

Data from Connecticut Maternal
Mortality Review Committee, 2015-2020

Pregnancy-Related Deaths in Connecticut

December 2022



**Connecticut Department
of Public Health**

Connecticut Department of Public Health

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Acknowledgements

Each medical record reviewed represents the death of a unique human being. The loss of a parent, partner, child, sibling, 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.

Gender Referencing

Connecticut Maternal Mortality Review Committee 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. The pronoun “they” is used throughout the report to refer to an individual in a gender-neutral manner.

Table of Contents

Maternal Mortality in Connecticut.....	1
Summary of Findings.....	1
Pregnancy-Related Mortality Ratio	1
Changes Over Time.....	2
Preventability.....	3
Timing of Death.....	3
Cause of Death	4
Manner of Death	4
Disparities	6
Circumstances of Death.....	7
Living Situations	13
Unstable Housing.....	13
Incarceration.....	14
Congregate Care.....	15
Contextual Sociospatial Indicators	16
References.....	19
Appendix A: Connecticut Towns.....	21
Appendix B: CT MMRC Recommendations	22
Providers & Staff.....	22
Care Systems and Hospitals.....	23
Community Context.....	23
State Policies, Resources & Standards.....	24
Appendix C: Connecticut Legislation.....	25
Appendix D: Methods.....	28
Qualitative Analysis.....	29
Appendix E: Data-Briefs	30

Table of Figures

Figure 1. Connecticut’s determination of pregnancy-relatedness between 2011 and 2020.....	2
Figure 2. Distribution of pregnancy-related deaths by timing of death relative to pregnancy, data from CT MMRC, 2015-2020 and data from MMRCs in 36 US states, 2017-2019	3
Figure 3. Timing of pregnancy-related deaths relative to pregnancy by cause of death in Connecticut, 2015-2020.....	5
Figure 4. Leading underlying causes of pregnancy-related deaths, data from CT MMRC, 2015-2020 and from MMRCs in 36 US states, 2017-2019.....	5
Figure 5. Underlying causes of pregnancy-related death categories by race/ethnicity in Connecticut, 2015-2020.	6
Figure 6. Disparities in pregnancy-related deaths in Connecticut, 2015-2020.....	7
Figure 7. Factors that contributed to pregnancy-related deaths in Connecticut, 2018-2020.....	8
Figure 8. Missed opportunities for care among pregnancy-related deaths to which mental health conditions contributed or probably contributed, Connecticut, 2015-2020.....	10
Figure 9. Missed opportunities for care among pregnancy-related deaths to which substance use disorder contributed or probably contributed, Connecticut, 2015-2020	12
Figure 10. Unstable housing correlates, Connecticut, 2018-2020.....	14
Figure 11. Connecticut’s contextual sociospatial indicators	18

Acronyms

ACOG	American College of Obstetricians and Gynecologists
CDC	Centers for Disease Control and Prevention
CT	Connecticut
DCF	Department of Children and Families
DPH	Department of Public Health
ED	Emergency Department
ERASE MM	Enhancing Reviews and Surveillance to Eliminate Maternal Mortality
IPV	Intimate Partner Violence
L&D	Labor & Delivery
MHC	Mental Health Conditions
MMR	Maternal Mortality Review
MMRC	Maternal Mortality Review Committee
MMRIA	Maternal Mortality Review Information Application
OB	Obstetric Provider
PRMR	Pregnancy-Related Mortality Ratio
SDOH	Social Determinants of Health
SES	Socioeconomic Status
SUD	Substance Use Disorder
US	United States
VTE	Venous Thromboembolism

Key Terms

Connecticut Maternal Mortality Review Committee (CT MMRC)

As required by Connecticut General Statute 19a-59(i), CT MMRC is 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.

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 a pregnancy complication, a chain of events initiated by pregnancy, or the aggravation of an unrelated condition by the physiologic effects of pregnancy.

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.

Executive Summary

As required by Connecticut Statute 19a-59i, the Connecticut Maternal Mortality Review Committee (CT MMRC) submits an annual report of disaggregated data regarding the information and findings obtained through the Committee's review of pregnancy-associated deaths among Connecticut's residents. The Committee's key findings for the period between 2015 and 2020 include the following:

Finding 1: There were, on average, 5 pregnancy-related deaths per year among Connecticut residents in the period between 2015 and 2020. Pregnancy-related deaths comprise a subset of pregnancy-associated deaths that are causally related to pregnancy or its management.

Finding 2: With the adoption of the Utah standardized criteria for review of perinatal suicides and accidental drug-related deaths, the percentage of pregnancy-associated deaths that were determined by CT MMRC to be pregnancy-related increased from 34% in 2015-2017 to 42% in 2018-2020.

Finding 3: In line with national findings, a large majority (90%) of pregnancy-related deaths in 2015-2020 were preventable.

Finding 4: More than half of pregnancy-related deaths occurred between 7 and 365 days after the end of pregnancy. Under a quarter of pregnancy-related deaths occurred during pregnancy or on the day of delivery.

Finding 5: There were racial and social class disparities in pregnancy-related mortality in Connecticut: Black persons, those with Medicaid for health insurance, and those without a Bachelor's degree were overrepresented among pregnancy-related deaths.

Finding 6: CT MMRC found that discrimination contributed or probably contributed to 70% of pregnancy-related deaths in 2018-2020. Indicators of discrimination included negative patient provider/facility interactions, undertreatment or delay in treatment, lack of care coordination or adequate discharge planning, language, dismissal of patient concerns, and cultural incompetence.

Finding 7: Mental health conditions, including substance use disorder, were the leading underlying cause of pregnancy-related death in both Connecticut and nationally.

Finding 8: Mental health conditions other than substance use disorder contributed or probably contributed to nearly half of pregnancy-related deaths in 2015-2020. Although most decedents with mental health disorders received some form of mental health treatment during pregnancy or the postpartum period, there were many missed opportunities for care.

Finding 9: Substance use disorders contributed or probably contributed to about one-third of pregnancy-related deaths in 2015-2020. Nearly half of decedents with a substance use disorder received no form of substance use disorder treatment in the perinatal period.

Finding 10: A quarter of those who died from a pregnancy-related death in 2018-2020 experienced unstable housing.

Finding 11: Those living in Connecticut's Urban Core and Rural towns were over-represented among pregnancy-related deaths in 2015-2020.

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Maternal Mortality in Connecticut

This is a third in a series of reports that summarize findings from CT MMRC’s review of pregnancy-associated deaths among Connecticut residents. The term “pregnancy-associated death” pertains to the deaths that occur during pregnancy or within one year after the end of pregnancy, regardless of the cause. This report covers the period between 2015 and 2020, and it focuses on pregnancy-related deaths—a subset of pregnancy-associated deaths that are causally related to pregnancy or its management. Additionally, the report includes an analysis of decedents’ living situations, including housing instability and contextual sociospatial indicators. Lastly, Appendix E contain a set of briefs that may be used independently of the report to raise awareness of Connecticut pregnancy-related deaths due to medical conditions, pregnancy-associated deaths to which mental health conditions contributed, as well as the occurrence of intimate partner violence (IPV) among pregnancy-associated deaths.

Summary of Findings

Pregnancy-Related Mortality Ratio

In the period between 2015 and 2020, there were, on average, 13 pregnancy-associated deaths per year among Connecticut residents, with a range between 8 and 18 deaths annually. The CT MMRC determined that nearly four-in-ten of those deaths were pregnancy-related ($n = 31$, 39%); about half were pregnancy-associated but not pregnancy-related ($n = 41$, 51%); and determination of pregnancy-relatedness could not be made for eight deaths ($n = 8$, 10%).

There were, on average, five pregnancy-related deaths per year in 2015-2020, with a range between 3 and 11 deaths annually. Table 1 shows counts of pregnancy-associated deaths by pregnancy-relatedness, as well as pregnancy-related mortality ratios (PRMRs) for each of the two periods under study: 2015-2017 and 2018-2020. The count of pregnancy-related deaths almost doubled over time, from 11 in 2015-2017 to 20 in 2018-2020. In considering these findings, it is important to keep in mind changes over time in the way that pregnancy-relatedness has been operationalized.

Table 1. Pregnancy-associated deaths by pregnancy-relatedness, 2015-2020

year of death:		2015-2017			2018-2020			
pregnancy-associated deaths	count	PRMR	95% CL*		count	PRMR**	95% CL*	
pregnancy-related	11	10.3	5.1	18.4	20	19.6	11.9	30.2
not pregnancy-related	19				22			
undetermined	2				6			

Note: PRMR=pregnancy-related mortality ratio per 100,000 live births. CL=confidence limits. *95% exact Poisson confidence limits. **Based on the 2018 Registration Report, revised 6/21/2022; the 2019 provisional Registration Report, revised 7/14/2022; and the 2020 provisional Registration Report, revised 11/09/2022.

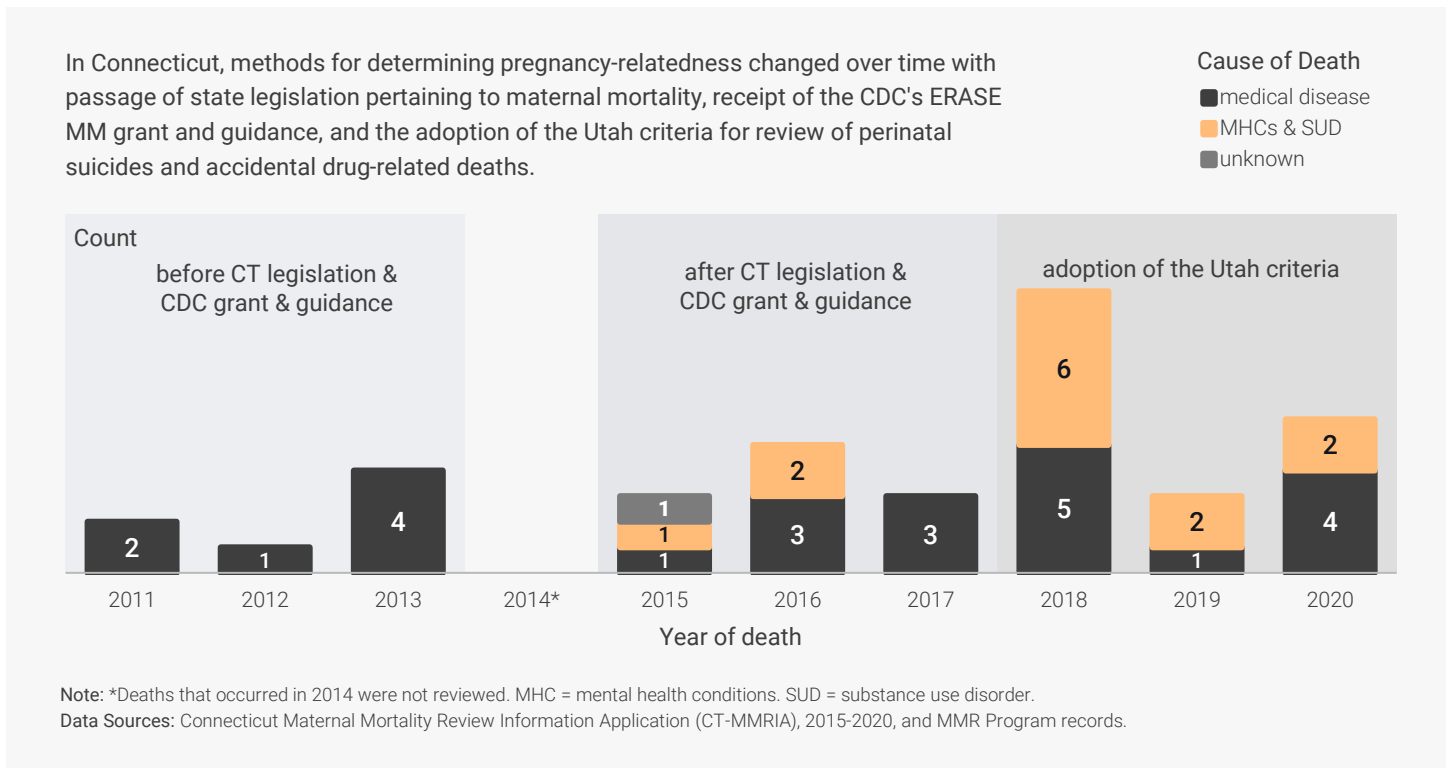
Data Sources: Connecticut Maternal Mortality Review Information Application (CT-MMRIA), 2015-2020 and CT DPH Registration Reports.

Changes Over Time

Before the passage of Connecticut’s Maternal Mortality Review (MMR) legislation, in the summer of 2018, the MMR Program operated on a small budget and was able to conduct maternal mortality surveillance owing to the volunteer efforts of a physician who abstracted medical records and who conferred with a small number of colleagues about the pregnancy-relatedness of each pregnancy-associated death. During this time, only those persons who died from medical diseases were included in the count of pregnancy-related deaths. As Figure 1 shows, there were seven such deaths in 2011-2013. Following the passage of Connecticut’s MMR legislation, which statutorily required a multidisciplinary committee, the MMR Program convened the CT MMRC to review pregnancy-associated deaths. Drawing upon guidance from the Centers for Disease Control and Prevention (CDC), two other physicians

volunteered their time and expertise to prepare detailed case narratives that included both medical and psychosocial information. With the receipt of CDC’s maternal mortality grant in 2019, the MMR Program was able to contract with a nurse, who took over the task of abstracting medical records and preparing case narratives. In this period, persons who died from medical diseases, as well as those who died from mental health conditions other than substance use disorder (substance use disorder being a type of mental health disorder) were included in the count of pregnancy-related deaths; not one accidental drug-related death was determined to be pregnancy-related. As shown on Figure 1, there were seven deaths due to medical disease and three deaths due to mental health conditions in 2015-2017; the underlying cause of death could not be determined for one person.

Figure 1. Connecticut’s determination of pregnancy-relatedness between 2011 and 2020



In September 2020, the CT MMRC adopted the Utah standardized criteria for review of perinatal suicides and accidental drug-related deaths.¹ The Utah criteria were established as a guide for pregnancy-relatedness determination for deaths that occurred in 2018-2020, and as is the case in other states,¹ they likely contributed to increased classification of deaths as pregnancy-related. As Figure 1 shows, there were ten deaths from mental health conditions, including substance use disorder, in 2018-2020, in addition to ten deaths from medical diseases.

