cause of death?
- 2) was the death pregnancy-related?
- 3) was the death preventable?

Definitions of concepts, such as pregnancy-relatedness and preventability, are presented via Power Point slides, and at times read aloud, after

which a vote is taken on each question. All Committee members participate in the vote. If a qualified majority of at least 67 percent is not achieved, the discussion is reopened and is followed by a second vote. Reaching plurality the second time around is deemed sufficient for a response choice (eg, "yes," "probably," or "no") to be selected and marked as the Committee's decision.

It is important to emphasize that CT MMRC is using standard concept definitions, which are listed on CDC's *Committee Decisions Form*, to guide Committee members' decision-making on the questions of interest.¹⁴ Namely, **underlying cause of death** is defined as "the disease or injury that initiated the chain of events leading to death or the circumstances of the accident or violence which produced the fatal injury."¹⁴ The cause of death listed on a death certificate is, at least in theory, the underlying cause of death. Hence, the discussion of this topic during the CT MMRC meetings typically involves a confirmation of the cause of death listed on a death certificate. There have been, however, instances of a different underlying cause of death being identified by the Committee.[§]

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, facility, system and/or community factors."¹⁴

A death is classified as **pregnancy-related** if it occurs "during pregnancy or within one year of the end of pregnancy from a pregnancy complication, a chain of events initiated by pregnancy, or the aggravation of an unrelated condition by the physiologic effects of pregnancy."¹⁴ By contrast, a death is classified as pregnancy-associated but **not**

[§] That CT MMRC identifies, on occasion, a different underlying cause of death from the one listed on the death certificate should not come as a surprise. This occurs because the Committee has more information about decedents' lives and deaths than is typically available to death certifiers at the time of death. For all

deaths that occurred between 2015 and 2017, the Committee agreed with the cause of death listed on the death certificate. For deaths that occurred in 2018, there were a few instances in which the Committee disagreed with the cause of death listed on the death certificate and identified a different cause of death.

pregnancy-related if it happens “during pregnancy or within one year of the end of pregnancy from a cause that is not related to pregnancy.”¹⁴ Pregnancy-associated deaths for which pregnancy-relatedness cannot be determined are classified as “pregnancy-associated but unable to determine relatedness.”¹⁴

In addition to the standard definitions of pregnancy-relatedness, CT MMRC has adopted, in the fall of 2020, standardized criteria for determining pregnancy-relatedness of perinatal suicides and accidental drug-related deaths.¹⁵ These criteria have been used in pregnancy-relatedness deliberations starting with deaths that occurred in 2018.

Besides voting on the three key questions, the Committee votes on factors that may have contributed to the death—obesity, discrimination, mental health conditions, and substance use disorder—and, for non-natural deaths, the manner of death (ie, suicide and homicide). For deaths that are determined to be pregnancy-related (ie, causally related to pregnancy), case discussion covers three additional key questions:

- 4) what were the contributing factors to the death?
- 5) what are the recommendations and actions that address those contributing factors?
- 6) what is the anticipated impact of those actions if implemented?

Answers to these and all other questions are recorded on the CDC’s *Committee Decisions Form* and entered into MMRIA, the CDC’s data system for monitoring maternal mortality in the US, within a week after each CT MMRC meeting.

Development of Recommendations

The last phase in the review process involves the development of official CT MMRC recommendations for action to prevent pregnancy-related deaths in the future. This process starts with descriptive analyses of deaths reviewed by CT MMRC; a listing of working recommendations proposed during Committee

meetings; and a review of recommendations issued by other MMRCs in the US. Having assessed all available information, CT MMRC co-chairs compile a list of several recommendations for discussion, input, and vote by all Committee members.

To date, one Committee meeting was devoted to the discussion and vote on official CT MMRC recommendations. This meeting was held at the end of the first CDC grant year, in September 2020; official CT MMRC recommendations coming out of this meeting are listed on page 23 of this report.

CT MMRC MEETINGS

Assembled in September 2018 after a 3-year hiatus, CT MMRC started with 12 members. Committee’s membership doubled over the next two years, reaching 24 members at the end of the first CDC grant year, in September 2020. Figure A-1 shows a list of CT MMRC meetings that were held since September 2018; changes over time in the total count of members; and attendance at each meeting. In considering Figure A1, it is important to keep in mind the spread of coronavirus disease (COVID-19). In keeping with Governor Lamont’s executive orders to encourage social distancing and limit in-person meetings, the CT MMRC meeting scheduled for March 16, 2020 was cancelled, and the CT DPH Co-chair sought and obtained approval from the CT DPH Legal Office to hold any future meetings via a web-based platform. The first virtual meeting was convened in May 2020, and as of December 2020, five virtual meetings have been held.

It is interesting to note that attendance at CT MMRC meetings has improved over time, and especially with transition from in-person to virtual meetings. One factor in this may be increased convenience of virtual meetings. Another factor may be changes in the composition of Committee membership and changes in key staff within the CT DPH MMR program. And, the last factor may be an introduction of the continuous improvement process,

which involves, first, polling the members on their overall satisfaction with the meetings, perceptions of meeting efficiency, and experience of their voice being heard during Committee deliberations; second, making changes to the meeting process and structure based on Committee members’ feedback; and third, making adjustments to the way meetings are run based on feedback from CDC staff, who observed one meeting and who continue to hold monthly meetings with Connecticut MMR program staff.

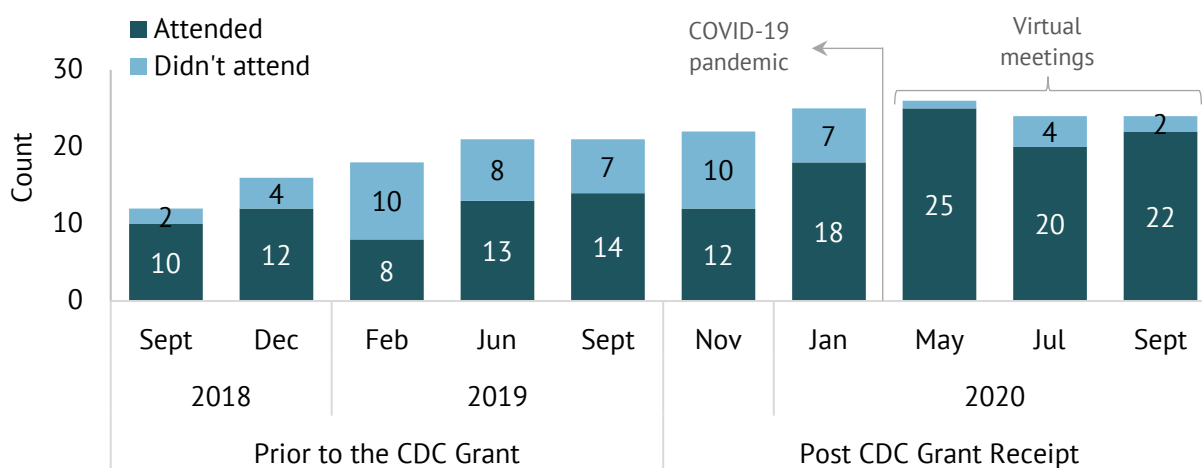
As of September 2020, CT MMRC membership included 16 clinical and 8 non-clinical members. The following clinical disciplines were represented: maternal-fetal medicine, pathology, cardiology,

internal medicine, obstetrics/gynecology, pediatrics, midwifery, psychiatry, neonatology, and nursing. Non-clinical service providers included a social worker, a psychologist, a community health worker, a doula, a home visiting supervisor, a substance abuse counseling supervisor, and a behavioral health manager. Additionally, the Committee included a representative of the UConn-sponsored Health Disparities Institute, Connecticut Hospital Association Director of Patient Safety and Quality, CT DPH State Women’s Health Coordinator, State Medicaid program, a Federally Qualified Health Center provider, and a patient representative.

FIGURE A-1

CT MMRC membership doubled over time

Attendance at CT MMRC meetings between September 2018 and September 2020



Between September 2018 and September 2020, the ratio of clinical to non-clinical CT MMRC members fluctuated around 2:1 (Figure A-2), which slightly exceeds CDC’s recommended ratio of 3:2. Among Committee members who were in attendance at any given meeting (active members), the ratio of clinical to non-clinical members was 7:3. Anywhere

between 2 and 5 cases were reviewed at CT MMRC meetings between September 2018 and September 2020 (Figure A-3). With receipt of CDC funding in September 2019, staffing changes within CT DPH MMR program in December 2019, and subsequent improvements in the review process, the number of cases discussed at each meeting increased to 4 or 5 in

the first half of 2020, and has further increased to 5 cases per meeting starting November 2020. One exception is the September 2020 meeting, which included only 2 case discussions but which

incorporated the development of official CT MMRC recommendations based on the deaths of Connecticut residents that occurred in the period between 2015 and 2017 (page 23).

