Maternal Mortality in Tennessee 2021

2023 Report to the Tennessee General Assembly

Tennessee Department of Health | Family Health and Wellness | October 2023

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Dedication

The Tennessee Department of Health expresses its gratitude to the countless advocates and partners who have championed the purpose of the Maternal Mortality Review Committee (MMRC) to generate quality data to prevent maternal mortality. We extend our gratitude to all those already implementing the recommendations from this report. Thank you also to the committee for reviewing every one of the deaths and developing the recommendations that can save lives.

It is with deepest sympathy and respect that we dedicate this report to the memory of those 134 women who died while pregnant or within one year of pregnancy in 2021. These are 134 deaths too many. Also, we dedicate this report to the loved ones of these 134 women.

We know our efforts to further understand the causes and contributing factors of maternal mortality in Tennessee will prevent future deaths.

Acknowledgements

Chair

Tobi Amosun, MD, FAAP

Deputy Commissioner for Population Health

Tennessee Department of Health

TDH Program Staff

Ralph Alvarado, MD, FACP

Ibitola Asaolu, DrPH, MPH

Linda A. Clayton, MD, MPH

Hannah Dudney, MD

Karen Cole-George, DNP, FNP-C, RN

Linda Hampton, RN

Elizabeth Harvey, PHD, MPH

Rachel Heitmann, MS

Kristina Herring, RN

Osaremhen Ikhile, MPH

Ashley Moore, MPH

Brenda Ruiz, MPH

Bethany Scalise, BSN

Denise Werner, MD

Members

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James Brinkley

Kitty Cashion, RN-BC, MSN

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Cathleen Suto, MD

Danielle Tate, MD

Representative Brian Terry, MD

Lynlee Wolfe, MD

Parul Zaveri, MD

Executive Summary

The 2023 Maternal Mortality Report includes 2021 deaths and a compilation of 2017 to 2021 death data where appropriate. This report describes maternal deaths in Tennessee and the demographic characteristics of women who died while pregnant or within one year of pregnancy. This report also summarizes the causes of death and contributing factors. Below are the key findings and a summary of the recommendations.