Preventability

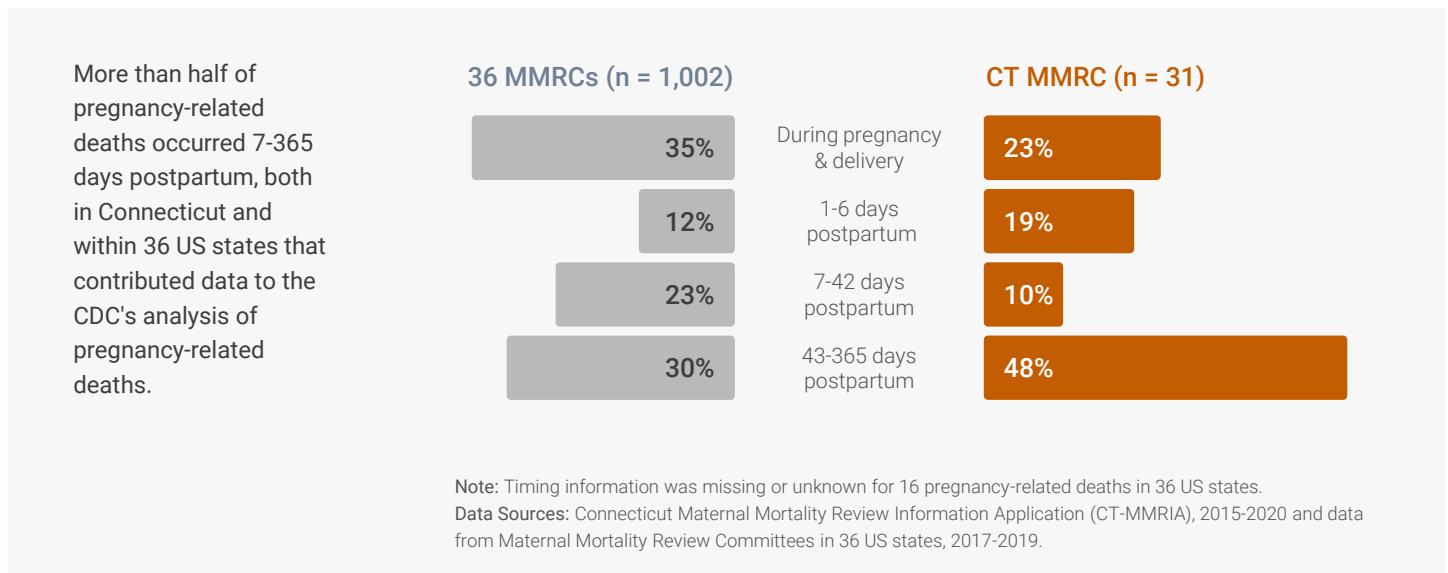
The CT MMRC made a preventability determination for 30 out of 31 pregnancy-related deaths in 2015-2020. Of these, a large majority were determined to be preventable, which is to say that there was at least some chance of the death being averted by one or more reasonable changes to patient, family, facility, system of care, and/or community factors. Namely, 27 (90%) pregnancy-related deaths were determined to have had some chance ($n = 19$, 63%) or good chance ($n = 8$, 27%)

for altering the outcome. In comparison, the CDC’s recent analysis of MMRC data showed that about 84% of pregnancy-related deaths that occurred in 36 US states, including Connecticut, in 2017-2019, were preventable.² Though not representing the same time period, the CDC’s analysis provides a broad context within which to situate Connecticut’s data, and it shows that Connecticut is generally consistent with other US states with respect to preventability determinations. It is worth noting that all three deaths that were determined by the CT MMRC to be not preventable occurred in the 6-week period after the end of pregnancy, with medical disease as the underlying cause of death in each instance.

Timing of Death

More than half of pregnancy-related deaths occurred 7-365 days postpartum, both in Connecticut ($n = 18$, 58%) and in 36 states whose MMRCs contributed data to the CDC’s analysis of pregnancy-related deaths in 2017-2019 (Figure 2).² Almost a quarter ($n = 7$, 23%) of Connecticut’s pregnancy

Figure 2. Distribution of pregnancy-related deaths by timing of death relative to pregnancy, data from CT MMRC, 2015-2020 and data from MMRCs in 36 US states, 2017-2019



related deaths occurred during pregnancy or on the day of delivery; about one-fifth ($n = 6$, 19%) occurred within a week after the end of pregnancy, one-in-ten ($n = 3$, 10%) within 6 weeks after the end of pregnancy, and almost half ($n = 15$, 48%) in the late postpartum period.

Over half of Connecticut's pregnancy-related deaths in 2015-2020 ($n = 17$, 55%) were due to medical diseases; about four-in-ten deaths ($n = 13$, 42%) were due to mental health conditions, including substance use disorders; and, the underlying cause of death could not be determined in one instance.

As shown on Figure 3, over half of deaths from medical diseases ($n = 9$, 53%) occurred in the 6-week period after the end of pregnancy; under a third ($n = 5$, 29%) occurred in the late postpartum period (43-365 days after the end of pregnancy); and nearly one-fifth of deaths from medical diseases ($n = 4$, 18%) occurred during pregnancy or on the day of delivery. Among deaths from mental health conditions, more than two-thirds ($n = 9$, 69%) occurred in the late postpartum period, and about one-third ($n = 4$, 31%) occurred in pregnancy or on the day of delivery.

Cause of Death

Mental health conditions, including substance use disorder, were the leading underlying cause of pregnancy-related death in Connecticut in 2015-2020, as well as in 36 US states that contributed to the CDC's analysis of MMRC data (Figure 4).² In Connecticut, mental health conditions accounted for about four-in-ten ($n = 13$, 42%) pregnancy-related deaths, including in the count one death that was coded as an "injury," with substance use disorder as a contributing factor. Various medical diseases such as cardiac and coronary conditions ($n = 4$, 13%), hemorrhage ($n = 3$, 10%), infection ($n = 2$, 7%), and venous thrombotic embolism (VTE; $n = 1$, 3%) accounted for over half ($n = 17$, 55%) of pregnancy-related deaths in 2015-2020. The apparently higher

proportion of deaths due to mental health conditions in Connecticut (42%) than in 36 US states (23%) may be a function of different time periods (2015-2020 in Connecticut, and 2017-2019 in 36 US states), CT MMRC's relatively early adoption of the Utah standardized criteria for reviewing perinatal suicides and accidental drug-related deaths, or random variation.¹

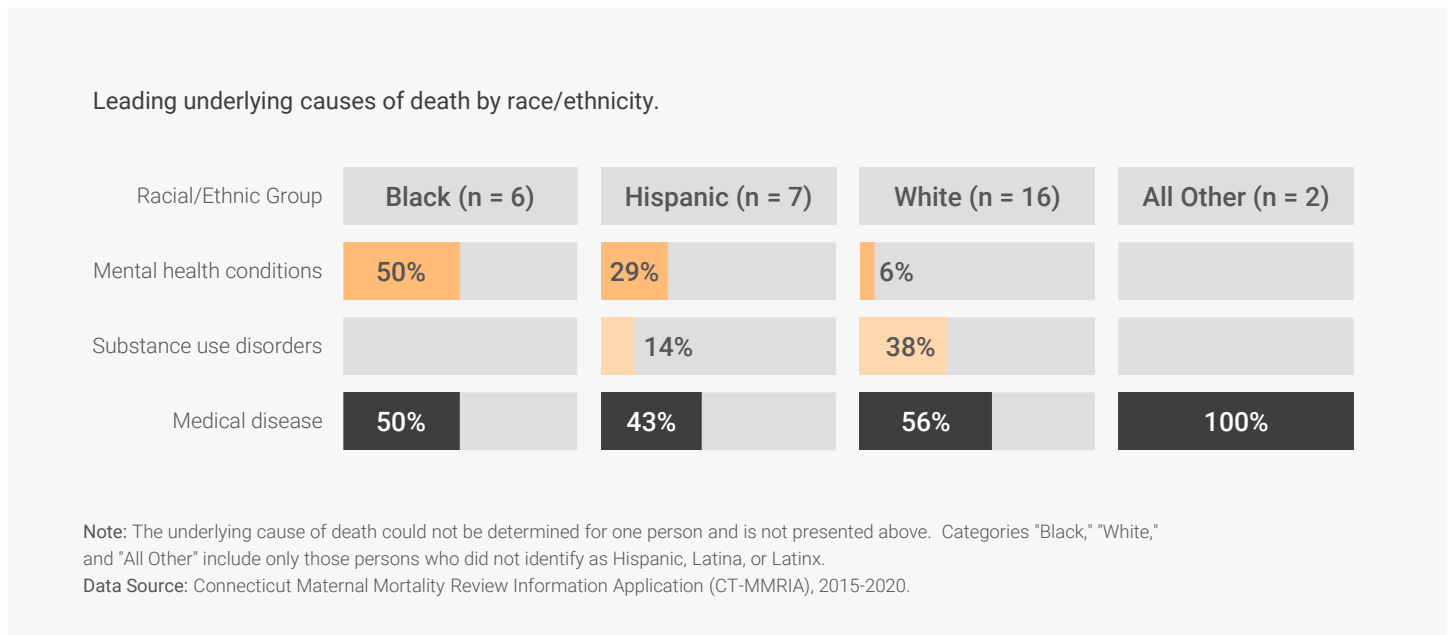
There were some differences in the underlying cause of death categories by race/ethnicity (Figure 5) and by socioeconomic status (SES). Because the number of deaths within each subgroup was small, the PRMRs were not computed for racial/ethnic groups or for groups defined by socioeconomic markers. Most notably, there were no deaths due to substance use disorder among Black persons, whereas six ($n = 6$ out of 16, 38%) White persons died from an accidental overdose or from chronic complications due to a substance use disorder. Furthermore, persons who died from substance use disorders accounted for more than a third of deaths ($n = 6$, 35%) among those who had Medicaid for insurance, but only one ($n = 1$ out of 13, 8%) death among those who had private insurance. Lastly, all seven deaths due to substance use disorder occurred among persons who had less than a Bachelor's degree at the time of death.

Manner of Death

In the period between 2015 and 2020, over half of pregnancy-related deaths were due to natural causes ($n = 17$, 55%). Just under one-fifth each were accidents ($n = 6$, 19%) and suicides ($n = 6$, 19%). The manner of death could not be determined in one case.

The manner of injury was poisoning/overdose in all six accidental deaths. Most of these decedents were White ($n = 5$, 83%), had Medicaid for insurance ($n = 5$, 83%), and had less than a Bachelor's degree at the time of death ($n = 6$, 100%). Of the six deaths by suicide, five ($n = 5$, 83%) occurred among decedents of color.

Figure 5. Underlying causes of pregnancy-related death categories by race/ethnicity in Connecticut, 2015-2020.



Disparities

Of the 31 persons whose deaths were determined to be pregnancy-related, a large majority ($n = 25, 81\%$) had less than a Bachelor’s degree at the time of death. Fewer than one-fifth of decedents ($n = 6, 19\%$), as compared with 45% of Connecticut’s residents who had a live birth in 2016-2020, had completed at least a Bachelor’s degree (Figure 6).

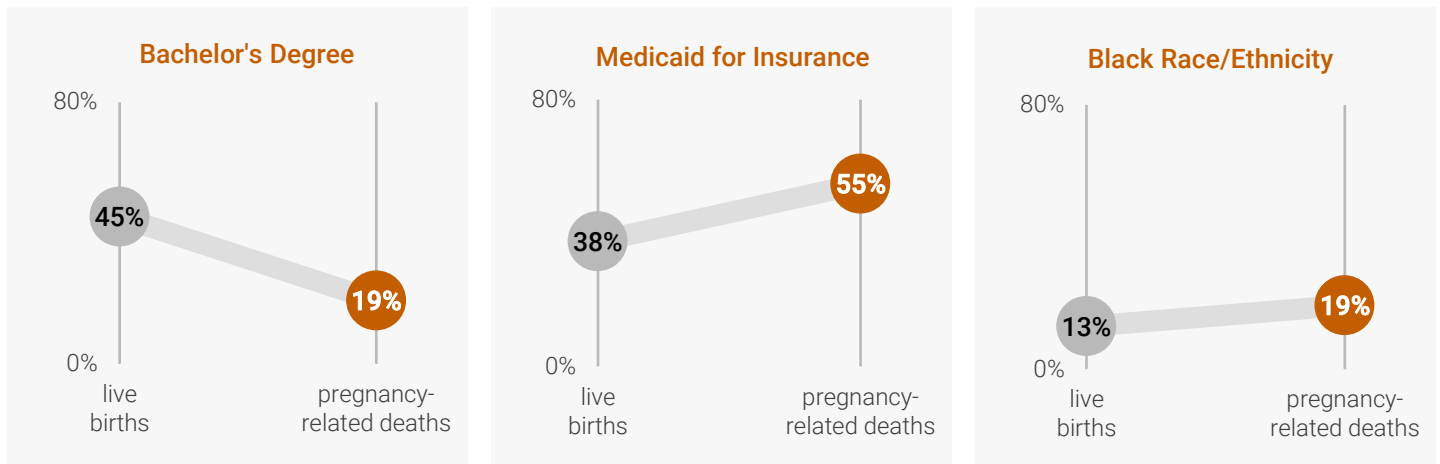
Additionally, over half of decedents ($n = 17, 55\%$) had Medicaid for insurance at delivery or during pregnancy (among those who died in pregnancy), as compared with 37.5% of Connecticut residents who had a live birth in 2016-2020 (Figure 6).

Lastly, White persons accounted for about half of decedents ($n = 16, 52\%$) and for 54.4% of live births; Hispanic/Latinx persons accounted for fewer than one-quarter of decedents ($n = 7, 23\%$) and for 24.9% of live births; Black persons

accounted for just under one-fifth of decedents ($n = 6, 19\%$), but for 12.8% of live births; and decedents of all other racial/ethnic backgrounds accounted for fewer than one-in-ten ($n = 2, 7\%$) pregnancy-related deaths in 2015-2020 and for 7.7% of live births in 2016-2020.