FIGURE A-2

CT MMRC includes both clinical and non-clinical members

Clinical-to-non clinical member ratio between September 2018 and September 2020

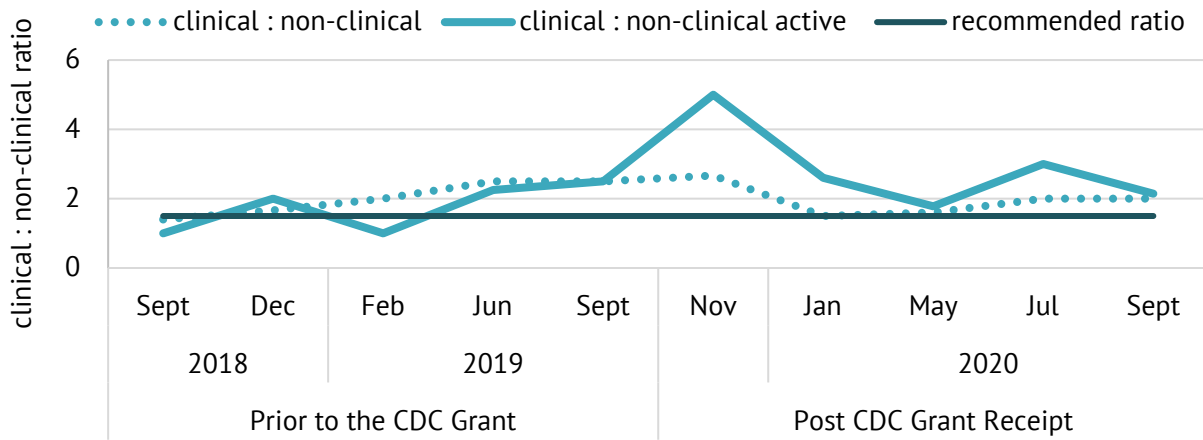
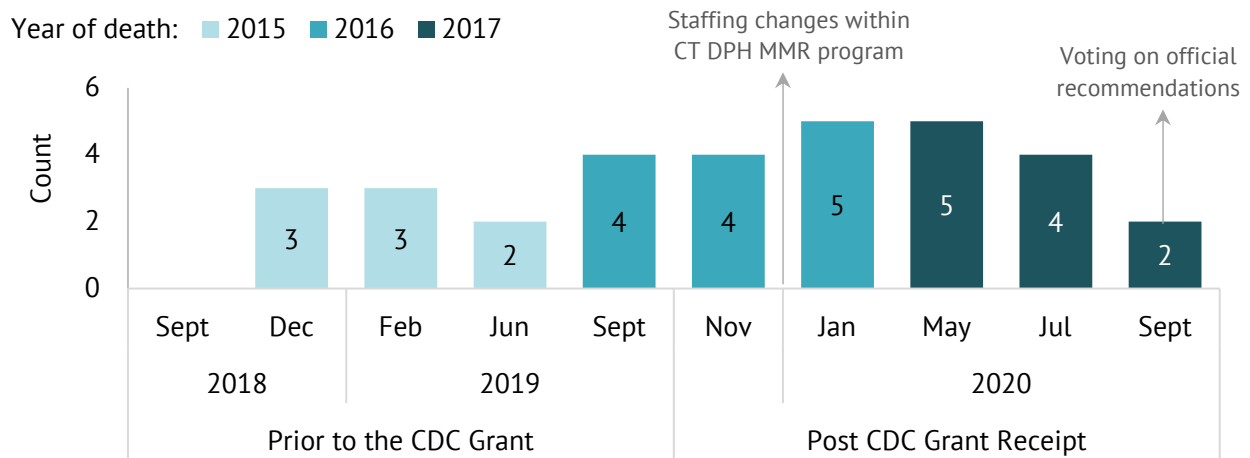


FIGURE A-3

Meeting efficiency has improved over time

Count of cases reviewed during each meeting September 2018 and September 2020



As of this writing in December 2020, Connecticut is not meeting CDC’s expectations for timeliness of the review process; however, progress is being made. One of CDC’s objectives for the MMRCs is to identify and review all deaths potentially associated with pregnancy within two years of the date of death. In Connecticut, CT MMRC reviewed 2015 deaths an average of 43 months after the date of death. Deaths that occurred in 2016 were reviewed an average of 39 months after the date of death, and deaths that occurred in 2017 were reviewed an average of 35 months after the date of death.

Figure A-4 shows an estimated breakdown by the task** in death-to-review timelines for pregnancy-associated deaths that occurred in 2015, 2016, and 2017. Because of budgetary and staff changes within CT DPH, and a new contract with a CSMS-appointed physician, there was a more-than-

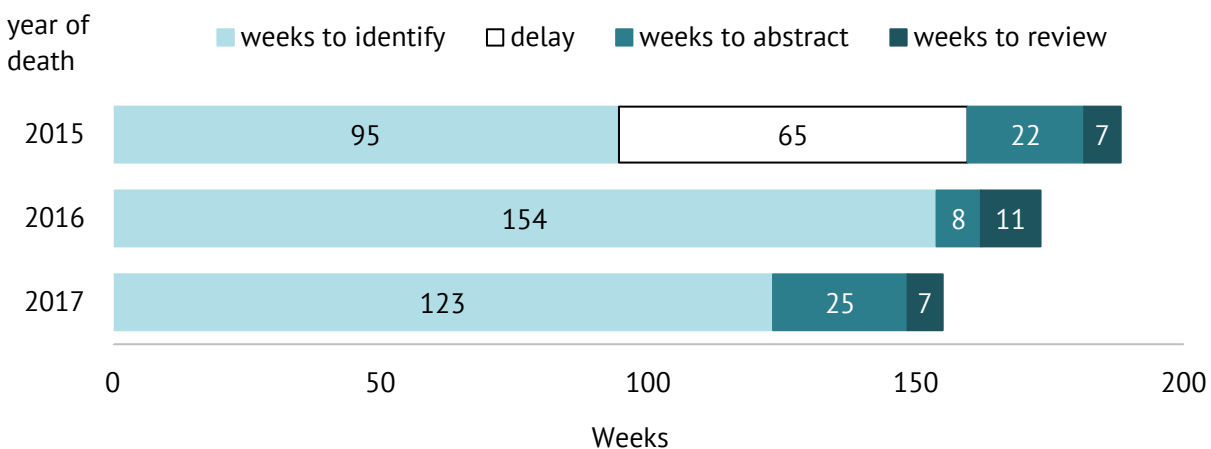
a-year-long delay in the review of 2015 deaths. A linked file of deaths that occurred in 2016 was not requested from the CT DPH SAR Unit until after the review of 2015 deaths had been completed, which accounted for the lengthy period needed to identify deaths potentially associated with pregnancy. And, there was a 4-month hiatus in abstracting and reviewing deaths that occurred in 2017 because of the COVID-19 pandemic.

Going forward, CT MMRC will hold monthly (instead of quarterly or bi-monthly) meetings and will review 5 cases at each meeting in order to improve the timeliness of review and to meet the CDC’s objective of reviewing all pregnancy-associated deaths within two years of the date of death. Additionally, electronic death records, which are expected to be rolled out by December 2021, will help with shrinking the death-to-review lag.

FIGURE A-4

The death-to-review lag is shrinking

Average number of weeks between the time a death has occurred and its review by CT MMRC



** Exact dates were not available in all instances. Time to complete case abstraction also includes time needed to identify pregnancy-

associated cases and to identify and remove from the pregnancy-associated cohort the cases that were included in error.

Pregnancy-Associated Deaths in Connecticut

Data from Connecticut Maternal Mortality Review Committee, 2015-2017

Pregnancy-associated deaths bear a temporal relationship to pregnancy: all deaths that occur during pregnancy or within one year of the end of pregnancy, regardless of the cause, are considered pregnancy-associated. There are three subsets within this category (Figure B-1). The first subset includes deaths that are causally related to pregnancy; these are known as **pregnancy-related**. Some examples of pregnancy-related deaths include deaths from pregnancy complications such as amniotic fluid embolism, infection, or hemorrhage; deaths from chains of events initiated by pregnancy such as postpartum depression ending in a suicide; and deaths from aggravations of unrelated conditions by the physiologic effects of pregnancy such as malignancy.

The second subset includes deaths from causes unrelated to pregnancy; these are known as pregnancy-associated but **not pregnancy-related**

deaths. The last subset includes deaths for which MMRCs are unable to determine whether they are pregnancy-related or not pregnancy-related.