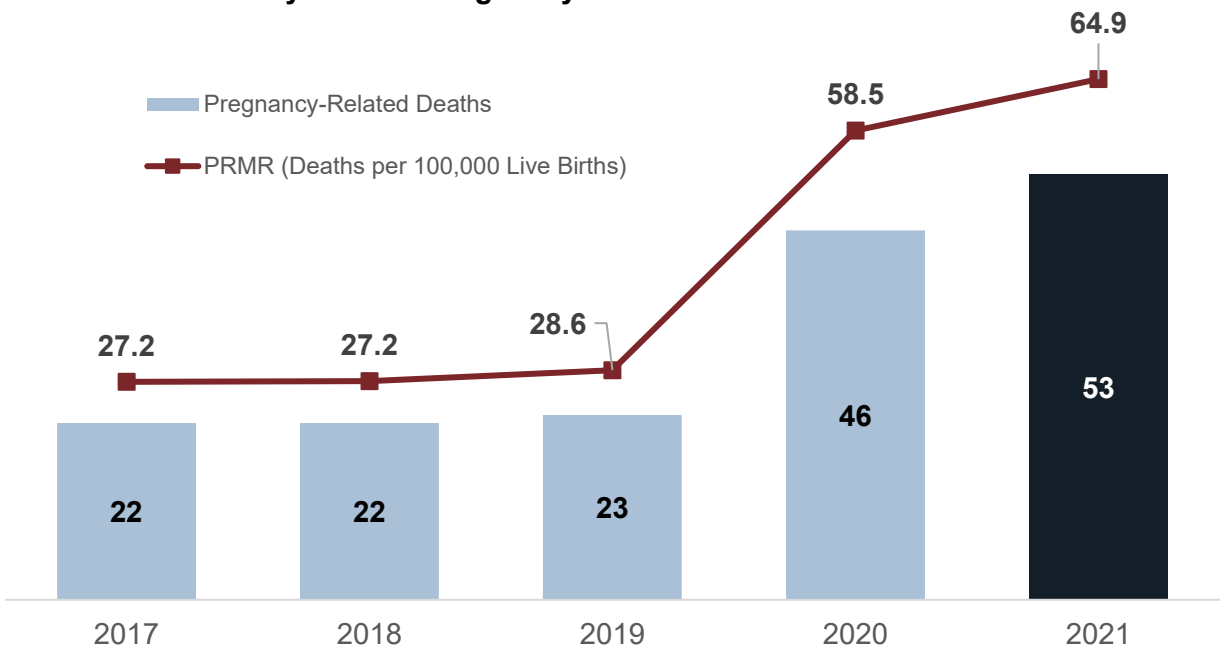
Key Findings: 2021

In 2021, 134 women in Tennessee died during pregnancy or within a year after the end of their pregnancy. Beginning with 2021 deaths, the MMR program added the Hospital Discharge Data System (HDDS) to its existing case identification efforts. About 1 in 10 (n=14) of all pregnancy-associated deaths were identified through the HDDS. Two in five (40%) of all 2021 deaths were deemed pregnancy-related while 47% of all deaths were determined to be pregnancy-associated, but not related. **The pregnancy-related mortality ratio in 2021 (64.9 deaths per 100,000 live births) was almost 2x the prior four-year (2017-2020) average ratio of 35.4 deaths per 100,000 live births.** This is due to the increase of COVID-19 deaths in 2021 and the utilization of the Utah Criteria[1] during MMRC reviews. **Seven in ten (70%) pregnancy-associated deaths were deemed to be preventable**, with 35% having a 'good chance' of being prevented and 65% having 'some chance' of being prevented. **The MMRC noted several contributing factors to deaths including substance use disorder (45%), mental health conditions (31%), discrimination (22%), and obesity (21%).**

Pregnancy-Related Deaths: 2021

Deaths within one year of pregnancy where pregnancy was the aggravating factor.

Number and Mortality Ratio of Pregnancy-Related Deaths: 2017-2021



[1] Smid MC, Maeda J, Stone NM, Sylvester H, Baksh L, Debbink MP, Varner MW, Metz TD. Standardized Criteria for Review of Perinatal Suicides and Accidental Drug-Related Deaths. Obstet Gynecol. 2020 Oct;136(4):645-653. doi: 10.1097/AOG.0000000000003988. PMID: 32925616; PMCID: PMC8086704.

Executive Summary

Pregnancy-Related Deaths: 2021

In 2021, 53 women in Tennessee died from pregnancy-related causes. The burden of pregnancy-related death is higher among **non-Hispanic Black women**, **women covered by TennCare**, and **those residing in West Tennessee**.

The **3 leading causes** of pregnancy-related death were **COVID-19**, **cardiovascular disease**, and **substance use disorder**.

Non-Hispanic **Black women were 2.3x as likely to die** as white women.

Obesity contributed to over 1 in 3 (38%) pregnancy-related deaths.

Mental health contributed to almost one-third (32%) of all pregnancy-related deaths. **Substance use disorder was a contributing factor in about 1 in 3 (32%)** pregnancy-related deaths.

Most **(79%) pregnancy-related deaths were deemed preventable**, with two in five (40%) deaths having a good chance of being prevented.

COVID-19 Related Deaths: 2021

In 2021, **22 women died from COVID-19** during pregnancy or within a year of pregnancy. Over half (55%) of these deaths occurred between 7-42 days postpartum.

About 4 in 5 (n=18) women who died from COVID-19 were unvaccinated.

About **4 in 5 COVID-19 deaths (81%) were pregnancy-related**, and most (86%) COVID-19 deaths were deemed preventable.

Obesity contributed to almost 2 in 3 (64%) pregnancy-associated COVID-19 deaths. Covid-related deaths occurred more among metro residents (n=17) than rural residents (n=5).

Pregnancy-Associated, but NOT Related Deaths: 2021

Deaths within one year of pregnancy where pregnancy was NOT the aggravating factor.

In 2021, 63 women died from pregnancy-associated, but not related causes. Over half of these women were **younger than 30 years (63%)** and **non-Hispanic White (52%)**. Key takeaways from pregnancy-associated, but not related deaths include:

Acute overdose (39%) was the leading cause of death for pregnancy-associated, but not related deaths.

Two in three (67%) of these deaths were deemed preventable.

Substance use disorder was a contributing factor to almost three in five (59%) deaths.