The observed overrepresentation of Black persons among pregnancy-related deaths, in conjunction with high levels of socioeconomic inequality, suggests that structural racism continues to play a role in maternal health and maternal mortality in Connecticut. Given the small number of cases, however, pregnancy-related mortality ratios were not computed for racial/ethnic subgroups and statistical testing was not conducted. It bears pointing out that the observed differences are consistent with other racial/ethnic health disparities in Connecticut.³

Figure 6. Disparities in pregnancy-related deaths in Connecticut, 2015-2020



Data Sources: CT DPH Vital Records Office provisional computations for 2016-2020, sent to the MMR Program on 6/21/2022, and Connecticut Maternal Mortality Review Information Application (CT-MMRIA), 2015-2020.

Circumstances of Death

For each of the 31 pregnancy-related deaths that occurred between 2015 and 2020, CT MMRC reviewed circumstances of death to determine the contribution of 1) obesity, 2) mental health conditions other than substance use disorder, and 3) substance use disorder. Per CT MMRC's decisions, obesity contributed or probably contributed to fewer than one-fifth ($n = 6$, 19%) of all pregnancy-related deaths.

Mental health conditions contributed or probably contributed to nearly half ($n = 14$, 45%) of pregnancy-related deaths: four in 2015-2017 and ten in 2018-2020.

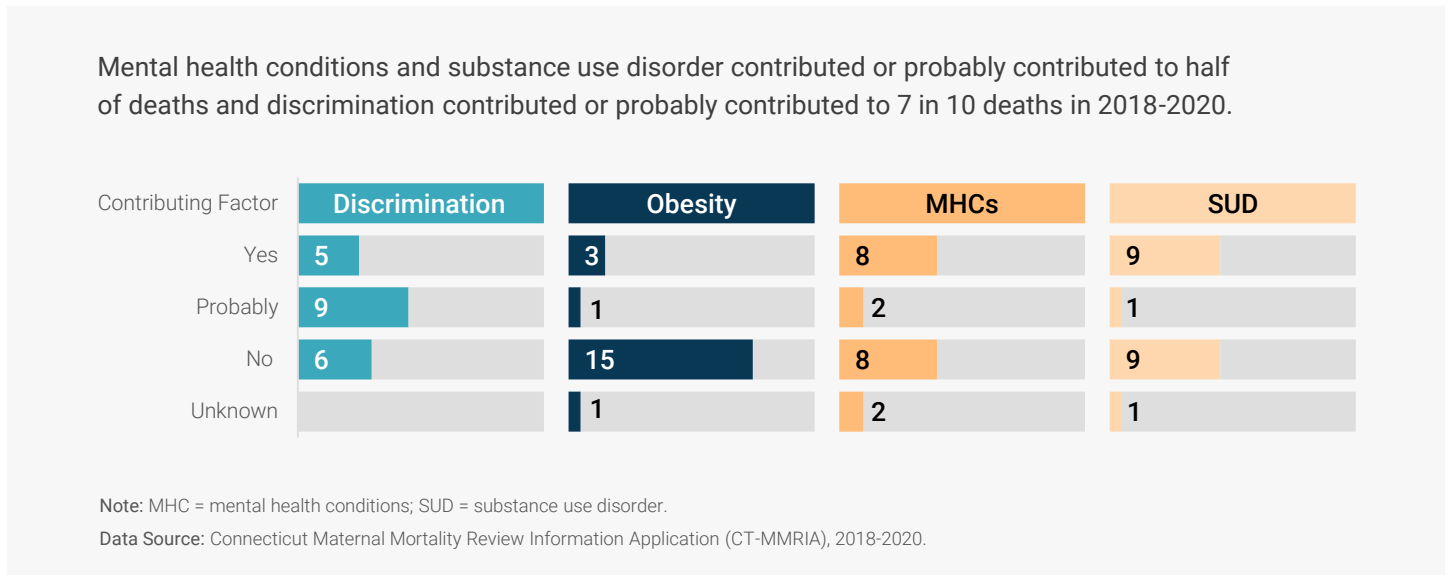
Substance use disorder contributed or probably contributed about one-third ($n = 11$, 35%) of pregnancy-related deaths, all but one of which occurred in 2018-2020.

Of note are connections between the two latter factors. Namely, substance use disorder contributed or probably contributed to ten ($n = 10$ out of 14, 71%) deaths in which other mental health conditions also played a role. Conversely, mental health conditions contributed or probably

contributed to ten ($n = 10$ out of 11, 91%) deaths in which substance use disorder was a factor.

In September 2020, the CT MMRC added to their review process consideration of discrimination (broadly defined to include interpersonal racism, structural racism, and discrimination) as a potential contributing factor, starting with deaths that occurred in 2018. Discrimination was found to have contributed or probably contributed to 14 out of 20 (70%) pregnancy-related deaths in 2018-2020. Figure 7 shows a side-by-side comparison of CT MMRC decisions about the role of discrimination and the other three contributing factors—obesity, mental health conditions, and substance use disorder—in pregnancy-related deaths in 2018-2020. Not shown on Figure 7, but important to highlight, is the finding that discrimination contributed or probably contributed to nine ($n = 9$ out of 10, 90%) deaths in which mental health conditions also played a role; nine ($n = 9$ out of 10, 90%) deaths in which substance use disorder was a factor; and two ($n = 2$ out of 6, 33%) deaths to which obesity contributed or probably contributed.

Figure 7. Factors that contributed to pregnancy-related deaths in Connecticut, 2018-2020



DISCRIMINATION

In September of 2020, the CT MMRC began including discrimination as a contributing factor as part of the review process. The Committee determined that discrimination contributed to five and probably contributed to nine pregnancy-related deaths in 2018-2020. A closer look at case narratives and discrimination forms for the five pregnancy-related deaths in which discrimination was a contributing factor revealed that race/ethnicity was the most common basis for discrimination ($n = 4$ out of 5, 80%); this was followed by income and education, substance use, single marital status, unstable housing, obesity, mental health conditions, physical disability, encounters with law enforcement, and adherence to recommended treatment. While race/ethnicity was listed as the sole factor in one case and obesity as the sole factor in another case, three of the five cases included multiple factors as potentially contributing to discrimination.

Indicators of discrimination included negative patient-provider and/or facility interactions, undertreatment or delay

in treatment, lack of care coordination and/or adequate discharge planning, language, dismissal of patient concerns, and cultural incompetence.

OBESITY

Most ($n = 5$ out of 6, 83%) deaths to which obesity contributed or probably contributed in 2015-2020 were determined by the CT MMRC to be preventable. Preventability determination could not be made in one instance. Medical disease was the underlying cause of death in all six cases. Categories of disease accounting for these deaths included cardiovascular conditions, VTE, hematologic conditions, and pulmonary conditions. Four ($n = 4$ out of 6, 67%) deaths to which obesity contributed occurred in the late postpartum period (43-365 days after the end of pregnancy).

MENTAL HEALTH CONDITIONS

Mental health conditions other than substance use disorder contributed or probably contributed to nearly half ($n = 14$, 45%) of pregnancy-related deaths in 2015-2020. Five of these deaths occurred during pregnancy, and nine occurred in the

late postpartum period, on average nine months after the end of pregnancy. All 14 deaths were determined to be preventable.

Figure 8 shows a simplified timeline of care provided to these decedents, and more importantly, missed opportunities for mental health screening, referral, and treatment. To start with, all but one ($n = 13$ out of 14, 93%) decedents had documented mental health conditions prior to the index pregnancy. Nearly two-thirds ($n = 9$, 64%) had received some form of mental health treatment before the index pregnancy. Even so, of the ten persons who sought prenatal care, only two were screened for mental health concerns and only two were referred for mental health treatment by their prenatal care provider.

Available documentation suggests that roughly half ($n = 8$ out of 14, 57%) of those to whose deaths mental health conditions contributed received some form of mental health treatment prenatally. This included medication in outpatient settings ($n = 4$, 29%), outpatient therapy or counseling ($n = 3$, 21%), residential treatment ($n = 2$, 14%), and inpatient psychiatric treatment ($n = 2$, 14%). Of those who were treated prenatally in outpatient settings, only two received both medication and therapy/counseling.

Similarly, about half ($n = 5$ out of 9, 55%) of those who died in the postpartum period received some form of mental health treatment in the postpartum period. This included medication in outpatient settings ($n = 3$, 33%), inpatient treatment ($n = 1$, 11%), and residential treatment ($n = 1$, 11%). Per available records, none of the decedents received outpatient counseling or therapy in the postpartum period.

All five persons who died during pregnancy had some form of contact with the medical system in the weeks preceding their death. One was not screened for mental health concerns by their prenatal care provider or by ED staff. This person was

hospitalized during an ED visit and was seen by a social worker because of substance use. Although a history of mental health conditions emerged during this consultation, and the person was discharged with a prescription for psychotropic medication, they were neither connected to mental health services in an outpatient setting nor was their prenatal provider contacted. The person died by suicide a couple of weeks after this hospitalization.

Of those who died during pregnancy, three additional persons had a substance use disorder along with other mental health conditions. None of these decedents accessed prenatal care. One screened positive for mental health concerns at an ED visit but was not referred presumably because they were already in mental health treatment. Another person was brought to ED by ambulance and then transferred to an inpatient psychiatric unit at a hospital because of apparent disorientation and confusion. Yet another person screened negative for mental health concerns at an ED visit and was not referred to treatment. All three of these decedents died from an overdose early in pregnancy. Lastly, one person who died in pregnancy resided in a congregate care facility. Although this person received psychotropic medication, they were not successfully engaged in mental health treatment and they died by suicide during pregnancy.

Factors contributing to the five deaths that occurred during pregnancy included lack of referrals (ie, lack of policies on following up with patients, lack of provider knowledge about available resources and how to access them, and lack of resources in the community); discrimination and structural racism; failures in care coordination; inconsistent screening; lack of communication between ED and prenatal care providers; lack of provider knowledge on safety planning and wraparound services; trauma and unstable housing.

Among nine persons who died in the postpartum period, six ($n = 6$ out of 9, 67%) were screened for mental health

MATERNAL MORTALITY IN CT

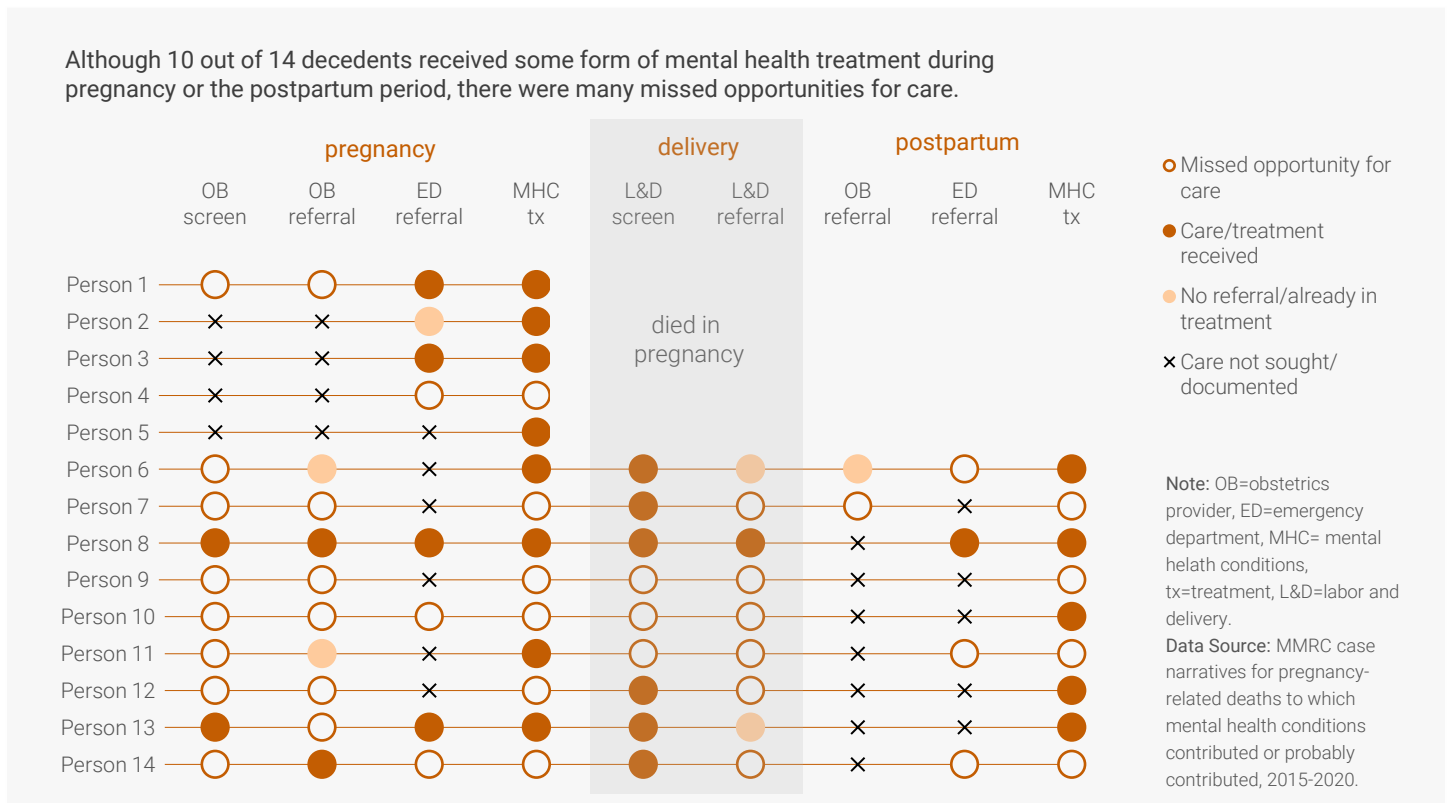
conditions during their labor and delivery hospitalization, and three ($n = 3, 33\%$) were not. One was referred for mental health treatment; two were not referred presumably because they were already in treatment; three were neither screened nor referred; and three were screened but received no referrals for therapy or counseling despite a positive screen for anxiety in one instance, being tired and stressed out in another instance, and being on psychotropic medication in a third instance.