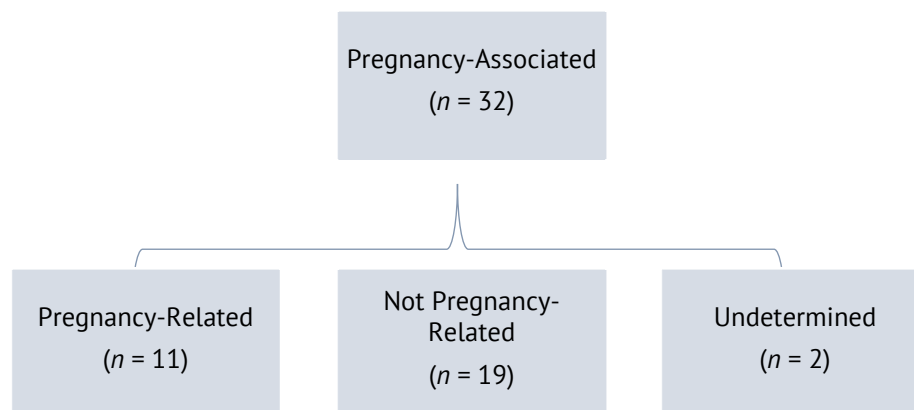
Between 2015 and 2017, there were 32 pregnancy-associated deaths among Connecticut residents. About 1 in 3 of those deaths, a count of 11, were determined by the CT MMRC to be pregnancy-related; about 6 in 10 pregnancy-associated deaths, a count of 19, were determined to be not pregnancy-related; and, determination of pregnancy-relatedness could not be made in two cases (Figure B-2).

CT MMRC decision-making around pregnancy-relatedness was consistent with the findings of MMRCs in other parts of the US. Namely, in the period between 2008 and 2017 about 1 in 3 pregnancy-associated deaths in 14 US states were determined by the MMRCs in those states to be pregnancy-related, which is to say causally related to pregnancy or its management.¹⁶

FIGURE B-1

Pregnancy-related deaths are a subset of pregnancy-associated deaths

Pregnancy-associated deaths ($n = 32$) in Connecticut, 2015-2017

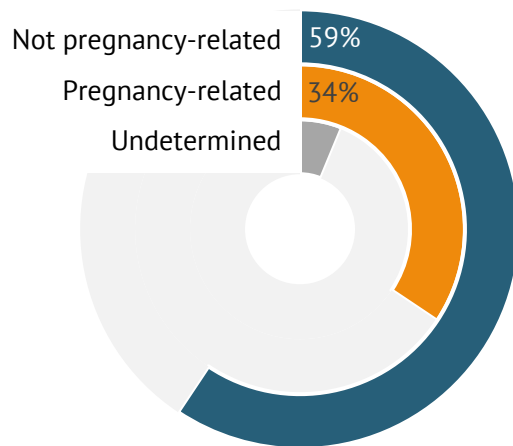


Source: CT MMRC Committee Decisions Forms.

FIGURE B-2

About 1 in 3 pregnancy-associated deaths were pregnancy-related

Pregnancy-associated deaths (n = 32) by pregnancy-relatedness, 2015-2017



Source: CT MMRC Committee Decisions Forms.

Each year in the period between 2015 and 2017, there were between 8 and 11 pregnancy-associated deaths of Connecticut residents, and between 3 and 5 pregnancy-related deaths. Mortality ratios for the period between 2015-2017 are presented in Table B-1. Because these ratios are based on a very small

numbers of deaths, they are subject to large random variation; hence, a range of possible values is provided alongside each ratio. These confidence limits show the possible range of values for the corresponding estimates in the period between 2015 and 2017.

TABLE B-1

Each year there were 3-5 pregnancy-related deaths in Connecticut

Pregnancy-associated deaths by pregnancy-relatedness, 2015-2017

	2015	2016	2017	2015-2017		
	count	count	count	count	ratio*	95% CI**
Pregnancy-associated	8	13	11	32	30.0	(20.5, 42.3)
Not pregnancy-related	3	8	8	19	17.8	(10.7, 27.8)
Pregnancy-related	3	5	3	11	10.3	(5.1, 18.4)
Undetermined	2	-	-	2	-	-
Live births	35,711	36,021	35,012	106,744		

Note: *per 100,000 live births. **95% exact Poisson confidence interval.

The cause of death listed on a death certificate is the underlying disease process or injury that initiated the lethal sequence of events. To facilitate analyses of pregnancy-associated deaths, CT MMRC co-chairs grouped causes of pregnancy-associated deaths^{††} in Connecticut based on a classification scheme proposed by the *Building U.S. Capacity to Review and Prevent Maternal Deaths* report from nine MMRCs.⁸ Because of a small number of events in each category, these groupings were further banded, for the purpose of this report, into six broad categories. The distribution of pregnancy-associated deaths across these broad categories is presented in Table B-2. Medical disorders such as

cardiomyopathy, infection, malignancy, and amniotic fluid embolism, to give a few examples, accounted for about 40% of all pregnancy-associated deaths, about a quarter (5 out of 19) of not pregnancy-related deaths, and almost two-thirds (7 out of 11) of pregnancy-related deaths. Accidental overdoses and mental health disorders accounted for about 34% of all pregnancy-associated deaths, over 40% (8 out of 19) of not pregnancy-related deaths, and about a quarter (3 out of 11) of pregnancy-related deaths. Lastly, injuries, both unintentional and homicides, accounted for over 20% of pregnancy-associated deaths, 6 out of 19 not pregnancy-related deaths, and none of the pregnancy-related deaths.

TABLE B-2

About 4 in 10 pregnancy-associated deaths were due to medical disorders

Pregnancy-associated deaths (n = 32) by pregnancy-relatedness and by the leading cause of death category, 2015-2017

Leading causes of death	Pregnancy-associated deaths		Not pregnancy-related deaths	Pregnancy-related deaths
	count	percent	count	count
Total medical disorders	13	40.6	5	7
Cardiovascular/stroke*	7	-	3	4
Other medical disorders**	6	-	2	3
Total overdose & mental health	11	34.4	8	3
Accidental overdose	7	-	7	0
Mental health condition	4	-	1	3
Total injury	7	21.9	6	0
Unintentional injury	4	-	3	0
Homicide	3	-	3	0
Unknown	1	-	0	1
Grand total	32	100.0	19	11

Note: Pregnancy-associated deaths for which pregnancy-relatedness could not be determined by the CT MMRC (n = 2) were excluded from the breakdown by pregnancy-relatedness. *The Cardiovascular/Stroke category subsumes three categories: cardiomyopathy, cardiovascular and coronary conditions, and cerebral vascular accident. **"Other medical disorders" category includes metabolic/endocrine conditions, infections, malignancies, liver and gastrointestinal conditions, and amniotic fluid embolism.

†† Classification was based on causes of death listed on the death certificate. For all deaths that occurred between 2015 and 2017,

CT MMRC agreed with the cause of death listed on the death certificate.

Based on a review of medical records and other available evidence, CT MMRC determined that 75% of all pregnancy-associated deaths and 82% of pregnancy-related deaths were preventable. Among pregnancy-related deaths, the chance to alter outcome was deemed “good” in over a quarter of cases and “some” in over half of the cases.

The manner of death represents the circumstances for how the death occurred. Based on federal guidelines, these circumstances may be classified as either “natural” or “unnatural.” The “natural” category includes deaths due exclusively to medical disease processes; no injury or intoxication can contribute. Primary care providers or hospital physicians can issue this type of death certificate. The “unnatural” category is further divided into five subcategories: 1) accident, which includes deaths due to inadvertent injuries or intoxication; 2) suicide, which includes deaths from injury with intent to end one’s own life; 3) homicide, which includes deaths at the hand of another; 4) undetermined, which includes deaths for which insufficient information is available to determine if an injury contributes to the death and/or how an injury occurred; 5) therapeutic

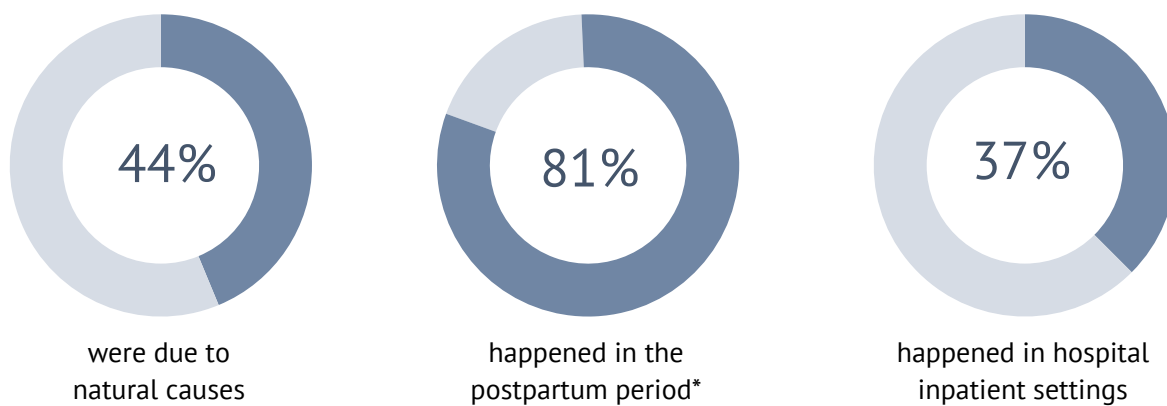
complication, which includes deaths hastened by procedures where there was a complication. By state statute, all “unnatural” deaths must be reported to and investigated by the Office of the Chief Medical Examiner (OCME). The OCME uses all available information from the family, the police, the autopsy, and the toxicology to determine the manner of death and to issue the death certificate.