Mental health contributed to about a third (35%) of deaths.

Executive Summary: Recommendations

Recommendations were established by the Maternal Mortality Review Committee after a careful review of all 2021 maternal deaths. The recommendations are to promote women's safety, well-being and prevent maternal deaths. The Committee identified emerging issues for community and statewide agencies, clinics and hospital systems, healthcare providers, women, and their friends and families.

Below is a summary of the recommendations for pregnancy-related deaths and pregnancy-associated but not related deaths.

Pregnancy-Related Recommendations

- COVID-19 was the leading cause of pregnancy-related deaths in 2021. **The COVID-19 vaccine should be offered to all pregnant women and providers should be educated and aware of the improved outcomes for pregnant patients with the use of ECMO.**

- One in four pregnancy-related deaths had co-occurring mental health and substance use disorder contributing to the death. **The State should improve access to and availability of mental healthcare providers and find ways to promote an increase in the mental healthcare workforce.** Treatment should be offered to all women with a substance use disorder.

- Hemorrhage was the leading cause of death among women who died on the day of delivery. **Facilities should require providers to maintain competencies in managing obstetric hemorrhage and offer training and education on pregnancy and postpartum complications.**

Pregnancy-Associated, but NOT Related Recommendations

- Acute overdose was the leading cause of pregnancy-associated, but not related deaths. **Naloxone should be provided to all households with known substance use disorder and a substance use history.** Providers should **ensure outpatient treatment for pregnant women** and provide education and resources to their family members who also have a substance use disorder to establish a sober living environment.

- Deaths relating to violence were one of the leading causes of pregnancy-associated, but not related deaths that occurred 43-365 days after delivery. **Providers should screen all women for domestic violence during every medical visit**, especially at prenatal care appointments.

- Lack of prenatal care was a contributing factor in pregnancy-associated, but not related deaths**. The State should improve access to prenatal care with increased enrollment in presumptive eligibility** to ensure the proper treatment, resources, and screenings during their pregnancy.

Maternal Mortality Review: Introduction

The Tennessee Maternal Mortality Review Act of 2016 (T.C.A. § 63-3-601) established the **TN Maternal Mortality Review Committee** (MMRC). This interdisciplinary committee reviews every death and contributes to the annual recommendations in this report. The first set of reviewed deaths were 2017 maternal deaths, and they represent baseline data of reviewed maternal deaths. Through a comprehensive review of these deaths by the MMRC, this report identifies opportunities for the prevention of maternal mortality and promotion of women's health with specific recommendations at the individual/family, community, provider, facility, and systems levels.

Definitions

Categorizations of maternal mortality further specify the timing and cause of death. A breakdown of the categories can be seen below. While some organizations define maternal mortality as only occurring during or within 42 days of pregnancy, the Tennessee Maternal Mortality Review program is aligned with the Centers for Disease Control and Prevention's (CDC) definition.

Pregnancy-associated deaths: The death of a woman during pregnancy or within one year of the end of pregnancy from any cause. This definition encompasses all qualifying deaths the MMRC reviews. Pregnancy-associated deaths can further be classified into pregnancy-related deaths or pregnancy-associated, but not related deaths.

Pregnancy-related deaths: The death of a woman 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, <u>but not related</u> deaths: The death of a woman during pregnancy or within one year of the end of pregnancy from a cause that is not related to pregnancy.

Defining Maternal Deaths in Tennessee

Maternal Mortality Review Process

Records are collected from the sources and relevant information is abstracted into the CDC's Maternal Mortality Review Information Application (MMRIA).

These Sources Include

- Death Certificate
- Fetal Birth or death certificate
- Autopsy Reports
- Hospitals and Hospital Discharge Data
- Clinics
- Legal History
- Department of Child Services
- Substance Use Clinics

Multidisciplinary MMRC

- Anesthesiology
- District Attorney
- Domestic Violence
- Family Practice
- Medical Examiner
- Obstetric nurses and physicians
- Public Health
- TennCare/Medicaid
- Title V Maternal and Child Health Director
- TN Hospital Association
- Certified Nurse Midwife
- Child Protective Services
- March of Dimes
- Maternal Fetal Medicine
- Mental Health
- Neonatology
- TN Justice Center

Decision Process Key Questions to Answer

- Was the death pregnancy-related?
- What was the underlying cause of death?
- What recommendations may help prevent future deaths?
- Was the death preventable?
- What factors contributed to the death?