Postnatal obstetric records were available for two persons, both of whom were screened for mental health conditions. Neither person was referred for mental health treatment: one, possibly, because they were already in treatment, and the other, presumably, because a brief counseling session by their perinatal care provider was deemed sufficient.

Four ($n = 4$ out of 9, 44%) decedents visited the ED postnatally. Of those, one screened negative for mental health concerns and was not referred for treatment; one was not referred despite screening positive for mental health concerns; one was neither screened nor referred; and only one was screened and referred for mental health treatment.

Most of the factors contributing to these deaths pertained to healthcare facilities, providers, and systems of care. They included lack of continuity of care/care coordination, lack of referrals, inconsistent screening, and lack of knowledge about perinatal depression, cooccurring disorders, and wrap-around services. Social support/isolation was the most commonly-noted factor at the level of community, and unstable housing was the most frequent factor at the level of systems of care.

Figure 8. Missed opportunities for care among pregnancy-related deaths to which mental health conditions contributed or probably contributed, Connecticut, 2015-2020



SUBSTANCE USE DISORDERS

Substance use disorders contributed or probably contributed to about one-third ($n = 11$, 35%) of pregnancy-related deaths, all of which were determined by the CT MMRC to be preventable. Four deaths occurred during pregnancy, and seven deaths occurred in the postpartum period, on average 8 months after the end of pregnancy.

Figure 9 shows a simplified timeline of engagement in treatment, or lack thereof, for each decedent. Nine persons ($n = 9$ out of 11, 82%) had a documented substance use disorder or problems with substance use before the index pregnancy; little information was available about one person; and no substance use before the index pregnancy was documented for one person. Available records suggest that four ($n = 4$ out of 11, 36%) decedents received some form of substance use treatment before pregnancy.

There was documentation of prenatal care for seven ($n = 7$ out of 11, 64%) decedents. All seven were screened for substance use by their obstetric provider at least once prenatally. Of these, four screened positive at least once, and three had no positive screens. Prenatal care providers referred two persons for substance use treatment; two persons were already in treatment and did not receive a referral; and the three persons without positive screens were not referred to treatment.

Six ($n = 6$ out of 11, 55%) decedents visited an ED at least once during pregnancy. All six were screened for substance use during at least one ED visit, and four were referred for substance use treatment. Of the two who were not referred, one reported that they had been clean for the few months at each of several ED visits, and one indicated a lack of interest in detox services.

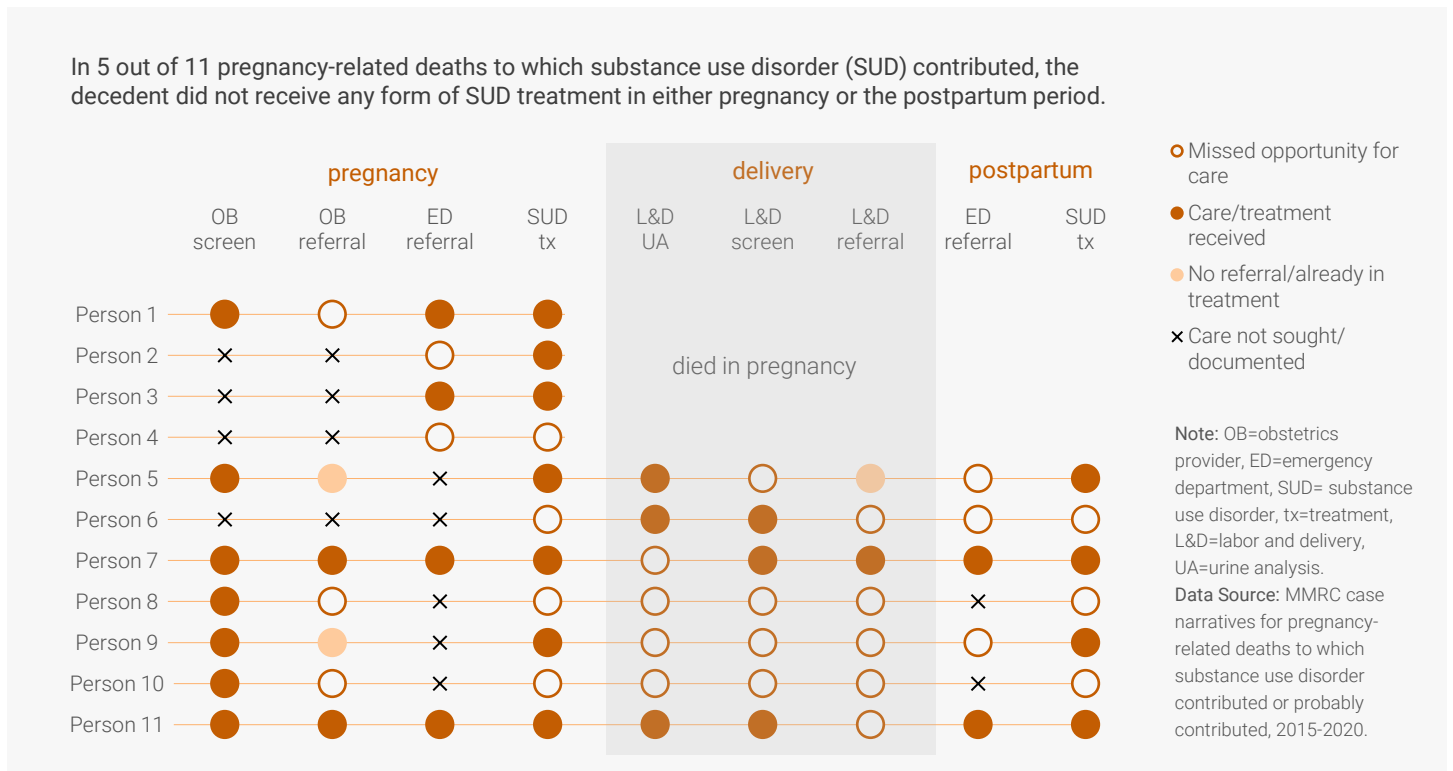
Nearly two-thirds ($n = 7$ out of 11, 64%) of decedents received some form of substance use treatment prenatally,

including medication in an outpatient setting ($n = 4$, 36%), outpatient therapy ($n = 1$, 9%), residential treatment ($n = 1$, 9%), and inpatient treatment ($n = 1$, 9%). It is important to emphasize that only one person received both medication and talk therapy.

Among the seven decedents who were hospitalized for labor and delivery, four ($n = 4$, 57%) were screened either verbally or via urine analysis, and three ($n = 3$, 43%) were not screened. Four decedents with positive screens were referred to Child Protective Services, but only one of them was referred to substance use treatment. Only four ($n = 4$ out of 7, 57%) decedents received some form of substance use treatment in the postpartum period, including medication in an outpatient setting ($n = 3$, 43%), residential treatment ($n = 1$, 14%), and inpatient treatment ($n = 1$, 14%).

A closer read of case narratives reveals three approaches to substance use disorder treatment (employed by some medical providers) that may be problematic. The first is the idea that telling patients to stop using drugs would achieve the desired effect. For example, one medical record contained a note indicating that the patient had been counseled by ED staff on the importance of avoiding drugs. The patient in question was not referred to substance use disorder treatment during this ED visit. The second approach appears to be based on prioritizing the worth and well-being of an unborn child over that of the parent. For example, a psychiatrist documented in one instance that the patient was to be given a chance at inpatient treatment because medical staff needed to protect the fetus. Lastly, there appears to be a relatively pervasive assumption among medical providers that those in the throes of addiction would have the agency to seek treatment on their own. Five case narratives show not only failures in care coordination but also gaps in treatment, such that patients were discharged from hospital with instruction to follow up with an outpatient provider the next day, or in some instances, several days afterward.

Figure 9. Missed opportunities for care among pregnancy-related deaths to which substance use disorder contributed or probably contributed, Connecticut, 2015-2020



Living Situations

US Department of Health and Human Services has identified *Neighborhood and Built Environment* as one of five core areas of social determinants of health.⁴ *Neighborhood and Built Environment* includes housing (stability, condition, affordability), neighborhood (safety/violence, access to food, health care, education, public transportation), and environment (water and air quality, noise, outdoor spaces).⁴ Housing instability is a broad term that covers multiple living situations, including having to move frequently, staying with relatives or friends, living in overcrowded conditions, experiencing difficulty with paying rent, being homeless, or living with the threat of eviction.⁵ Housing stability and affordability, housing conditions, and housing location have been increasingly associated with maternal health.⁵ Unstable housing has been identified as a contributing factor to maternal mortality and homelessness has been linked to an increase in physical complications of pregnancy,⁶ as well as anxiety, depression, and postpartum depression.^{7,8} Some populations are more likely to experience housing instability, including those who have been incarcerated,⁴ those with serious mental health conditions and/or substance use disorders, and people of color.⁷

The following analysis focuses on persons who experienced unstable housing, incarceration, or congregate care, among those who died from a pregnancy-related death in 2018-2020. The analysis is limited to the period between 2018 and 2020, because the MMR program did not conduct systematic searches of newspaper articles, social media, and judicial records for deaths that occurred in 2015-2017.

Unstable Housing

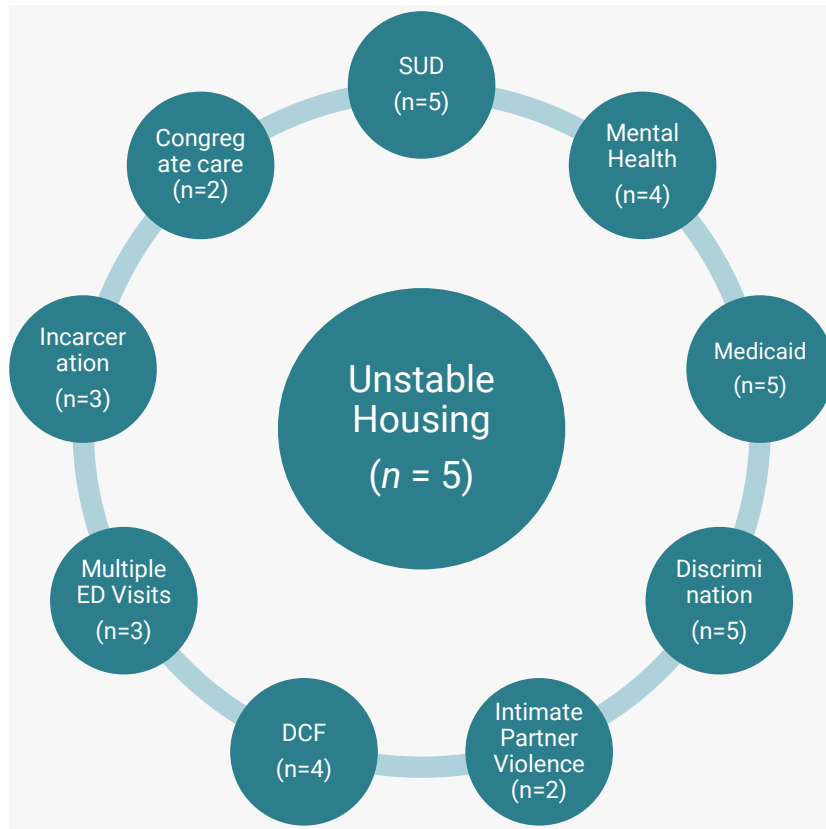
Unstable housing was a factor in one-quarter ($n = 5$, 25%) of pregnancy-related deaths in 2018-2020. A qualitative analysis of these case narratives by two program evaluators from

Partners in Social Research revealed various living situations among these five pregnancy-related deaths in which unstable housing was a factor.

In one case, a person refused to leave the ED after discharge, stating they had nowhere to go and requesting detox. Records indicate that they were given food and a prescription for pain medication before their relative was called to pick them up from the ED. This person died by suicide a couple of months later, in the late postpartum period. Another person was brought to the ED from a women's shelter a few weeks after delivery. Yet another reported lack of shelter when entering the ED during pregnancy. After being medicated for a psychiatric disorder and stabilized, they died due to an overdose on the day of discharge. One person had experienced intermittent homelessness and was living with a family member at the time of death from an overdose in the late postpartum period. Another revealed they were homeless during pregnancy and had been kicked out of their family's home during the postpartum period.

Case narratives of these five pregnancy-related deaths reflect what appears to be a complex set of circumstances and difficulties among those who experienced unstable housing. Mental health conditions and substance use disorders were pervasive. CT MMRC determined that mental health conditions contributed to at least four of these deaths. No mental health screenings were completed during pregnancy or postpartum in the fifth case, therefore it was not possible to determine mental health status. Substance use disorder was noted prior to pregnancy in all five cases, with four out of five continuing to use substances during pregnancy. Two requested detox during ED visits. Two had been in congregate care at some point in their lives. In all cases of live birth ($n = 4$ out of 5, 80%), DCF was involved at delivery and the infant was placed in foster care due to the mother's

Figure 10. Unstable housing correlates, Connecticut, 2018-2020



substance use. In one of these cases, there had been no positive drug tests during pregnancy and DCF was mistakenly involved due to a recent history of substance use disorder.

The impact of mental health conditions and substance use disorders is further evidenced by the causes of death, which were determined to be accidental overdose in three cases, mental health conditions in one case, and medical disease in another case. CT MMRC determined that death was preventable in four out of five of these cases.

Several of those who experienced unstable housing also lacked adequate prenatal care. One who died shortly after discovering they were pregnant had no prenatal care; another had only one prenatal visit, and yet another had only two prenatal visits. There were seven and eleven prenatal visits

recorded in the other two cases. Three people died between 43 and 365 days postpartum, and one died between 7 and 42 days postpartum.

While there is no available information on decedents' income, other characteristics, including education levels, health insurance, and occupation, serve as indicators of SES. Three persons had completed high school, one had some high school, and one had some college education. All five persons were insured by Medicaid. Three were not employed at the time of death, and two were employed as service workers. CT MMRC determined that discrimination contributed or probably contributed to all five deaths.

Multiple ED visits were noted in three cases; one person visited an ED two times during pregnancy and five times during postpartum, another visited an ED five times during pregnancy and six times during postpartum. IPV was documented as having been an issue at some point in two cases.