Among pregnancy-associated deaths that occurred between 2015 and 2017, the most common manner of death, as reported on the death certificate, was natural (44%). This was followed by accident (28%), homicide (9%), suicide (9%), and undetermined cause (3%). Natural was also the most common manner of death among pregnancy-related deaths, reported in almost two-thirds (64%) of cases. By contrast, natural was reported as the manner of death in only about one-third (32%) of not pregnancy-related deaths; the most common manner of death for this subgroup was accident (47%). It is noteworthy that the CT MMRC determined all suicides to be pregnancy-related and all accidents, including accidental overdoses, to be pregnancy-associated but not pregnancy-related.

FIGURE B-4

Fewer than half of pregnancy-associated deaths were due to natural causes

Among pregnancy-associated deaths (n = 32) that occurred between 2015 and 2017:



Source: CT MMRC Committee Decisions Forms. Note: *Included is a small number of deaths that occurred on the day of delivery.

Regarding the timing of death, a large majority (81%) of all pregnancy-associated deaths occurred either on the day of delivery or in the postpartum period, and only about one-fifth (19%) occurred during pregnancy (Figure B-4). Death on the day of delivery was rare, occurring in 2 out of 32 pregnancy-associated cases. By far most common (72%) was death in the delayed postpartum period, between 43 and 365 days after the end of pregnancy.

Among a subgroup of persons whose deaths were determined to be pregnancy-related, over one-third (36%) died either on the day of delivery or within 6 days after the end of pregnancy; close to two-thirds (64%) died in the delayed postpartum period. Among persons whose deaths were determined to be pregnancy-associated but not pregnancy-related, about a quarter (26%) were pregnant at the time of death and almost three-quarters (74%) had been pregnant within 43 and 365 after the end of pregnancy.

Concerning the place of death, hospital inpatient setting was the most common location for all

pregnancy-associated deaths (37%; Figure B-4). Among pregnancy-related deaths, the most common place of death was the hospital inpatient setting (45%), followed by the decedent's residence (27%) and other places (27%). The proportion of deaths that occurred in hospital inpatient settings was considerably lower among pregnancy-associated but not -related deaths (26%) than among pregnancy-related deaths (45%).

Most pregnancy-associated deaths between 2015 and 2017 occurred among persons whose economic resources were limited during pregnancy. A review of prenatal records suggests that most members of the 2015-2017 cohort worked in low paying jobs or were unemployed; over half had Medicaid for insurance at delivery; and few (16%) held a postsecondary degree. As concerns education it is important to note that about 16% of members of the 2015-2017 cohort did not have a high school diploma; about 34% had a high school diploma and no college coursework; and about 28% had some college coursework but no degree (Table B-3).

TABLE B-3

Many had limited economic resources during pregnancy

Demographic characteristics of persons whose deaths were pregnancy-associated (n = 32):

Insurance at Delivery	count	percent
Medicaid	18	56.3%
Private	7	21.9%
Other/unknown	7	21.9%

Education	count	percent
No high school diploma	5	15.6%
High school graduate	11	34.4%
Some college	9	28.1%
Associate degree or higher	5	15.6%
Unknown	2	6.3%

Race/Ethnicity	count	percent
Black*	12	37.5%
Latinx	6	18.8%
White*	14	43.8%

Age	count	percent
20-24	9	28.1%
25-29	7	21.9%
30-34	9	28.1%
35-44	7	21.9%
-	-	-

Note: *Categories "Black" and "White" include only those who did not identify as Latinx or Hispanic.

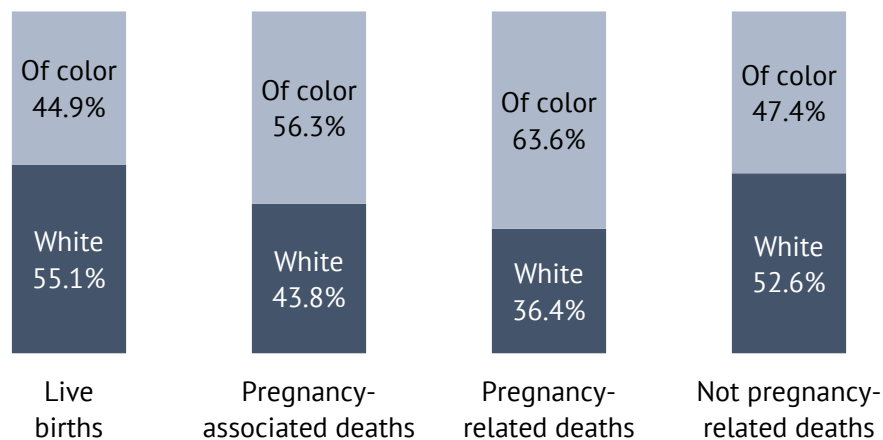
Regarding race/ethnicity, most of those whose deaths were pregnancy-associated identified as White (44%); this was followed by Black (37%) and Latinx (19%). The proportion of pregnancy-associated deaths that occurred among persons of color (56%)

exceeded their representation among those giving birth (45%), as Figure B-5 shows. This disproportionality was especially pronounced among those whose deaths were pregnancy-related.

FIGURE B-5

The proportion of pregnancy-related deaths that occurred among persons of color exceeded their representation among those giving birth

Live births (n = 106,744), pregnancy-associated deaths (n = 32), pregnancy-related deaths (n = 11), and not pregnancy-related deaths (n = 19) by race/ethnicity, 2015-2017



Source: CT MMRC Committee Decisions Forms, prenatal records, death certificates, and Connecticut Department of Public Health Registration Reports.

Intimate Partner Violence

Data from Connecticut Maternal Mortality Review Committee, 2015-2017

There were 32 pregnancy-associated deaths in Connecticut between 2015 and 2017. Pregnancy-associated deaths occur during pregnancy or in the postpartum period, and they may or may not be causally related to pregnancy. Reviews of pregnancy-associated deaths of Connecticut residents are conducted by Connecticut Maternal Mortality Review Committee (CT MMRC), a multidisciplinary panel that includes a broad spectrum of medical and non-medical professionals who provide direct services to persons of childbearing age. CT MMRC is coordinated by CT DPH, which is responsible for identifying pregnancy-associated deaths and obtaining relevant information from birth and death certificates, medical records, police reports, social media sites, and obituaries. CT MMRC reviews available evidence and develops recommendations for interventions to prevent such deaths in the future.

An analysis of CT MMRC data showed that about one-quarter of persons whose deaths were pregnancy-associated—a count of 8—experienced intimate partner violence (IPV) at some point in their lives (Figure C-1). What is more, IPV contributed to the death in 3 cases.

Prenatal care providers conducted IPV screening in 12 cases (37.5%); IPV screening was either not done or not documented in 13 cases (40.6%); prenatal care records were unavailable in 5 cases (16%); and it was known that 2 persons did not receive prenatal care (Table C-1). An IPV screen by a prenatal care provider was either not conducted or not documented in one case in which other sources (eg, police reports, emergency room records) revealed evidence of IPV. IPV screens by prenatal care providers were negative in 4 out of 7 cases in which there was, in fact, evidence of IPV (Table C-1). All positive screens by prenatal care providers revealed

historic rather than ongoing violence in romantic relationships. Taken together, these findings suggest a strong need for standardized IPV screening protocols by prenatal care providers, as well as referrals and connection to IPV services.

FIGURE C-1

IPV was common

Among persons whose deaths were pregnancy-associated (n = 32):

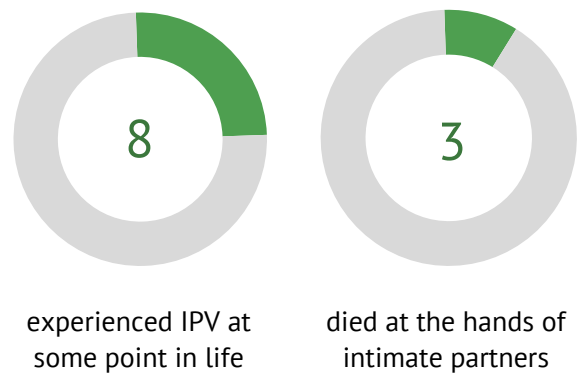


TABLE C-1

Results of IPV screens by prenatal care providers

Persons whose deaths were pregnancy-associated (n = 12), 2015-2017

IPV screening results	IPV at some point		Total count
	Yes count	No count	
Positive	3	-	3
Negative	4	5	9
Total	7	5	12

Mental Health

Data from Connecticut Maternal Mortality Review Committee, 2015-2017

In recent years, there has been increased interest in the role of mental health conditions in pregnancy-associated deaths.^{15,17} **Pregnancy-associated** deaths bear a temporal relationship to pregnancy: they occur during pregnancy or within one year after the end of pregnancy. Connecticut Maternal Mortality Review Committee (CT MMRC) identified 32 such deaths in the period between 2015 and 2017.