Pregnancy-Related Deaths

Pregnancy-Related Deaths

Deaths that occurred within one year of pregnancy and determined that the pregnancy was the aggravating factor.

Table 1: Demographics of Pregnancy-Related Deaths

Pregnancy-Related Deaths in Tennessee, 2017-2021				
Characteristics	**2020**	**2021**	**2017-2021**	**2017-2021 Pregnancy-Related Mortality Ratio (Deaths per 100,000 live births, PRMR)[3]**
Age at death	**N (%)**	**N (%)**	**N (%)**	
Less than 30 years	20 (43%)	20 (38%)	64 (39%)	26.1
30-39 years	24 (52%)	29 (55%)	90 (54%)	60.7
40+ years	2 (4%)	4 (8%)	12 (7%)	**129.2**
Race/Ethnicity				
Non-Hispanic White	30 (65%)	28 (53%)	86 (52%)	32.9
Non-Hispanic Black	10 (22%)	18 (34%)	61 (37%)	**78.2**
Other*	6 (13%)	7 (13%)	19 (11%)	--
Education				
Less than high school	11 (24%)	6 (11%)	29 (17%)	**56.2**
High school diploma/GED	15 (33%)	27 (51%)	63 (38%)	55.7
More than high school	20 (43%)	19 (36%)	73 (44%)	31.0
Insurance at Live Birth Delivery[1]				
TennCare	23 (74%)	21 (57%)	76 (61%)	**39.6**
Private	6 (19%)	13 (35%)	39 (31%)	22.0
Other	1 (3%)	0 (0%)	3 (2%)	--
None	1 (3%)	2 (5%)	4 (3%)	--
Unknown	0 (0%)	1 (3%)	2 (2%)	--
Area of Residence[2]				
Metropolitan county	20 (43%)	28 (53%)	85 (51%)	**48.6**
Rural county	26 (57%)	25 (47%)	81 (49%)	35.6
Grand Division				
West TN	18 (39%)	12 (23%)	49 (30%)	**49.8**
Middle TN	17 (37%)	23 (43%)	68 (41%)	38.5
East TN	11 (24 %)	17 (32%)	48 (29%)	37.6
Total	**46**	**53**	**166**	**41.2**

1. Insurance status defined for women with a live birth. This variable excludes insurance status for women with an out-of-state delivery and those without a live birth, i.e., women who died during pregnancy, following a miscarriage, or after a fetal death.
2. Metropolitan County includes: Davidson, Hamilton, Knox, Madison, Shelby, and Sullivan Counties.
Percentages may not add to 100 due to rounding.
3. PRMR: Pregnancy-Related Deaths per 100,000 live births
*Other: this category may refer to individuals with missing or unknown race category, or who are of Hispanic ethnicity, or Non-Hispanics of Asian, Pacific Islander, American Indian/Alaskan Native, or other race.
Data sources: Tennessee Department of Health, Division of Family Health and Wellness, Maternal Mortality Review Program. Tennessee Department of Health, Office of Vital Records and Health Statistics, Birth Statistical File, 2017-2021. Population estimates based on interpolated data from the U.S. Census's Annual Estimates of the Resident Population.

Pregnancy-Related Deaths

Deaths that occurred within one year of pregnancy and determined that the pregnancy was the aggravating factor.

From **2017 to 2021**, 166 Tennessee women died during pregnancy or within one year of pregnancy from causes related to or aggravated by pregnancy. Pregnancy-related deaths accounted for 36% of all pregnancy associated deaths between 2017 and 2021. The proportion of pregnancy-related death has increased over the past five years of maternal death review, from 28% in 2017 to 40% in 2021.