Incarceration

Arrest and/or incarceration was a factor in one-fifth ($n = 4$, 20%) of pregnancy-related deaths in 2018-2020. Arrest resulted in incarceration in three out of the four pregnancy-related cases. One person had experienced carceral pregnancy before being released and entering prenatal care. The other two experienced incarceration just before the index pregnancy. A closer look at these three cases reveals a similar pattern of life circumstances as those who experienced unstable housing. In fact, two of the three cases were included in the above analysis of unstable housing.

All three persons had mental health conditions other than substance use disorder before pregnancy, and CT MMRC determined that mental health conditions contributed or probably contributed to all three deaths. Substance use disorder was present in all three cases prior to pregnancy, and two persons continued use during pregnancy. Two persons had been in congregate care at some point in their lives. CT MMRC determined that substance use disorder contributed to the death and accidental overdose was the cause of death in all three cases. CT MMRC determined in all three cases that death was preventable.

Again, while there is no available information on income, education levels, health insurance, and occupation may serve as indicators of SES. One person had completed high school, one had some high school, and one had some college education. All three persons were insured by Medicaid. One person was not employed at the time of death, and two were employed as service workers. CT MMRC determined that discrimination contributed or probably contributed to all three deaths.

Screening for IPV was negative in one case. No screening was completed in another case despite multiple ED visits (five during pregnancy and six during postpartum) and the person reporting during an ED visit that they had taken out a restraining order against a boyfriend. In the final case, an IPV screening was completed and was positive. DCF involvement and unstable housing were present in two cases.

Congregate Care

Those who experienced congregate care also struggled with difficult life circumstances, overlapping with unstable

housing and incarceration, reflecting a level of vulnerability in relationship to maternal health and mortality.

Between 2018 and 2020, there were four pregnancy-related deaths among those with a history of congregate care. Congregate care facilities included group homes and residential treatment facilities for those with substance use disorders. Two had experienced unstable housing and were included in the analysis above.

Mental health conditions other than substance use disorder played a role in all four deaths. All four had a history of mental health conditions, and CT MMRC determined that mental health conditions contributed or probably contributed to these deaths. The manner of death was suicide in two cases.

Substance use disorder was present prior to pregnancy for all four persons, two of whom continued to use substances during pregnancy. CT MMRC determined that substance use disorder contributed to three of these cases, and it was unknown whether it contributed to the fourth. The manner of death was accidental overdose in two cases.

Education levels and insurance suggest low SES for all four decedents. Two had completed high school, one had some high school, and one had some college education. All four persons were insured by Medicaid. CT MMRC determined that discrimination contributed or probably contributed to all four deaths.

Contextual Sociospatial Indicators

Contextual sociospatial indicators (eg, low birth weight infants, unemployment, food insecurity, lower income neighborhoods, obesity, level of education, proportion of African American mothers) have been associated with maternal mortality ratios in a number of studies.^{9,10} This includes a study of counties across the US in which higher pregnancy-related mortality ratios were associated with low birth weight infants, food insecurity, and unemployment; and lower pregnancy-related mortality ratios were associated with higher median household incomes, percentages of college-educated adults, and owner-occupied households. While these associations don't provide evidence of a causal relationship, they do support the hypothesis that environmental context makes a difference in perinatal outcomes.⁹ Similar patterns emerge when a contextual sociospatial framework is applied to incidents of maternal mortality in Connecticut.

The Five Connecticut^{3,11} is a system that groups Connecticut's 169 towns as belonging to one of five categories based on similarity in median household income, population density, and poverty rate. The categories include Wealthy, Suburban, Rural, Urban Periphery, and Urban Core. When the *Five Connecticut* system is applied to available data, ie, live births between 2016 and 2020, a pattern emerges that suggests those living in Urban Core and Rural towns may be at greater risk for adverse health outcomes. Urban Core towns, especially, are higher than other towns on the percentage of residents whose delivery was paid by Medicaid and who received WIC benefits during pregnancy, but also lower on the percentage of mothers with at least a Bachelor's degree—all indicators of lower SES, as depicted in Figure 11. Additionally, there is some evidence that the residents of Urban Core and Rural towns may be over-represented among pregnancy-related deaths in 2015-2020 (Figure 11), although PRMRs were not

computed because of a small number of deaths within each subgroup.

Additional evidence of disparities is revealed when Connecticut towns are ranked on contextual sociospatial indicators and grouped into quartiles (Appendix A). Among towns with at least one pregnancy-related death in 2015-2020, more than half were in the highest quartile with respect to the birth rate per 1,000 population and the percentage of residents of color, but in the lowest quartile with respect to the percentage of White persons, native English language speakers, and US-born mothers.

Furthermore, at least half of towns with at least one pregnancy-related death were in the highest quartile with respect to the indicators of low SES—the percentage of unemployed residents, persons without health insurance, persons whose delivery was paid by Medicaid, mothers who received WIC benefits during pregnancy, and households that received SNAP. Conversely, at least half of these towns were in the lowest quartile on median household income, which ranged between \$36,278 in the lowest-ranking town and \$190,277 in the highest-ranking town, as well as on per capita income, which ranged between \$21,061 and \$118,833 in 2015-2019 (Appendix A).

Lastly, at least half of towns in which pregnancy-related deaths occurred were in the highest quartile with respect to indicators of difficulties in social functioning and reproductive health, including the percentage of single-parent households, teen birthrate per 1,000 females age 15-19, violent crime rate per 1,000 population, and drug arrests rate per 1,000 population (Appendix A).

About four in ten towns in which pregnancy-related deaths occurred in 2015-2020 ($n = 13$, 42%) were in the highest

quartile on at least five out of nine SES indicators (with reverse-coded ranks for three indicators to facilitate comparison) and on at least two out of four indicators of social functioning and reproductive health. These included five out of six Urban Core towns, seven out of 30 Urban Periphery towns, and one rural town.

It is also interesting to note that six towns in which pregnancy-related deaths occurred were in the highest quartile on all nine SES indicators and on all four indicators of social functioning and reproductive health—four of these were Urban Core towns and two were Urban Periphery towns. Notably, these towns were also in the highest quartile on the percentage of residents of color, and in particular Black residents, and in the lowest quartile on the percentage of White residents, native English language speakers, and US-born mothers.

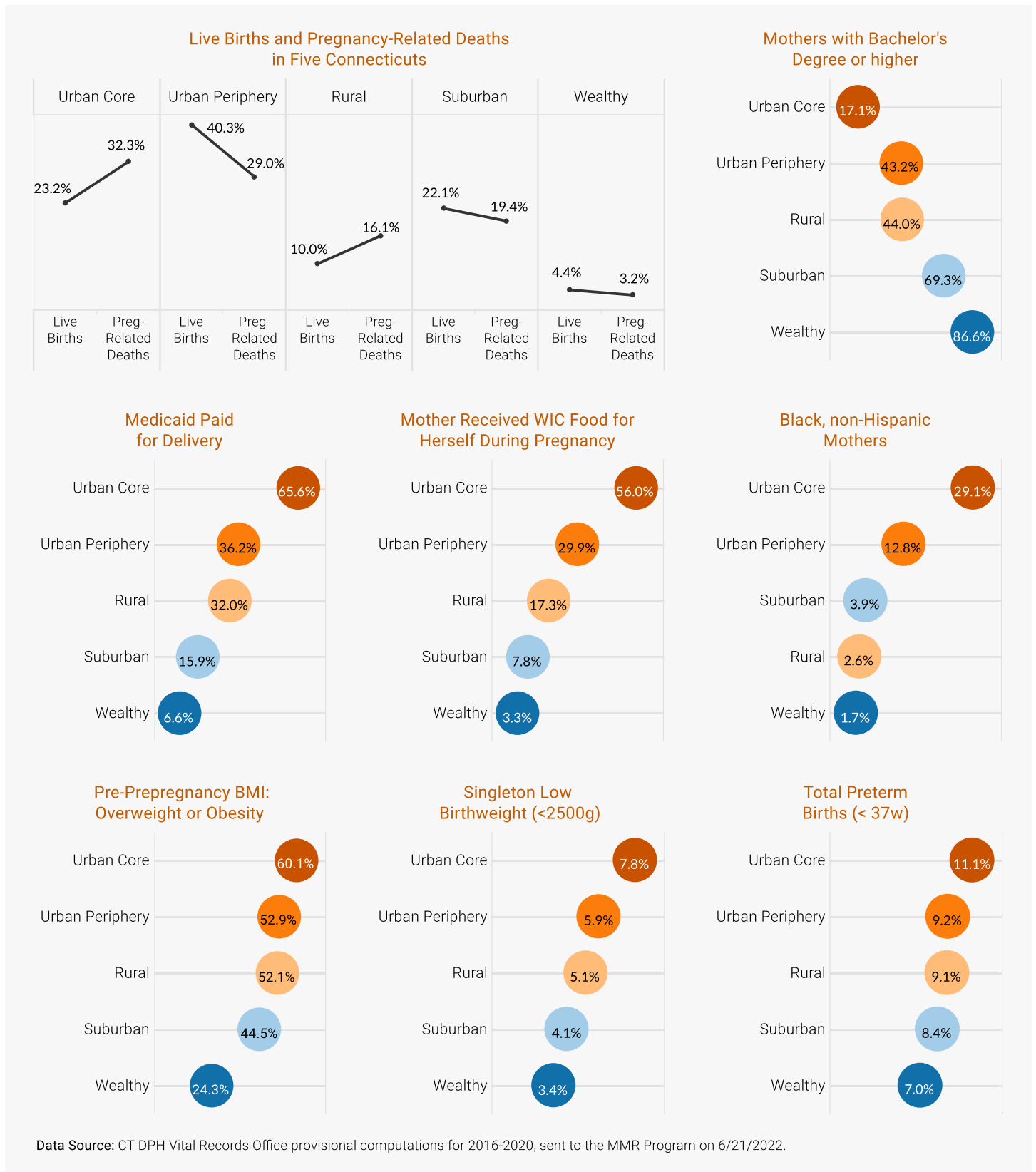
Put in other terms, among towns in which pregnancy-related deaths occurred, all Urban Core towns were in the highest quartile in relationship to all, or nearly all, indicators of risk, and all Urban Periphery towns were in the highest quartile on most indicators of risk.

Overall, these findings support the Restoring our Own Through Transformation (ROOTT) theoretical framework¹² that clusters uneven distribution of income, education,

housing, safety, food, and access to care to reveal an interconnected web of structural and social causation in relationship to Black maternal health. This web is maintained by structural racism, including institutional policies and practices.

Similarities and differences emerge when data on contextual sociospatial indicators is sorted by towns using the *Five Connecticut*s versus quartile framework. As expected, residents of Urban Core towns appear to be overrepresented among pregnancy-related deaths. Residents of rural towns are also overrepresented among pregnancy-related deaths; however, rural towns do not rank in the higher quartiles of risk factors. Similarly, residents of Urban Periphery appear to be underrepresented among pregnancy-related deaths, yet many of these towns are in the high quartiles relative to risk factors. There are several possible explanations for divergent results. Addresses associated with persons who experienced pregnancy-related deaths may not be accurate. For example, those who are homeless may give a parent's address when filling out forms, or a "last known" address may be used in some records. Most importantly and thankfully, the data does not allow conclusions to be made with certainty given the small numbers of pregnancy-related deaths across towns in Connecticut.

Figure 11. Connecticut's contextual sociospatial indicators



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Appendix A: Connecticut Towns

	CT Towns with Pregnancy-Related Deaths in 2015-2020								All CT Towns	
	Q1		Q2		Q3		Q4		min	max
	n	%	n	%	n	%	n	%		
Population Density Per Sq. Mile	1	4.1%	5	20.8%	8	33.3%	10	41.6%	176.0	9,024.9
Birth Rate Per 1,000 Population	1	4.1%	4	16.6%	5	20.8%	14	58.3%	6.3	14.6
Pct Black Persons	2	8.3%	3	12.5%	6	25.0%	13	54.1%	0.1	37.6
Pct Hispanic Persons	3	12.5%	2	8.3%	6	25.0%	13	54.1%	1.4	44.3
Pct White Persons	13	54.1%	6	25.0%	2	8.3%	3	12.5%	14.8	95.8
Pct Native English Speakers	13	54.1%	4	16.6%	3	12.5%	4	16.6%	50.3	96.4
Pct US-Born Mothers	14	58.3%	4	16.6%	2	8.3%	4	16.6%	0.4	1.0
Socioeconomic Status										
Pct Mothers with a Bachelor's Degree*	11	45.8%	5	20.8%	3	12.5%	5	20.8%	0.1	0.9
Pct Unemployed Persons	3	12.5%	4	16.6%	5	20.8%	12	50.0%	5.3	13.3
Pct Persons Without Health Insurance	3	12.5%	6	25.0%	3	12.5%	12	50.0%	1.4	16.3
Pct Medicaid Paid for Delivery	5	20.8%	3	12.5%	3	12.5%	13	54.1%	0.1	0.7
Pct Persons Living Below Poverty	4	16.6%	6	25.0%	2	8.3%	12	50.0%	2.5	28.1
Pct Mothers Receiving WIC in Pregnancy*	4	16.6%	4	16.6%	2	8.3%	14	58.3%	0.0	0.6
Pct Households Receiving SNAP	4	16.6%	4	16.6%	2	8.3%	14	58.3%	1.8	38.8
Median Household Income	13	54.1%	1	4.1%	4	16.6%	6	25.0%	\$36,278	\$190,227
Per Capita Income	12	50.0%	5	20.8%	5	20.8%	2	8.3%	\$21,061	\$118,833
Social Functioning and Reproductive Health										
Pct Single-Parent Households	4	16.6%	4	16.6%	3	12.5%	13	54.1%	10.4	63.1
Teen Birthrate Per 1,000 Females Age 15-19**	5	20.8%	2	8.3%	5	20.8%	12	50.0%	0.1	26.4
Violent Crime Rate Per 1,000 Population	3	12.5%	4	16.6%	4	16.6%	13	54.1%	9.7	895.3
Drug Arrests Rate Per 1,000 Population	4	16.6%	3	12.5%	4	16.6%	13	54.1%	1.2	76.5
Prenatal Care and Outcomes										
Pct Low Birthweight Births (Singletons)*	2	8.3%	6	25.0%	5	20.8%	11	45.8%	0.0	0.1
Pct Mothers Who Were Overweight/Obese*	3	12.5%	3	12.5%	7	29.1%	11	45.8%	0.2	0.6
Pct Prenatal Care Starting in 1st Trimester*	12	50.0%	4	16.6%	2	8.3%	6	25.0%	0.8	0.9

Data Sources: *CT DPH Vital Records Office provisional computations for 2016-2020, sent to the MMR Program on 6/21/2022. **CT DPH Vital Records Office Registration Reports for 2015-2019. Connecticut Data Collaborative (<http://data.ctdata.org/organization>) data from the American Community Survey (ACS) 5-Year estimates for 2015-2019, the Connecticut Department of Emergency Services and Public Protection for 2016 and 2017, the Connecticut Department of Labor for 2020, the Connecticut Department of Economic and Community Development.