Included within the broad category of pregnancy-associated deaths are those deaths that occur as a result of pregnancy—from a pregnancy complication, a chain of events initiated by pregnancy, or an aggravation of an unrelated condition by the physiologic effects of pregnancy. These are known as **pregnancy-related** deaths. About one-third of pregnancy-associated deaths that occurred between 2015 and 2017 were determined by CT MMRC to be pregnancy-related.

In contrast to pregnancy-related deaths stand pregnancy-associated but **not pregnancy-related** deaths, which are not causally related to pregnancy. Almost 60% of pregnancy-associated deaths that occurred between 2015 and 2017 were determined by CT MMRC to be not pregnancy-related.

Notably, CT MMRC is a multidisciplinary committee that includes a wide range of clinical and non-clinical professionals. Coordinated by the Connecticut Department of Public Health, CT MMRC convenes quarterly, or more often if needed, to review pregnancy-associated deaths of state residents. The review includes evidence abstracted from birth and death certificates; prenatal, hospital, emergency room, and medical transport records; and police reports, obituaries, and social media sites. By examining the circumstances of each death, CT MMRC contributes not only to epidemiological analyses of maternal mortality but also the

development of actionable recommendations for prevention.

An analysis of data assembled as part of CT MMRC’s review has shown that over half (53%) of pregnant or postpartum persons who died between 2015 and 2017 had at least one mental health diagnosis at some point in their lives. Additionally, CT MMRC determined that mental health conditions other than substance use disorder contributed, or probably contributed, to 37% of pregnancy-associated deaths (Figure D-1). The most commonly occurring mental health conditions included anxiety disorders (8 cases) and depressive disorders (7 cases); other conditions listed in medical records, or determined based on available evidence by CT MMRC subject experts, included bipolar disorder, posttraumatic stress disorder, schizoaffective disorder, and history of postpartum depression in prior pregnancies.

FIGURE D-1

Mental health conditions factored in people’s lives and deaths

Among persons whose deaths were pregnancy-associated (n = 32):

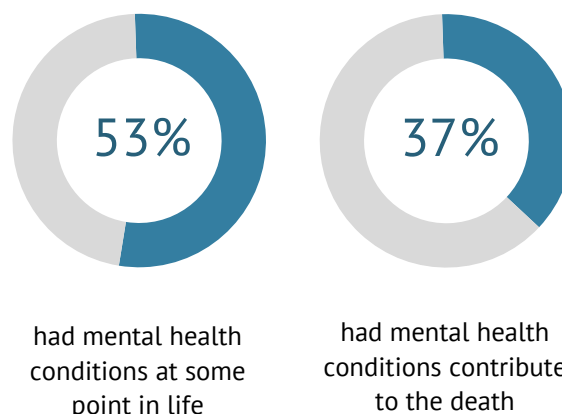
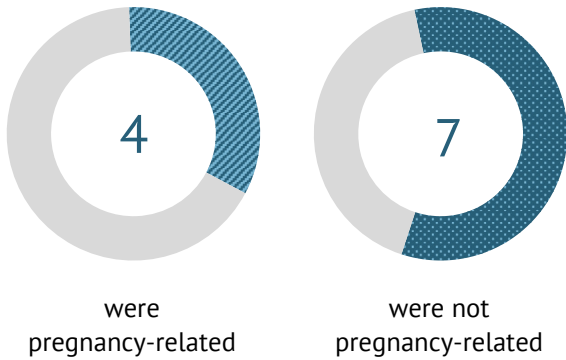


FIGURE D-2

Pregnancy-relatedness and mental health conditions

Among pregnancy-associated deaths to which mental health conditions contributed (n = 12):



Of 12 pregnancy-associated deaths to which mental health conditions contributed, 4 were pregnancy-related and 7 were not pregnancy-related (Figure D-2); pregnancy-relatedness could not be determined in one case.

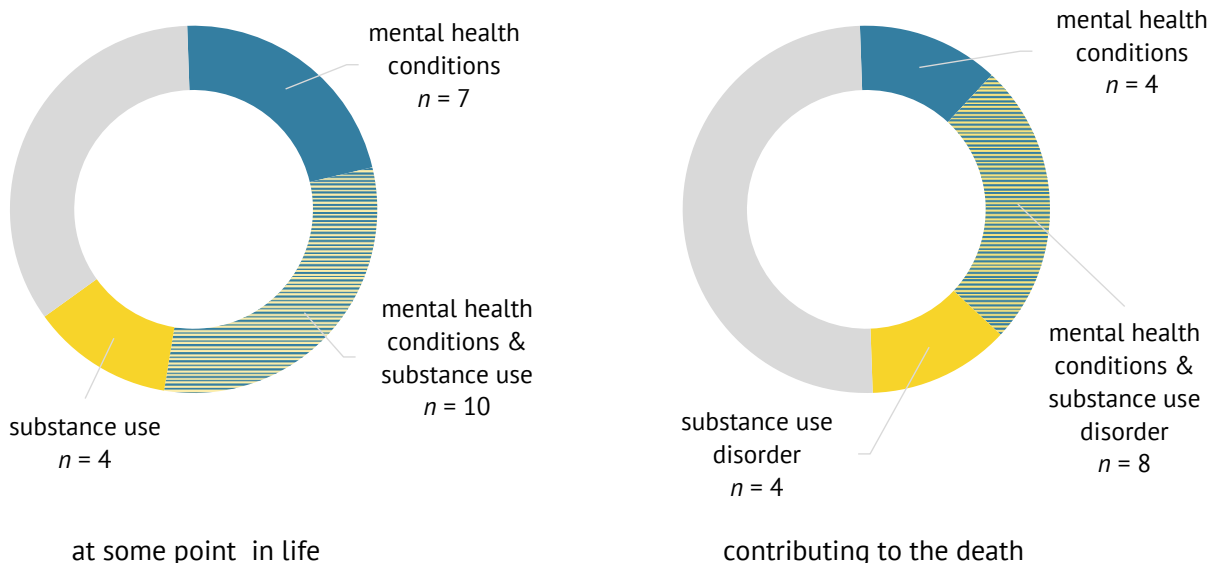
Looking within the two categories of pregnancy relatedness, mental health conditions contributed to 4 out of 11 pregnancy-related deaths, and similarly, to 7 out of 19 not pregnancy-related deaths, slightly over one-third in each instance.

Lastly, it is worth considering an intersection between mental health conditions and substance use, broadly defined as the use of illicit substances or misuse of licit substances. Two-thirds of persons whose deaths were pregnancy-associated had either mental health conditions or substance use at some point in their lives, and almost one-third had both (Figure D-3). Furthermore, either mental health conditions or substance use disorder contributed to half of pregnancy-associated deaths, and both contributed to a quarter of deaths. Taken together, these findings underscore the importance of interventions that support mental health, especially considering that substance use is often driven by, sometimes undiagnosed, mental health conditions.¹⁸

FIGURE D-3

Mental health conditions intersected with substance use

Pregnancy-associated deaths (n = 32) by mental health conditions and substance use, 2015-2017



Substance Use

Data from Connecticut Maternal Mortality Review Committee, 2015-2017

Each year there are about a dozen of pregnancy-associated deaths in Connecticut. And each year more than a third of those deaths involve the use of substances. To discern factors that contribute to these deaths, and ultimately, to prevent them, Connecticut Department of Public Health coordinates a multidisciplinary panel—Connecticut Maternal Mortality Review Committee (CT MMRC). CT MMRC comprises a wide range of clinical and non-clinical professionals who provide direct services, including medical care, counseling, and parenting education, to reproductive-age persons. CT MMRC convenes bi-monthly, or more frequently, to review pregnancy-associated deaths, to determine their preventability, and to develop recommendations for providers, hospital systems, and policy-makers. The Committee’s proceedings are confidential, and its work is protected under CGS §19a-25.

Within the purview of CT MMRC are deaths that occur during pregnancy or within one year of the end of pregnancy, regardless of cause. These are known as **pregnancy-associated** deaths. Included within this category are three subcategories: 1) **pregnancy-related** deaths, which are causally related to pregnancy or its management; 2) pregnancy-associated but **not pregnancy-related** deaths, which are *not* causally related to pregnancy; and 3) deaths for which pregnancy-relatedness cannot be determined. In the period between 2015 and 2017, CT MMRC identified 32 pregnancy-associated deaths, 11 of which were deemed to be pregnancy-related and 19 not pregnancy-related; pregnancy-relatedness could not be determined in 2 cases.

As part of its work, CT MMRC conducts a thorough review of evidence, which includes death and birth certificates; medical records; police and autopsy reports; and social media posts and

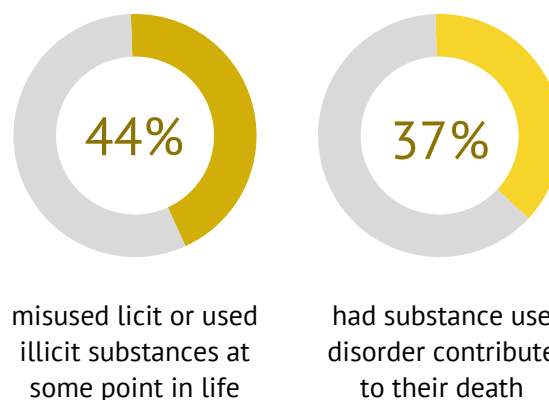
obituaries. The results of this extensive review showed that 44% of persons whose deaths were pregnancy-associated used substances at some point in their lives (Figure E-1). To be clear, any mention in the records of the use of illicit substances such as cocaine and heroin, misuse of prescription medications such as benzodiazepines and prescription opioids, or abuse of alcohol—before, during, or after pregnancy—was counted as “substance use” for the purpose of this analysis.