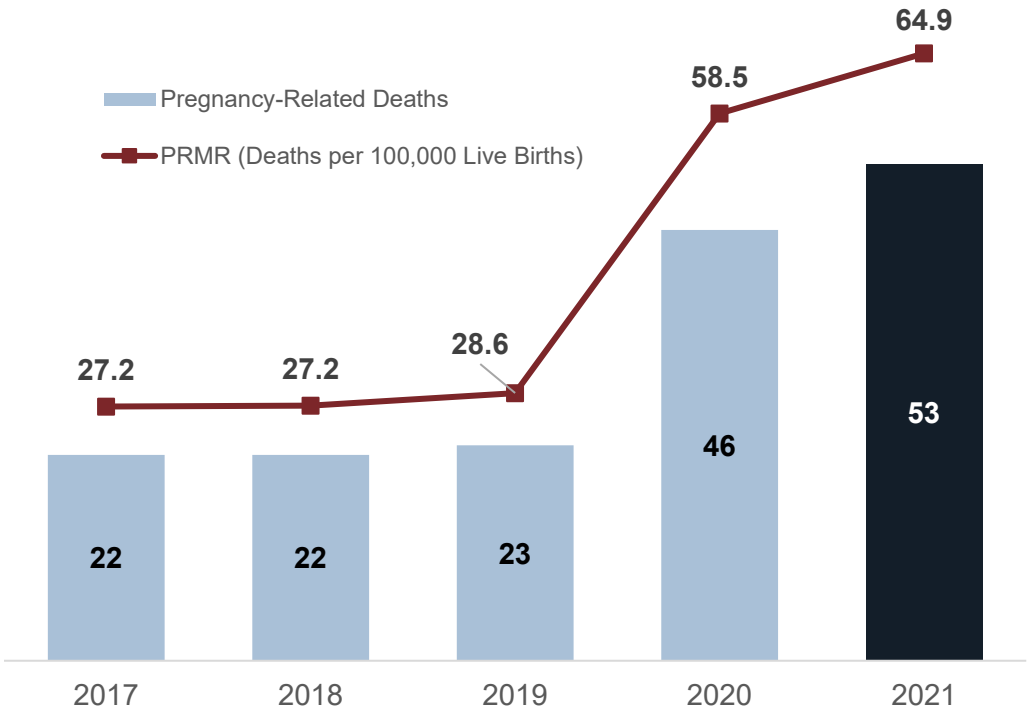
Risk Groups

Non-Hispanic Black women are **2.3x as likely** to die as non-Hispanic White women.

Women aged 30 to 39 years were over **2x as likely** to die as younger women.

Women with TennCare were **1.8x as likely** to die from pregnancy as women with Private Insurance.

Women in West Tennessee had a **higher ratio of pregnancy-related deaths** than women in other grand divisions.



Pregnancy-related mortality ratio (PRMR) increased from 27.2 deaths per 100,000 live births in 2017 to 64.9 deaths per 100,000 live births in 2021. This increase may have occurred due to the increase of deaths from COVID-19, acute overdose, and the implementation of the Utah Criteria[2] when determining the pregnancy-relatedness of overdose deaths.

[2] Smid MC, Maeda J, Stone NM, Sylvester H, Baksh L, Debbink MP, Varner MW, Metz TD. Standardized Criteria for Review of Perinatal Suicides and Accidental Drug-Related Deaths. Obstet Gynecol. 2020 Oct;136(4):645-653. doi: 10.1097/AOG.0000000000003988. PMID: 32925616; PMCID: PMC8086704.

Pregnancy-Related Deaths

Deaths that occurred within one year of pregnancy and determined that the pregnancy was the aggravating factor.

Location of Pregnancy-Related Deaths: 2021

Pregnancy-related deaths occurred in multiple settings. The location of the death can help direct prevention efforts, especially for those being treated outside of inpatient and/or obstetric settings.

About **3 in 5 (62%)** pregnancy-related deaths **occurred in inpatient/hospital settings**. The top causes of death were: COVID-19, hemorrhage, and cardiovascular disease.

Seventeen percent (17%) of pregnancy-related deaths occurred in an **emergency department**. The causes of death in outpatient settings included cardiomyopathy, hypertension, acute overdose, suicide, and pulmonary embolism.