Appendix B: CT MMRC Recommendations

Providers & Staff

Increase Provider Education

The MMRC recommends that:

- 1) The Connecticut Perinatal Quality Collaborative (CPQC) and Connecticut Hospital Association (CHA) offer, through the Alliance for Innovation on Maternal Health (AIM) Hypertension (HTN) bundle, provider training to increase awareness of health care needs, follow-up, and the significance of hypertensive disorders among pregnant and postpartum persons.
 - a. CPQC and CHA provide obstetrics and gynecology providers with education about the importance of ensuring a referral to primary care providers, both during pregnancy and in the postpartum period, for persons with high blood pressure during pregnancy.
 - b. CPQC and CHA educate primary care providers regarding the significance of high blood pressure during pregnancy and the importance of following up after delivery with patients who have high blood pressure during pregnancy.
- 2) Department of Public Health (DPH) coordinate the development or improvement of an existing web-based point of access portal for primary care providers and obstetrics and gynecology providers to identify where to refer patients to community resources such as, but not limited to, mental health treatment, substance use treatment programs, and home visiting programs.
- 3) CSMS and CHA provide training for emergency department providers to raise awareness on how to make referrals for substance use and mental health treatment for pregnant and postpartum persons.
- 4) CHA in partnership with birth hospitals provide ongoing training to obstetrics and gynecology providers on appropriate treatment for substance use during pregnancy.
- 5) CSMS and CHA in partnership with birth hospitals provide training to educate emergency department providers on the significance of Group A Strep in pregnant and postpartum persons.
- 6) CSMS and CHA educate providers about checking prescription drug monitoring programs and patients' substance use history before prescribing opioids.
- 7) Promote CDC's *Hear Her* campaign to obstetricians and other obstetrics providers, hospital obstetrics units, and emergency departments.*
- 8) The Connecticut Coalition Against Domestic Violence (CCADV) provide trainings to MMRC members on intimate partner violence (IPV).*

- 9) MMRC subcommittee consisting of CCADV, DPH, and CSMS provide education to obstetric providers on available evidence-based screening tools for IPV, perinatal depression, and substance use disorder, and also available resources.*
- 10) MMRC subcommittee consisting of CCADV, DPH, and CSMS provide education in hospitals to emergency department and social work staff as well as to obstetrics offices on indicators of IPV.*

Care Systems and Hospitals

Develop Medical Care (Provider) Protocols

The MMRC recommends that:

- 11) MMRC members lobby for an increased capacity of mobile crisis services to ensure 24/7 access.
- 12) CPQC, CHA, and birth hospitals ensure, via AIM venous thromboembolism (VTE) bundle, that hospital discharge plans provide education to patients on the importance of mobility following cesarean sections, as well as risks associated with immobility, and that providers are prescribing and documenting the use of anticoagulation and pneumatic compression boots for birthing persons at risk of VTE, including persons who have had cesarean sections and those who have had prolonged immobility.
- 13) CHA and hospitals work to flag all critical lab reports collected in emergency departments with panic values to ensure results are reported promptly to ordering providers and/or primary care providers.
- 14) CT MMR program staff develop a patient safety bundle for pregnant and postpartum persons with mental health disorders other than substance use disorder.

Improve Care Systems (Hospital) Protocols

The MMRC recommends that:

- 15) CPQC ensure all birth hospitals have a policy in place about when to consult with maternal-fetal medicine.
- 16) CHA, hospitals, and physician offices work to implement policies about screening consistently for social determinants of health – including, at a minimum, intimate partner violence, perinatal depression, and adverse childhood experiences – at initial emergency department and obstetrics and gynecology visits, over the course of pregnancy, and in the postpartum period.
- 17) CHA and hospitals ensure policies are in place to provide discharge summaries and discharge instructions to primary care physicians, pediatricians, and treating obstetrics and gynecology providers.

Community Context

Improve Coordination of Care and Community Collaboratives

The MMRC recommends that:

- 18) The Human Services Committee, Women and Girl's Subcommittee propose a legislative mandate for all home visiting programs in Connecticut to enroll all birthing persons prenatally.

- 19) The American College of Obstetricians and Gynecologists (ACOG) chapter in Connecticut provide ongoing training to educate obstetrics and gynecology providers about the importance of collaborating with home visiting programs to ensure outreach to pregnant persons when there is a lapse in prenatal care.
- 20) The Office of Early Childhood (OEC) home visiting program conduct outreach to all obstetrics and gynecology providers to increase awareness about services offered through home visiting and how to refer patients.

State Policies, Resources & Standards

Broader Level (State and Community) Supports

The MMRC recommends that:

- 21) Department of Children and Families (DCF) provide support to all parents who are undergoing removal of a child and send a report to the patient’s obstetric provider.
- 22) Hospital social workers be involved with cases where the child is being removed and develop a postpartum plan and send it to the obstetric provider.
- 23) Hospital social workers provide parents with contact information for therapists and counselors when there is consideration for child removal or a temporary hold on infant discharge.
- 24) MMRC members lobby for increased inpatient psychiatric capacity in Connecticut.
- 25) MMRC members lobby for congregate care housing for pregnant and postpartum persons with mental health disorders other than substance use disorder.
- 26) Department of Social Services (DSS) consider extending Medicaid coverage to one year postpartum.*
- 27) DSS improve access to same day long-acting contraception in Federally Qualified Health Centers by adjusting Medicaid reimbursement.*

* The committee issued 6 recommendations in September 2020 and 21 recommendations in October 2021. Recommendations from September 2020 are marked with an asterisk; they were included in the Committee’s first annual report, in December 2020, and are reprinted here for the sake of reference.

Appendix C: Connecticut Legislation

Sec. 19a-59h. Maternal mortality review program. Confidentiality of information. (a) As used in this section and section 19a-59i, “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) A hospital shall provide the department with access, including remote access, to the entirety of a patient’s medical record, as the department deems necessary, to review case information related to a maternal death case under review by the program. Such remote access shall be provided on or before October 1, 2022, if technically feasible. All personal information obtained from the medical record shall not be divulged to anyone and shall be held strictly confidential pursuant to section 19a-25 by the department.

(e) All information obtained by the department for the maternal mortality review program shall be confidential pursuant to section 19a-25.

(f) Notwithstanding subsection (e) of this section, the department may provide the maternal mortality review committee, established pursuant to section 19a-59i, with information as is necessary, in the department’s discretion, for the committee to make recommendations regarding the prevention of maternal death.

Sec. 19a-59i. Maternal mortality review committee. (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.

APPENDICES

(c) The maternal mortality review committee may include, but need 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 who specializes in obstetrics and gynecology, appointed by the Connecticut State Medical Society;
 - (2) A physician licensed pursuant to chapter 370 who is a pediatrician, appointed by the Connecticut State Medical Society;
 - (3) A community health worker, appointed by the Commission on Women, Children, Seniors, Equity and Opportunity;
 - (4) A nurse-midwife licensed pursuant to chapter 377, appointed by the Connecticut Nurses Association;
 - (5) A clinical social worker licensed pursuant to chapter 383b, appointed by the Connecticut Chapter of the National Association of Social Workers;
 - (6) A psychiatrist licensed pursuant to chapter 370, appointed by the Connecticut Psychiatric Society;
 - (7) A psychologist licensed pursuant to chapter 20-136, 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 19a-59h 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.
- (e) Not later than January 1, 2022, and annually thereafter, the maternal mortality review committee shall submit a report of disaggregated data, in accordance with the provisions of section 19a-25, regarding the information and findings obtained through the committee's investigation process to the joint standing committee of the General Assembly having cognizance of matters relating to public health, in accordance with the provisions of section 11-4a. Such report may include recommendations to reduce or eliminate racial inequities and other public health concerns regarding maternal mortality and severe maternal morbidity in the state.

(f) All information provided by the department to the maternal mortality review committee shall be subject to the provisions of section 19a-25.

(g) Not later than January 1, 2023, the maternal mortality review committee shall develop educational materials regarding:

(1) The health and safety of pregnant and postpartum persons with mental health disorders, including, but not limited to, perinatal mood and anxiety disorders, for distribution by the Department of Public Health to each birthing hospital in the state. As used in this subdivision, “birthing hospital” means a health care facility, as defined in section 19a-630, operated and maintained in whole or in part for the purpose of caring for patients during the delivery of a child and for a postpartum person and such person’s newborn following birth;

(2) Evidence-based screening tools for screening patients for intimate partner violence, peripartum mood disorders and substance use disorder for distribution by the Department of Public Health to obstetricians and other health care providers who practice obstetrics; and

(3) Indicators of intimate partner violence for distribution by the Department of Public Health to (A) hospitals for use by health care providers in the emergency department and hospital social workers, and (B) obstetricians and other health care providers who practice obstetrics.

Appendix D: Methods

CT MMR program staff enter and store data on pregnancy-associated deaths in the Maternal Mortality Review Information Application (MMRIA). Developed by CDC and the CDC Foundation, MMRIA is housed on a secure server and is available, free of charge, to all state maternal mortality review committees. Data entered into MMRIA include information listed on birth/fetal death certificates and death certificates; autopsy reports; medical records; police reports; abstractors' case narratives; and committee decisions. CT MMRC did not use interviews with family members and other informants in the review of deaths that occurred between 2015 and 2020.

For the purpose of this report, data were extracted from MMRIA by CT MMR project evaluators and analyzed using SAS software. Analysis included calculation of mortality ratios and descriptive statistics pertaining to maternal demographic characteristics, circumstances of death, and committee decisions. CT MMR project evaluators calculated mortality ratios for pregnancy-related deaths. Mortality ratios serve to quantify mortality during pregnancy or in the postpartum period among Connecticut residents; they also allow for comparisons with other states, and they will be used, eventually, to track trends over time in Connecticut.

Mortality ratios were calculated as the number of deaths per 100,000 live births, as reported by CT DPH Vital Records Office, for the three-year period between 2015 and 2017, and the three-year period between 2018 and 2020. Additionally, 95% confidence limits were computed, using the gamma method, to quantify random variation associated with mortality ratios.

Furthermore, the analysis of MMRIA data included descriptive statistics (counts, percentages, and averages) pertaining to decedents' demographic characteristics (race/ethnicity, health insurance, education); circumstances of death (manner and timing); committee decisions (pregnancy-relatedness, preventability, cause of death, and contribution of discrimination, obesity, mental health conditions, and substance use disorder to the death); ranking of decedents' towns of residence on contextual sociospatial indicators (ie, population density, birth rate, residents' race/ethnicity and nation of origin, educational attainment, unemployment, health insurance, poverty, WIC receipt, SNAP receipt, median household income, single parent households, teen birth rate, violent crime rate, drug arrest rate, low birthrate births, maternal overweight/obesity, prenatal care starting in the first trimester of pregnancy); and grouping town rankings into quartiles.

Data on race and ethnicity were obtained from birth or fetal death records, and in cases in which such information was not available, from decedents' death records. All deaths in which ethnicity was coded as "Hispanic" were classified as Hispanic/Latinx. Birth and death record data were checked against medical records, and in one instance, CT MMR leadership in consultation with CT MMR project evaluators decided to report on data from sources other than birth and death records (one person was listed as "White" in the birth record, but "African American" on all medical records). Data on educational attainment were obtained from death records, but also checked against birth records and other available information. For one person education was listed as "Master's degree" in the birth record, but this was re-coded as "unknown" based on other available information. Another

person's education was coded as "Some college" based on the birth record rather than a lower level of education attainment that was listed on the death record. Data on health insurance were obtained from birth records for those who died in postpartum and from medical records for those who died during pregnancy. For all postpartum deaths, birth data were checked against medical records. In one instance, health insurance was listed as "unknown" in the birth record and was re-coded as "Medicaid" based on medical records.

For deaths that occurred during pregnancy, timing of death relative to pregnancy was based on CT MMR abstractors' timing assignments, which were informed by medical records and autopsy reports. For deaths that occurred postpartum, timing of death was calculated by comparing the date of death listed on the death record and the date of delivery listed on birth or fetal death record. Cause of death was obtained from the Committee Decision Form.

It is important to acknowledge that the MMR Program experienced significant difficulties in accessing decedents' medical records, and in some instances, determining the source of prenatal care. The CT MMRC's ability to construct accurate and detailed portraits of decedents' lives and deaths would be enhanced by access to all medical records, including those from primary care providers, substance use treatment providers, and mental health specialists. Additionally, complete data on WIC participation and Medicaid utilization would aid in constructing case narratives.

Qualitative Analysis

Two CT MMR project evaluators who have extensive research experience completed a qualitative analysis of pregnancy-related deaths that occurred between 2018 and 2020. The analysis centered on cases in which there was documentation of housing instability, congregate care, arrests, or incarceration, and on deaths to which mental health conditions and substance use disorder contributed or probably contributed.

Data sources included CT MMRC case narratives. Recent literature on maternal mortality was consulted prior to and throughout the analysis. All case narratives were read and re-read to develop deep understanding and to identify themes. Case narratives were imported into Atlas.ti software, re-read, and coded to track the frequency of each theme across all case narratives. Identifiers were removed and the use of rich text in results was condensed to maintain anonymity.