In addition to reviewing substance use in general, CT MMRC considers the contribution of substance use disorder to the death. Based on available evidence, CT MMRC determined that substance use disorder contributed, or probably contributed, to 37% of pregnancy-associated deaths—a count of 12 cases. Of these, 7 deaths were “accidental overdoses;” substance use was listed as a contributing factor to 3 natural deaths; and manner of death could not be determined in 2 cases.

FIGURE E-1

Substance use

Among persons whose deaths were pregnancy-associated (n = 32):



Among 12 pregnancy-associated deaths to which substance use disorder contributed, one was pregnancy-related and 11 were not pregnancy-related (Figure E-2). Looking within the two pregnancy-relatedness categories, substance use disorder probably contributed to 1 out of 11 pregnancy-related deaths, and by contrast, it contributed, or probably contributed, to 11 out of 19 (58%) not pregnancy-related deaths.

These breakdowns suggest a link between the contribution of substance use disorder to a death and its pregnancy-relatedness determination by CT MMRC. Namely, deaths to which substance use disorder contributed tended to be designated as not pregnancy-related, and in fact, all accidental overdoses that occurred between 2015 and 2017 were classified as such. By contrast, deaths to which substance use disorder did not contribute, but in which other mental health conditions played a role, tended to be designated as pregnancy-related. With the adoption of standardized criteria for review of suicides and accidental drug-related deaths in the fall of 2020,¹⁵ this is likely to change for deaths that occurred after 2017, and as a result, the annual count of pregnancy-related deaths is likely to rise.

Concerning the timing of deaths to which substance use disorder contributed, it is interesting to note that 9 out of 12 deaths occurred in the delayed postpartum period—that is, between 43 and 365 days after the end of pregnancy—and 3 out of 12 deaths occurred during pregnancy.

The last point of interest concerns substance use screening by prenatal care providers. Patients' answers to self-report questionnaires, urine drug tests, or both were documented in 22 out of 32 cases (68%) and were either not-documented or not done in 3 cases; prenatal records were unavailable in 5 cases, and it is known that 2 persons did not seek prenatal care. The results of substance use screens by prenatal care providers were negative in 3 out of 10 cases in which there was evidence of substance use

before and after pregnancy, as well as probable use of substances during pregnancy, in other sources such as emergency room records and medical examiner reports (Table E-1). These findings suggest the need for consistent documentation of screening results, as well as enhanced approaches to substance use screening by prenatal care providers.

FIGURE E-2

Link between substance use and CT MMRC's determination of pregnancy-relatedness

Among pregnancy-associated deaths to which substance use disorder contributed (n = 12):

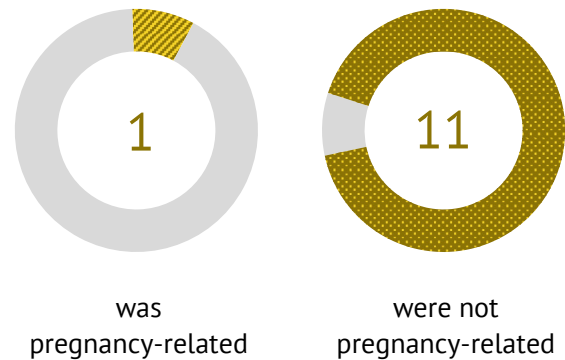


TABLE E-1

Results of substance use screening by prenatal care providers

Persons whose deaths were pregnancy-associated (n = 22), 2015-2017

Substance use screening results	Substance use		Total count
	Yes count	No count	
Positive	7	-	7
Negative	3	12	15
Total	10	12	22

Contributing Factors

Data from Connecticut Maternal Mortality Review Committee, 2015-2017

In Connecticut, the review of pregnancy-associated deaths starts with decisions about pregnancy-relatedness and preventability. For deaths that are determined to be pregnancy-related *and* preventable, CT MMRC identifies factors that contributed to the death and that, if modified, might have prevented it. Information about contributing factors serves as a framework for developing actionable recommendations to prevent future deaths.

In accordance with CDC’s guidelines, each contributing factor is assigned a level and a class.¹⁴ The level refers to the placement of a contributing factor within a social system, and it includes the following categories: 1) patient/family, 2) provider, 3) facility, 4) system of care,** and 5) community.¹⁴ The class refers to a thematic grouping of

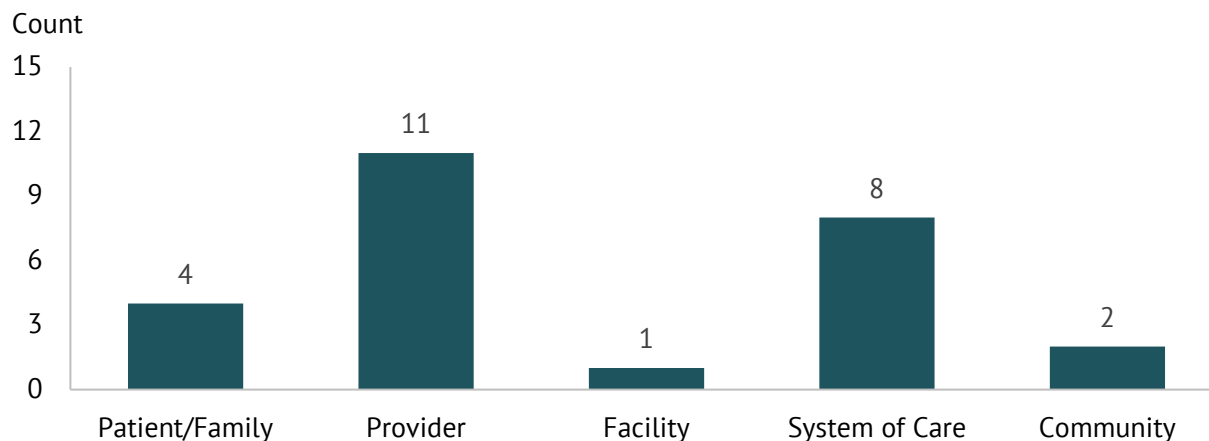
contributing factors based on subject matters such as financial resources, chronic disease, unstable housing, continuity of care, adherence to medical recommendations, and quality of care, to name a few. As of this writing in December 2020, there were 28 contributing factors listed on the *Committee Decisions Form*.¹⁴

Figure F-1 shows the distribution of contributing factors across levels for preventable pregnancy-related deaths that occurred between 2015 and 2017. CT MMRC identified 26 contributing factors for 9 preventable pregnancy-related deaths. Most factors were identified at the levels of provider and system of care. By contrast, relatively few factors were identified at the patient/family level. Table F-1 contains a listing of the classes of contributing factors, with illustrative examples, grouped by the level.

FIGURE F-1

Most contributing factors were at the levels of provider and system of care

Distribution of contributing factors (n = 26) for preventable pregnancy-related deaths, 2015-2017



**Per Committee Decisions Form, system is defined as “interacting entities that support services before, during, or after a pregnancy -

ranges from healthcare systems and payors to public services and programs.”

TABLE F-1

Contributing factor classes

Summary of contributing factor classes for preventable pregnancy-related deaths, 2015-2017

Contributing Factor Class	Count	Example
Patient/Family Level		
Delay	1	Patient delayed seeking treatment after symptoms began.
Adherence	2	Patient did not adhere to the treatment plan and/or did not keep follow-up appointments.
Mental Health Conditions	1	Patient had a history of depression.
Provider & Facility Levels		
Knowledge	4	Prenatal care providers need additional knowledge on domestic violence screenings and available resources.
Mental Health Conditions	1	Prenatal care provider did not coordinate care with mental health providers.
Continuity of Care	1	Prenatal care provider did not make referral to a home visiting program.
Clinical Skill	3	There was no ECHO, EKG, or work-up for severe hypertension in the prenatal period. Anti-hypertensive medication was not administered.
Referral	1	Patient was not referred to Medicaid.
Assessment	1	Need for education on available evidence-based screening tools for domestic violence, perinatal depression, and substance abuse.
Policies/Procedures	1	Lack of policy or failure to adhere to policy for administering antihypertension medications.
Systems of Care		
Mental Health Conditions	1	Coverage for mental health treatment.
Access/Financial	3	Access to same day long-acting reversible contraceptives.
Continuity of Care	1	Cross-communication and coordination among all providers seeing the patient.
Clinical Skill	1	Lack of policy to review near misses and discuss standards of care within each hospital.
Outreach	1	Follow-up with missed appointments by providers.
Other	1	Medicaid coverage to one-year postpartum.
Community Level		
Social Support/Isolation	2	Lack of social supports and community level. Patient lost social support.

CT MMRC Recommendations

Action Steps Based on Death Reviews, 2015-2017

A key aspect of the death review process involves the development of Connecticut Maternal Mortality Review Committee (CT MMRC) official recommendations for action to prevent pregnancy-related deaths among Connecticut's residents. For deaths that occurred between 2015 and 2017, the development of recommendations started with, first, descriptive analyses of deaths reviewed by CT MMRC; second, a list of working recommendations proposed during Committee meetings for each preventable death; and third, a review of recommendations issued by other MMRCs in the US. Having assessed all available information, CT MMRC co-chairs compiled a list of several recommendations for a review and vote by all Committee members. CT MMRC discussed, voted on, and adopted its first set of official recommendations on September 8, 2020. These recommendations are presented in the paragraphs that follow.

1) Promote CDC's *Hear Her* campaign to obstetricians and other obstetrics providers (physician assistants, advanced practice registered nurses, registered nurses, certified nurse midwives), hospital obstetrics units, and emergency departments.

WHO: CT MMRC subcommittee consisting of Department of Public Health Co-Chair, Connecticut State Medical Society Co-Chair, Connecticut Hospital Association, Family Wellness Health Start providers, and Planned Parenthood Health Centers.

WHAT: The link to the CDC *Hear Her* campaign will be disseminated to educate the hospital emergency department staff, obstetric providers, inpatient obstetrics units, federally qualified health centers, and other community-based providers on

maternal mortality and the importance of listening to the patient's concerns. The Department of Public Health MMR webpage includes a link to the *Hear Her* campaign. Eleven Planned Parenthood Centers will air the *Hear Her* campaign in the health center waiting rooms.

WHEN: Beginning September 8, 2020.

2) Provide trainings to CT MMRC members on intimate partner violence.

WHO: The Department of Public Health CT MMRC Co-Chair will facilitate the scheduling of a virtual two-hour training of CT MMRC members by the Connecticut Coalition Against Domestic Violence.

WHAT: The Connecticut Coalition Against Domestic Violence Director of Training and Prevention and Director of Health Professional Outreach will train CT MMRC members on intimate partner violence resources, supports, and interventions available in the state of Connecticut. The training will cover the definition of intimate partner violence, methods of control, health consequences of intimate partner violence, and connections to maternal mortality. The training will also touch on coronavirus disease (COVID-19) and the impact that increased stress and isolation have had on victims and survivors of intimate partner violence. Participants will leave with an increased knowledge of the resources and supports available across the state and information on how health professionals can implement intimate partner violence screening and education into their practice. The virtual training will be held via a web-based platform.

WHEN: Tuesday, November 17, 2020.

3) Provide education to obstetric providers on available evidence-based screening tools for intimate partner violence, perinatal depression, and substance abuse, and also available resources.

WHO: CT MMRC subcommittee consisting of Connecticut Coalition Against Domestic Violence, Department of Public Health, and Connecticut State Medical Society Co-Chair.

WHAT: Trainings for obstetric providers to increase knowledge and use of evidence-based screening tools and referral resources and to increase the consistency of screening.

WHEN: By March 2021.

4) Provide education in hospitals to emergency department and social work staff as well as to obstetrics offices on indicators of intimate partner violence.

WHO: CT MMRC subcommittee consisting of Connecticut Coalition Against Domestic Violence, Department of Public Health, and Connecticut State Medical Society Co-Chair.

WHAT: Educate providers on indicators that identify the persons at risk for intimate partner violence and increase the consistency of screening.

WHEN: By March 2021.

5) Expand Medicaid coverage to one year postpartum.

WHO: CT MMRC subcommittee consisting of the Department of Public Health Co-Chair, Connecticut State Medical Society Co-Chair, and Department of Social Services, Medicaid Assistance Oversight Council.

WHAT: Present the MMRC recommendations on the benefit of expansion of Medicaid to 12 months post-partum to the Medicaid Assistance Provider

Oversight Council for vote by the Council and consideration by Department of Social Services.

WHEN: October 9, 2020.

6) Improve access to same day long-acting contraception in Federally Qualified Health Centers.

WHO: A subcommittee of the MMRC consisting of the DPH co-chair, Connecticut State Medical Society Co-Chair and Medicaid Assistance Oversight Council, Department of Social Services.

WHAT: Improve access to same day long-acting contraception for our state's most vulnerable population. The recommendation is for Medicaid to adjust reimbursement to allow same access to long-acting contraception in Federally Qualified Health Centers.

WHEN: On October 9, 2020 the DPH co-chair presented the MMRC recommendation to the Medicaid Assistance Provider Oversight Council for vote by the Council and consideration by Department of Social Services.

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Appendix A

Connecticut Maternal Mortality Review Legislation

Public Act No. 18-150

AN ACT ESTABLISHING A MATERNAL MORTALITY REVIEW PROGRAM AND COMMITTEE WITHIN THE DEPARTMENT OF PUBLIC HEALTH

Be it enacted by the Senate and House of Representatives in General Assembly convened:

Section 1. Section 19a-25 of the general statutes is repealed and the following is substituted in lieu thereof (Effective October 1, 2018):

All information, records of interviews, written reports, statements, notes, memoranda or other data, including personal data as defined in subdivision (9) of section 4-190, procured by the Department of Public Health, [\[or\]](#) by staff committees of facilities accredited by the Department of Public Health [or the maternity mortality review committee, established pursuant to section 3 of this act](#), in connection with studies of morbidity and mortality conducted by the Department of Public Health, [\[or\]](#) such staff committees [\[,\] or the maternal mortality review committee](#), or carried on by said department, [\[or\]](#) such staff committees [or the maternal mortality review committee](#) jointly with other persons, agencies or organizations, or procured by the directors of health of towns, cities or boroughs or the Department of Public Health pursuant to section 19a-215, or procured by such other persons, agencies or organizations, for the purpose of reducing the morbidity or mortality from any cause or condition, shall be confidential and shall be used solely for the purposes of medical or scientific research and, for information obtained pursuant to section 19a-215, disease prevention and control by the local director of health and the Department of Public Health. Such information, records, reports, statements, notes, memoranda or other data shall not be admissible as evidence in any action of any kind in any court or before any other tribunal, board, agency or person, nor shall it be exhibited or its contents disclosed in any way, in whole or in part, by any officer or representative of the Department of Public Health or of any such facility, by any person participating in such a research project or by any other person, except as may be necessary for the purpose of furthering the research project to which it relates. Notwithstanding the provisions of chapter 55, the Department of Public Health may exchange personal data for the purpose of medical or scientific research, with any other governmental agency or private research organization; provided such state, governmental agency or private research organization shall not further disclose such personal data. The Commissioner of Public Health shall adopt regulations consistent with the purposes of this section to establish the procedures to ensure the confidentiality of such disclosures. The furnishing of such information to the Department of Public Health or its authorized representative, or to any other agency cooperating in such a research project, shall not subject any person, hospital, sanitarium, rest home, nursing home or other person or agency furnishing such information to any action for damages or other relief because of such disclosure. This section shall not be deemed to affect disclosure of regular hospital and medical records made in the course of the regular notation of the care and treatment of any patient, but only records or notations by such staff committees pursuant to their work.

Sec. 2. (NEW) (*Effective October 1, 2018*) (a) As used in this section and section 3 of this act, "maternal death" means the death of a woman while pregnant or not later than one year after the date on which the woman ceases to be pregnant, regardless of whether the woman's death is related to her pregnancy, and "department" means the Department of Public Health.

(b) There is established, within the department, a maternal mortality review program. The program shall be responsible for identifying maternal death cases in Connecticut and reviewing medical records and other relevant data related to each maternal death case, including, but not limited to, information collected from death and birth records, files from the Office of the Chief Medical Examiner, and physician office and hospital records.

(c) Licensed health care providers, health care facilities and pharmacies shall provide the maternal mortality review program, established under this section with reasonable access to all relevant medical records associated with a maternal death case under review by the program.

(d) All information obtained by the department for the maternal mortality review program shall be confidential pursuant to section 19a-25 of the general statutes, as amended by this act.

(e) Notwithstanding subsection (d) of this section, the department may provide the maternal mortality review committee, established pursuant to section 3 of this act, with information as is necessary, in the department's discretion, for the committee to make recommendations regarding the prevention of maternal death.

Sec. 3. (NEW) (*Effective October 1, 2018*) (a) There is established a maternal mortality review committee within the department to conduct a comprehensive, multidisciplinary review of maternal deaths for purposes of identifying factors associated with maternal death and making recommendations to reduce maternal deaths.

(b) The cochairpersons of the maternal mortality review committee shall be the Commissioner of Public Health, or the commissioner's designee, and a representative designated by the Connecticut State Medical Society. The cochairpersons shall convene a meeting of the maternal mortality review committee upon the request of the Commissioner of Public Health.