The analysis of these retrospective case narratives was limited by lack of available information, inconsistency between the amount and type of information provided across case narratives, and absence of the voices of those whose experience researchers were attempting to represent. The low number of pregnancy-related deaths also limit confidence in identifying themes. Results are shared in this report in terms of themes despite low numbers, however, to provide readers with as much insight into the data as possible.

Appendix E: Data-Briefs

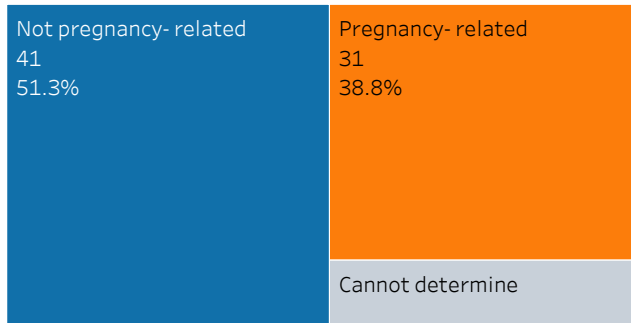
Pregnancy-Associated Deaths in Connecticut

Data from Connecticut Maternal Mortality Review Committee (MMRC), 2015-2020

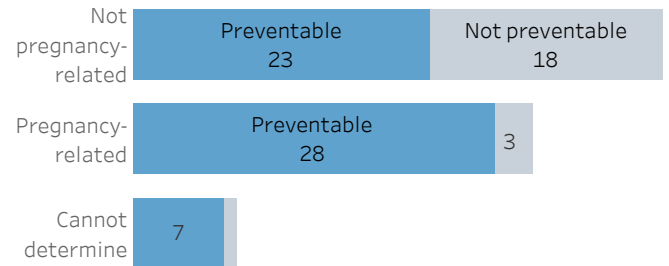


About 4 in 10 pregnancy-associated deaths were determined to be pregnancy-related.

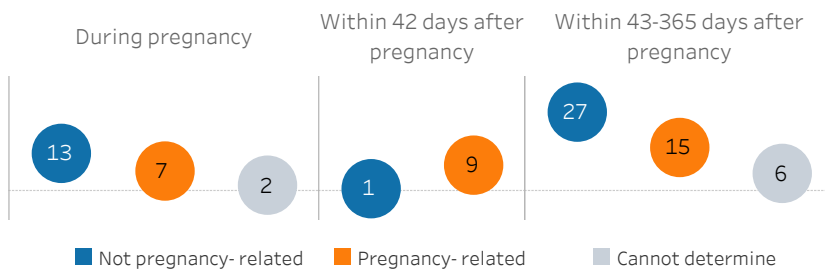
Pregnancy-associated deaths occur during or within one year of pregnancy, but are not necessarily causally related to pregnancy. A subset of pregnancy-associated deaths, **pregnancy-related** deaths are causally related to pregnancy or its management. In Connecticut, about 4 in 10 pregnancy-associated deaths that occurred between 2015 and 2020 were determined by Connecticut MMRC to be pregnancy-related.



Preventability of Death (n = 80)



Timing of Death (n = 80)



Case Characteristics

Race/Ethnicity (n = 80)

Race/Ethnicity	n	%
Black	21	26.3%
Hispanic	19	23.8%
White	35	43.8%
Other	5	6.3%

Age at Death (n = 80)

Age Group	n	%
10-19	2	2.5%
20-24	15	18.8%
25-29	15	18.8%
30-34	26	32.5%
35-39	17	21.3%
40-44	5	6.3%

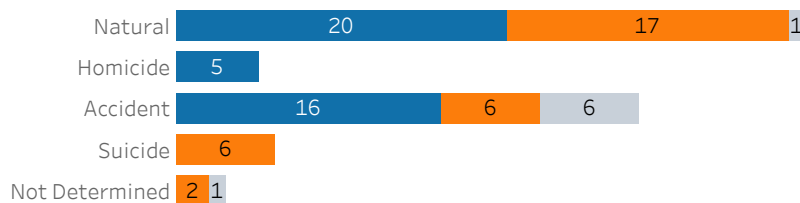
Education (n = 80)

Education Level	n	%
12th grade or less	11	13.8%
High school graduate	33	41.3%
Some college	19	23.8%
Associate or Bachelor	10	12.5%
Advanced degree	5	6.3%
Missing	2	2.5%

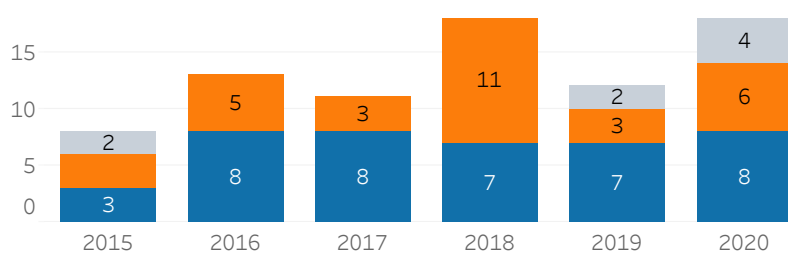
Insurance (n = 80)

Insurance Type	n	%
Private	23	28.8%
Medicaid	50	62.5%
Unknown	7	8.8%

Manner of Death (n = 80)



Year of Death (n = 80)



Source: Maternal Mortality Review Information Application (CT-MMRIA)

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

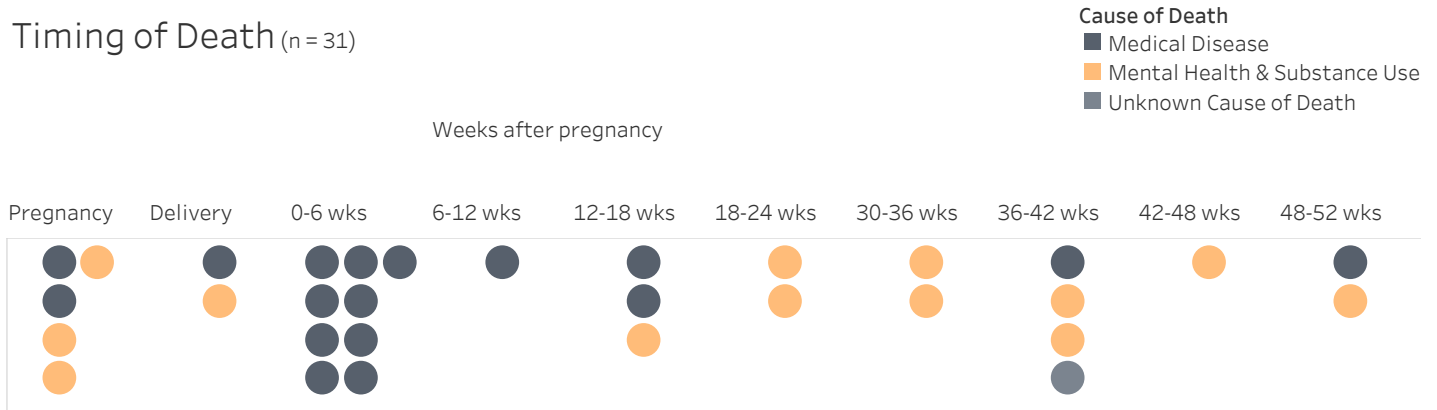
Pregnancy-Related Deaths in Connecticut

Data from Connecticut Maternal Mortality Review Committee (MMRC), 2015-2020

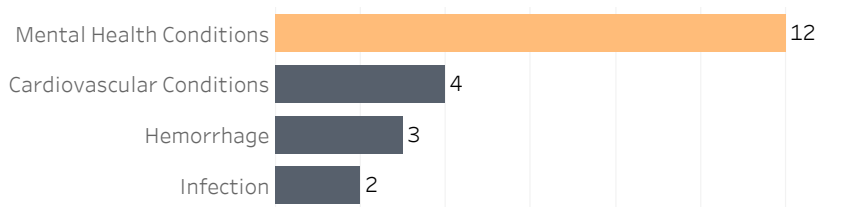


A **pregnancy-related death** is a death that occurs during or within one year after the end of pregnancy, from a) a pregnancy complication, b) a chain of events initiated by pregnancy, or c) the aggravation of an unrelated condition by the physiologic effects of pregnancy. In Connecticut, there were an average of 5 pregnancy-related deaths per year in the period between 2015 and 2020.

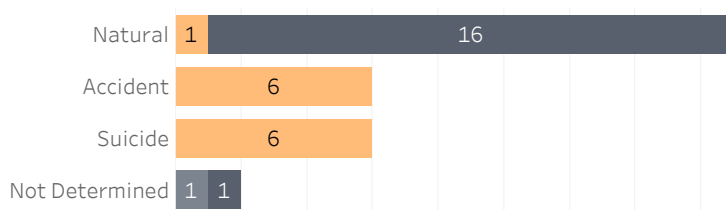
Timing of Death (n = 31)



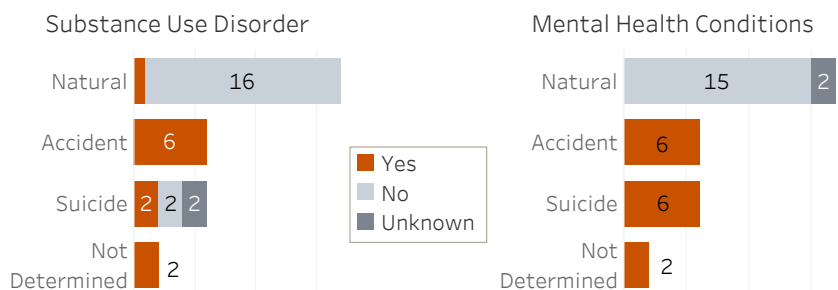
Top Causes of Death (n = 21)



Manner of Death by Cause of Death Category (n = 31)



Manner of Death by Key Contributing Factors (n = 31)



Case Characteristics

Race/Ethnicity (n = 31)		
	n	%
Black	6	19.4%
Hispanic	7	22.6%
White	16	51.6%
Other	2	6.5%

Age at Death (n = 31)		
	n	%
10-19	1	3.2%
20-24	6	19.4%
25-29	4	12.9%
30-34	13	41.9%
35-39	5	16.1%
40-44	2	6.5%

Education (n = 31)		
	n	%
12th grade or less	4	12.9%
High school graduate	12	38.7%
Some college	7	22.6%
Associate or Bachelor	5	16.1%
Advanced degree	3	9.7%

Insurance (n = 31)		
	n	%
Private	13	41.9%
Medicaid	17	54.8%
Unknown	1	3.2%

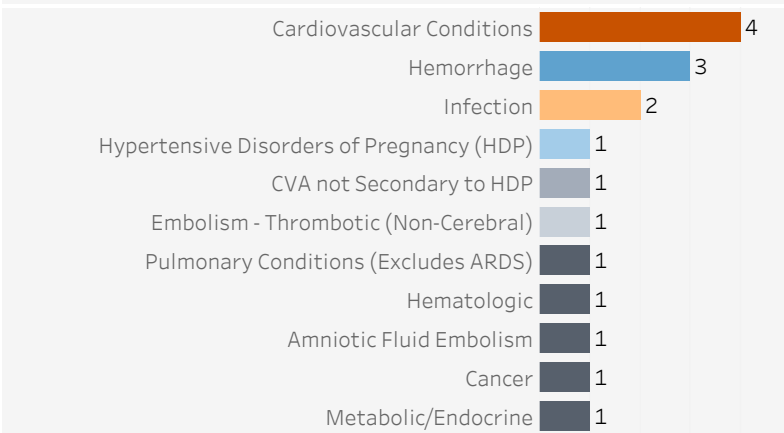
Pregnancy-Related Deaths Due to Medical Disease

Data from Connecticut Maternal Mortality Review Committee (MMRC), 2015-2020



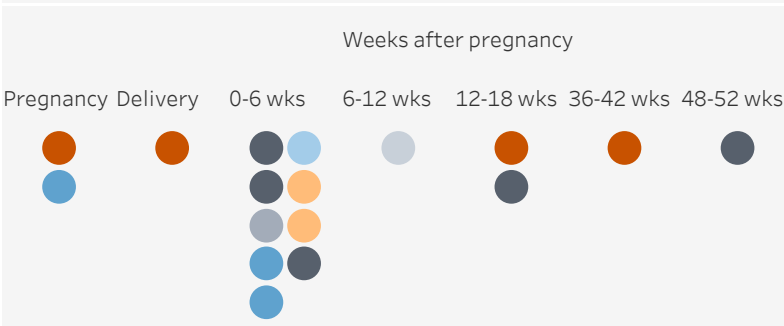
A **pregnancy-related death** is a death that occurs during or within one year after the end of pregnancy, from a) a pregnancy complication, b) a chain of events initiated by pregnancy, or c) the aggravation of an unrelated condition by the physiologic effects of pregnancy. In Connecticut, there were 17 pregnancy-related deaths due to medical disease in the period between 2015 and 2020. There was marked overrepresentation of persons without a Bachelor's degree (55% live births vs. 77% deaths), and an overrepresentation of Black persons (13% live births vs. 18% deaths) and those with Medicaid for insurance (37.5% live births vs. 41% deaths) among pregnancy-related deaths in 2015-2020.

Cause of Death (n = 17)



Note: Colored circles below correspond to the colors on the bar graph above.