(c) The maternal mortality review committee may include, but not be limited to, any of the following members, as needed, depending on the maternal death case being reviewed:

(1) A physician licensed pursuant to chapter 370 of the general statutes who specializes in obstetrics and gynecology, appointed by the Connecticut State Medical Society;

(2) A physician licensed pursuant to chapter 370 of the general statutes who is a pediatrician, appointed by the Connecticut State Medical Society;

(3) A community health worker, appointed by the Commission on Equity and Opportunity;

(4) A nurse-midwife licensed pursuant to chapter 377 of the general statutes, appointed by the Connecticut Nurses Association;

(5) A clinical social worker licensed pursuant to chapter 383b of the general statutes, appointed by the Connecticut Chapter of the National Association of Social Workers;

(6) A psychiatrist licensed pursuant to chapter 370 of the general statutes, appointed by the Connecticut Psychiatric Society;

(7) A psychologist licensed pursuant to chapter 20-136 of the general statutes, appointed by the Connecticut Psychological Association;

(8) The Chief Medical Examiner, or the Chief Medical Examiner's designee;

(9) A member of the Connecticut Hospital Association;

(10) A representative of a community or regional program or facility providing services for persons with psychiatric disabilities or persons with substance use disorders, appointed by the Commissioner of Public Health;

(11) A representative of The University of Connecticut-sponsored health disparities institute; or

(12) Any additional member the cochairpersons determine would be beneficial to serve as a member of the committee.

(d) Whenever a meeting of the maternal mortality review committee takes place, the committee shall consult with relevant experts to evaluate the information and findings obtained from the department pursuant to section 2 of this act and make recommendations regarding the prevention of maternal deaths. Not later than ninety days after such meeting, the committee shall report, to the Commissioner of Public Health, any recommendations and findings of the committee in a manner that complies with section 19a-25 of the general statutes, as amended by this act.

(e) All information provided by the department to the maternal mortality review committee shall be subject to the provisions of section 19a-25 of the general statutes, as amended by this act.

Approved June 12, 2018

Appendix B

CT MMRC Scope, Mission, Goals, and Vision

Scope:

The scope of cases for committee review is all pregnancy-associated deaths or any deaths of women with indication of pregnancy up to 365 days, regardless of cause (ie, motor vehicle accidents during pregnancy, motor vehicle accidents postpartum, suicide, homicide). Deaths are identified from review of death certificates with a pregnancy checkbox selection and linkage of vital records by searching death certificates of women of reproductive age and matching them to birth or fetal death certificates in the year prior.

Mission:

The mission is to increase awareness of the issues surrounding pregnancy-related death and to promote change among individuals, healthcare systems, and communities in order to reduce the number of deaths. The mission of the Connecticut Maternal Mortality Review Committee is to identify pregnancy-associated deaths, review those caused by pregnancy complications and other associated causes, and identify the factors contributing to these deaths and recommend public health and clinical interventions that may reduce these deaths and improve systems of care.

Goals:

The goals of the Maternal Mortality Review Committee are to:

- ◆ Perform a multidisciplinary review of cases to gain a holistic understanding of the issues.
- ◆ Determine the annual number of maternal deaths related to pregnancy (pregnancy-related mortality).
- ◆ Identify trends and risk factors among pregnancy-related deaths in CT.
- ◆ Recommend improvements to care at the provider and system levels with the potential for reducing or preventing future events.
- ◆ Prioritize findings and recommendations to guide the development of effective preventive measures.
- ◆ Recommend actionable strategies for prevention and intervention.
- ◆ Promote the translation of findings and recommendations into quality improvement actions at all levels.

Vision:

The Maternal Mortality Review Committee's vision is to eliminate preventable maternal deaths, reduce maternal morbidities, and improve population health for women of reproductive age in Connecticut.

Membership:

The Connecticut Maternal Mortality Review Committee is a multidisciplinary committee whose geographically diverse members represent various specialties, facilities, and systems that interact with and impact maternal health. At any one time, the committee consists of approximately 15-20 members who commit to serve a renewable 1-year term.

Meeting Structure:

Maternal Mortality Review Committees review and make decisions about each case based on the case narrative and abstracted data. The committee examines the cause of death and contributing factors, and determines:

- ◆ Was the death pregnancy-related?
- ◆ If pregnancy-related, what was the underlying cause of death? (PMSS-MM)
- ◆ Was the death preventable?
- ◆ If there were chances to alter the outcome, what were they?
- ◆ What were the contributing factors to the death?
- ◆ What specific and feasible recommendations for actions should be taken to prevent future deaths?

Process:

Information is gathered from death certificates, birth certificates, medical records, autopsy reports, and other pertinent resources. Records are abstracted by a trained abstractor, who prepares de-identified case narratives for review by a committee of experts from diverse disciplines.

Appendix C

Connecticut Maternal Mortality Review Program Procedures

1. Case Identification

- 1) DPH Co-chair requests linked files from CT DPH Surveillance Analysis and Reporting Unit (SAR).
- 2) DPH Co-chair notifies **Abstractor**, *Evaluator*, and MMR staff of the availability of the linked file. **Abstractor**, *Evaluator*, and MMR staff access the linked file through a secure link.
- 3) *Evaluator* merges the linked file, assigns labels to variable values, and assigns case IDs. *Evaluator* adds a field for case review justification. *Evaluator* sends the merged file, in MS Excel format, to the Co-chair via a secure link within 2 days of receiving it from the CT SAR.
- 4) DPH Co-chair requests death certificates within a week of receiving the linked file from the Evaluator.
- 5) DPH Co-chair requests and obtains medical examiner reports from the Office of the Chief Medical Examiner within two weeks of receiving the linked file from the CT SAR.
- 6) DPH Co-chair requests medical records within three weeks of receiving the linked file from Evaluator.
- 7) DPH Co-chair requests police reports on an as-needed basis.
- 8) DPH Co-chair and **Epidemiologist** conduct internet searches to obtain additional information, on an as-needed basis. This may include the search of obituaries, funeral homes, and social media networks.
- 9) DPH Co-chair reviews the merged file, death certificates, and medical records; identifies pregnancy checkbox errors; removes cases with incorrect pregnancy checkboxes from the pregnancy-associated death cohort and adds them to an Excel spreadsheet.
- 10) DPH Co-chair provides **Abstractor** with all records and co-ordinates with **Abstractor** the order of case review.

2. Data Entry

- 1) DPH MMR staff enter death certificate data, linked file data, ME data, and any other relevant data into MMRIA.
- 2) DPH MMR staff enter de-identified Case Narratives into MMRIA prior to each MMRC meeting.

3. Case Abstracting

- 1) **Abstractor** notifies DPH Co-chair of any issues regarding the collection of medical and other records.
- 2) **Abstractor** submits Case Narratives to the Co-chairs at least two weeks prior to each MMRC meeting.
- 3) DPH Co-chair reviews Case Narratives to ensure they are de-identified within one week of receiving them from the **Abstractor**.

4. MMRC Meeting Logistics

- 1) **Epidemiologist** sends a meeting invitation to the MMRC members at least two weeks in advance of each MMRC meeting.

- 2) DPH Co-chair sends deidentified Case Narratives to the MMRC members at least one week prior to each MMRC meeting through a secure file link.

5. Data Recording

- 1) **Epidemiologist** hosts the MMRC meeting and launches the poll questions.
- 2) *Evaluator* enters MMRC attendance into a meeting tracker during each MMRC meeting. **Epidemiologist** audits the meeting tracker within a week of each MMRC meeting.
- 3) CSMS Co-chair presents cases to the MMRC and leads the discussion.
- 4) DPH Co-chair fills out Committee Decision Forms during and after MMRC meetings.
- 5) *Evaluator*, **Abstractor**, and CSMS Co-Chair take notes during MMRC meetings and send them to Co-chair to assist with completing Committee Decision Forms.
- 6) *Evaluator* monitors MMRC discussion to ensure completeness of Committee Decision Forms.
- 7) DPH Co-chair sends completed Committee Decision Forms to **Epidemiologist** and *Evaluator* within 3 days after each MMRC meeting.

6. MMRC meeting debrief

- 1) Co-chairs, **Epidemiologist**, **Abstractor**, and *Evaluator* debrief within 1 week after each MMRC meeting to discuss continuous improvement and results of review of meeting poll from committee.

7. Data Entry

- 1) DPH Co-chair enters Committee Decision Forms within 2 weeks after each MMRC meeting.

8. Data Audit

- 1) *Evaluator* completes data audit within 3 weeks after each MMRC meeting. This includes:
 - i. Checking each MMRIA Committee Decision Form against .pdf Committee Decision Form, as well as Case Narratives
 - ii. Checking other MMRIA forms against Case Narratives
 - iii. Updating Case Narrative Matrix
- 2) *Evaluator* sends the data audit form to Nurse Consultant/Other Staff within 3 weeks after each MMRC meeting.
- 3) Nurse Consultant/Other Staff makes any necessary corrections to MMRIA data entries and notifies *Evaluator* and DPH Co-chair within 30 days after each MMRC meeting.