Timing of Death (n = 17)



Potential Contributors (counts)

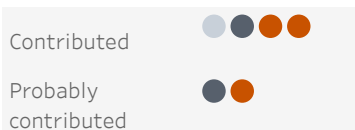
Preexisting Conditions



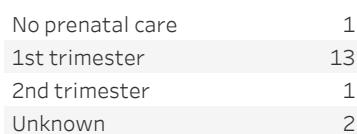
Problems During Pregnancy



Obesity



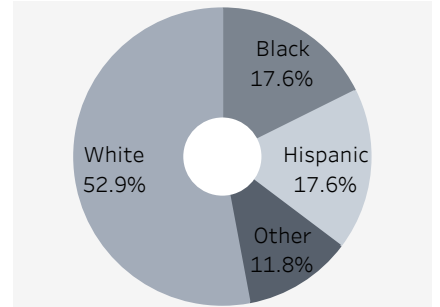
Timing of Prenatal Care



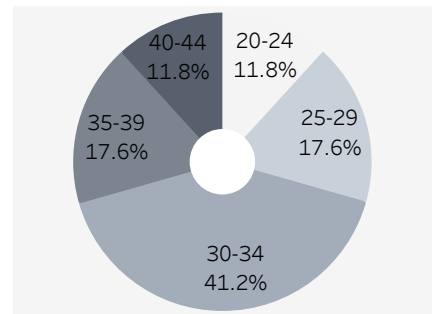
Source: Maternal Mortality Review Information Application (CT-MMRIA)

Case Characteristics

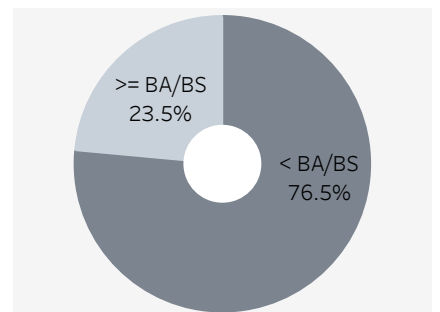
Race/Ethnicity (n = 17)



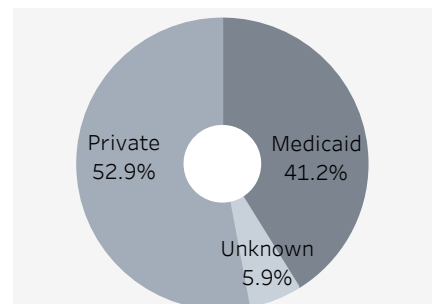
Age at Death (n = 17)



Education (n = 17)



Insurance (n = 17)



Mental Health Conditions

Data from Connecticut Maternal Mortality Review Committee, 2015-2020

Mental health conditions other than substance use disorder (SUD) contributed to over one-fifth ($n = 18/80$, 22.5%) of pregnancy-associated deaths in Connecticut in the period between 2015 and 2020, and they *probably* contributed to additional 11 out of 80 (14%) pregnancy-associated deaths.

Of 18 pregnancy-associated deaths in which mental health conditions definitively played a role, two-thirds ($n = 12/18$, 66.7%) were determined by the CT MMRC to be pregnancy-related—that is, causally related to pregnancy or its management. It is important to note that CT MMRC struggled with determining pregnancy-relatedness of deaths in which mental health conditions played a role largely because of an **absence of information** on decedents' internal processes. Although medical records, police reports, obituaries, and media posts were available in most, if not all, cases, notes from mental health treatment providers and interviews with family members were unavailable. It is possible, and in fact, likely, that the percentage of pregnancy-related deaths would have been higher had more comprehensive data been available for CT MMRC case review and discussion.

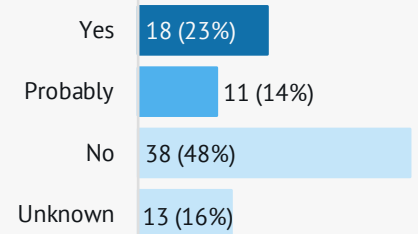
Accidental overdose was the most common cause of death among pregnancy-associated deaths in which mental health conditions other than SUD played a role. Half of decedents ($n = 9/18$) died of an overdose. Additionally, one-third of decedents ($n = 6/18$) died by suicide; other causes of death included unintentional injury and embolism. CT MMRC determined that all 18 deaths were preventable.

Most decedents ($n = 15/18$, 83%) used street drugs and/or overused alcohol or prescription medication at some point in their lives. Substance use disorder—and often polysubstance use—contributed to 61% of deaths ($n = 11/18$), and it *probably* contributed to 17% of deaths ($n = 3/18$).

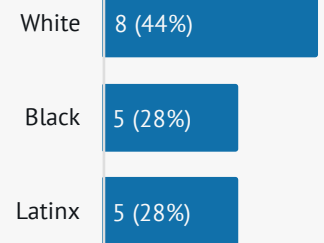
Roughly 44% of decedents were white; 28% were black; and 28% were Hispanic/Latinx. Only 11% of decedents held a Bachelor's degree or higher, and over 70% had Medicaid for insurance. Only two out of 18 decedents (11%) held a professional job; five (28%) were not employed outside of home; two were students; and others were employed as technicians or as sales, administrative, or service workers. Put together, the available data suggest that **those occupying lower social strata were vastly overrepresented** among pregnancy-associated deaths to which mental health conditions contributed. It is also noteworthy that a sizeable proportion of decedents had very difficult lives, as evidenced by housing instability (28%); incarceration or arrests (22%); residence in congregate care programs such as residential treatment facilities and group homes (17%); and involvement with the Department of Children and Families (50%).

In most cases, the onset of mental illness preceded the index pregnancy. At least 4 out of 18 decedents developed mental health conditions in childhood or adolescence, typically in the context of childhood abuse or neglect. Only two decedents experienced the onset of mental health symptoms in the aftermath of the index pregnancy.

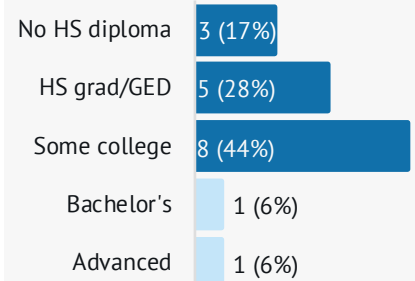
Did mental health conditions contribute to the death?



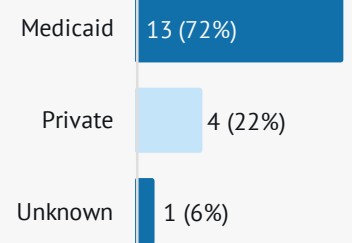
Race/Ethnicity (n=18)



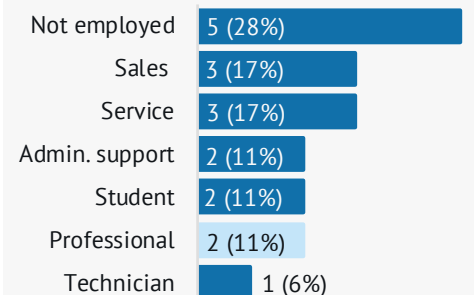
Education (n=18)



Insurance (n=18)



Occupation (n=18)



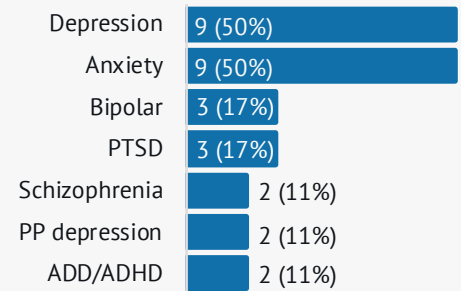
Most decedents ($n = 10/18$) had two or more mental health diagnoses on record. The most common conditions included depression ($n = 9/18$) and anxiety ($n = 9/18$), followed by bipolar disorder ($n = 3/18$), PTSD ($n = 3/18$), schizophrenia/schizoaffective disorder ($n = 2/18$), ADHD ($n = 2/18$), and postpartum depression ($n = 2/18$). Self-harm was documented in four out of 18 cases, and there was record of suicide attempts for three decedents.

One-third of decedents ($n = 6/18$) died during pregnancy or on the day of delivery: two by suicide, two from an accidental overdose, one from a medical disease, and one from unintentional injuries. Two-thirds of decedents ($n = 12/18$) died in the postpartum period: four by suicide, seven from an accidental overdose, and one from an undetermined cause of death. Nine out of 12 postpartum deaths occurred between 6 and 12 months after the delivery.

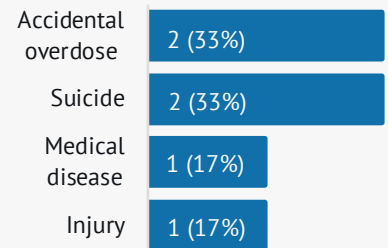
Available records indicate that **opportunities for mental health intervention existed but were used inconsistently**. In cases in which the system intervened, there were gaps in treatment, failures in care coordination, and inadequacies in the levels of care. Among those who died during pregnancy ($n = 6$), two persons were not screened for mental health conditions at any of their ER visits, and one was screened at only one of their many ER visits. The one person whose prenatal care records were available for review was not screened for mental health conditions by their obstetrician.

All 12 persons who died in the postpartum period received prenatal care. Although 10 had mental health conditions prior to the index pregnancy, only two were screened for mental health concerns (depression, anxiety, suicidal ideation) by their prenatal care providers. Half of those who died in the postpartum period ($n = 6/12$) were screened for mental health concerns during their hospitalization for labor and delivery. The other half of those who died in the postpartum period ($n = 6/12$) were neither screened for mental health concerns nor connected to mental health resources (other than paperwork about postpartum depression) by obstetrics providers despite their histories of mental illness prior to the index pregnancy.

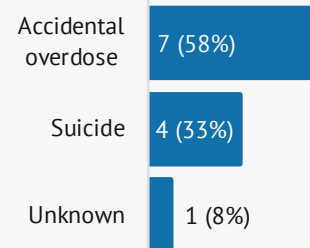
Mental health conditions



Causes of death in pregnancy (n=6)



Causes of death in the postpartum period (n=12)



Intimate Partner Violence

Data from Connecticut Maternal Mortality Review Committee, 2015-2020

There were 80 pregnancy-associated deaths in Connecticut between 2015 and 2020. 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 Department of Public Health, 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 15 persons (~19%) who died during pregnancy or in the postpartum period experienced intimate partner violence (IPV) at some point in their lives. What is more, IPV contributed to at least 3 deaths.

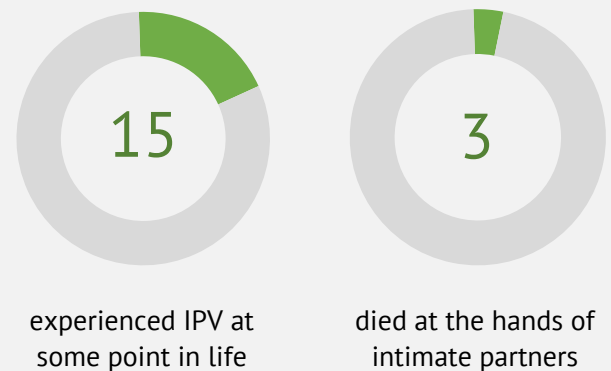
Screening for IPV by prenatal care providers was conducted inconsistently and was often ineffective. Of 55 persons for whom medical records were available for review by CT MMRC, IPV screening was either not conducted or not documented in more than one-third of cases ($n = 19$, 34%); this includes 3 cases in which other sources of data (eg, police reports, emergency room records) revealed evidence of IPV.

Almost two-thirds ($n = 36$, 65%) of those for whom medical records were available for review by CT MMRC were screened for IPV by their prenatal care providers. The results of those screens were negative in 6 cases in which there was evidence of ongoing IPV; in fact, 3 of those cases ended in a

homicide. The five positive screens revealed historic rather than ongoing violence in romantic relationships. (Prenatal care records were unavailable for 18 persons (23%), and 7 persons did not receive prenatal care, and therefore, had no prenatal record.)

IPV was common

among persons whose deaths occurred during pregnancy or in the postpartum ($n = 80$):



IPV screening was inconsistent

and often ineffective among persons whose deaths occurred during pregnancy or in the postpartum period ($n = 36$):

IPV screening results	IPV at some point		Total count
	Yes count	No count	
Positive	5	0	5
Negative	6	25	31
Total	11	25	36

It is also noteworthy that documentation of patient education about IPV or connection to IPV services was altogether missing from the medical records of those whose records were reviewed by CT MMRC. Taken together, these findings suggest a need for:

- 1) consistent education about IPV to every patient;
- 2) consistent, universal screening for IPV by prenatal care providers;
- 3) utilization of effective IPV screening protocols;
- 4) referral to CT Safe Connect, the statewide hotline, in cases in which IPV is identified; and
- 5) collaboration with IPV advocates.

In concert with these findings, CT MMRC official recommendations call for 1) education to obstetric providers on available evidence-based screening tools for IPV, as well as available resources; and 2) education to obstetrics offices, emergency department staff, and hospital social work staff on indicators of IPV.

Connecticut Coalition Against Domestic Violence (CCADV), the state's leading advocacy organization for victims of domestic violence, recommends that IPV screening be conducted in the context of universal education. This means educating all patients on [CT Safe Connect](#), Connecticut's domestic violence resource hub. CT Safe Connect offers free, confidential, and voluntary case management, safety planning, counseling, information, and connection to local IPV agencies. Notably, CT Safe Connect is not attached to police, child protective services, or immigration and customs enforcement.

IPV screening may be conducted through self-administered surveys or in-person querying, provided that certain safety precautions have been taken. Several IPV screening instruments are available, and CCADV recommends the 5-item E-HITS—Extended Hurt/Insult/Threaten/Scream—tool.^{1,2} When IPV is identified, CCADV recommends providing additional education and connecting patients to CT Safe Connect by calling or texting at (888) 774-2900 or via www.ctsafeconnect.org.

CCADV provides training to healthcare providers and consultation to systems on policies and practices related to IPV. To schedule a training or to seek consultation, contact Ashley Starr Frechette, CCADV Director of Health Professional Outreach, at astarrfrechette@ctcadv.org.

E-HITS^{1,2}

Over the last 12 months, how often did your partner:

1. physically hurt you?
2. insult you or talk down to you?
3. threaten you with harm?
4. scream or curse at you?
5. force you to have sexual activities?

Each item is answered on a 5-point Likert-type scale ranging from 1 = Never to 5 = Frequently. Scores range from 5 to 25, and the cutoff for IPV is 7.

1. Portnoy GA, Haskell SG, King MW, Maskin R, Gerber MR, Iverson KM. Accuracy and Acceptability of a Screening Tool for Identifying Intimate Partner Violence Perpetration among Women Veterans: A Pre-Implementation Evaluation. *Womens Health Issues*. 2018; 28(5): 439-445.
2. Iverson KM, King MW, Gerber MR, Resick PA, Kimerling R, Street AE, Vogt D. Accuracy of an Intimate Partner Violence Screening Tool for Female VHA Patients: A Replication and Extension. *J Trauma Stress*. 2015; 28: 79-82.