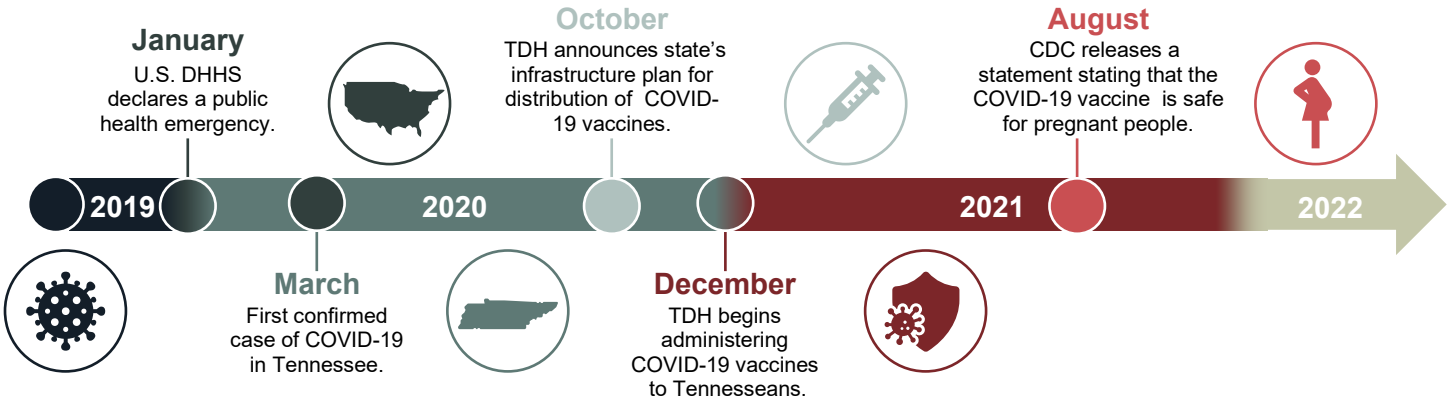
Seven deaths occurred at home, with SUD and mental health contributing to these deaths. **Acute overdose was the leading cause** of these deaths.

Over half of these deaths **occurred within 42 days postpartum**, and most (80%) were preventable.

Pregnancy-Related Deaths

Deaths that occurred within one year of pregnancy and determined that the pregnancy was the aggravating factor.

Leading Causes of Death in Pregnancy-Related Deaths: 2021

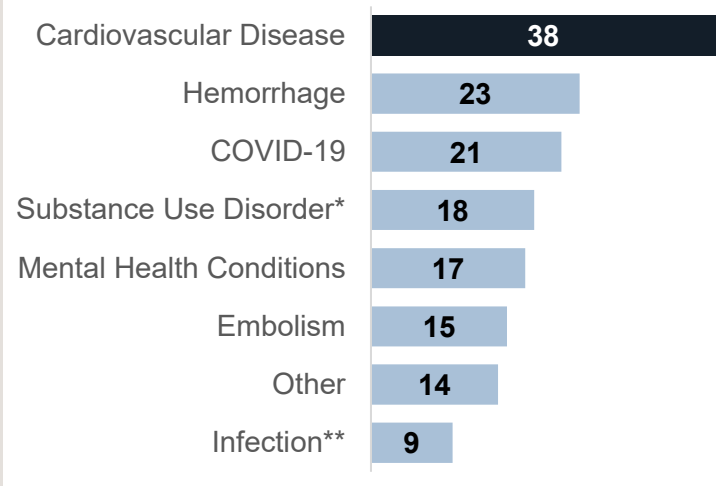


COVID-19 was the leading underlying cause of pregnancy-related death in 2021. In 2021, 18 women died from pregnancy-related COVID-19 infection. All but one (n=17) pregnancy-related deaths due to COVID-19 were preventable, and most (n=11) occurred in the 7-42 days postpartum period. The factors that contributed to pregnancy-related COVID-19 deaths included lack of vaccination, delay in appropriate treatment, and severe maternal morbidities. Obesity was a contributing risk factor in two of three (67%) pregnancy-related COVID-19 deaths. Lastly, discrimination was noted in about one in four (28%) COVID-19 related deaths.

In August 2021, the CDC released a statement stating that the COVID-19 vaccine was safe for pregnant women[3].

In 2021, COVID-19 was the leading cause of pregnancy-related deaths. Over the past five years (2017-2021), however, cardiovascular deaths remained the leading cause of pregnancy-related death. Although cardiovascular disease was not as prevalent in 2021, it is still a concern. Almost half (48%) of all cardiovascular deaths were due to preeclampsia and eclampsia, followed by cardiomyopathy and other causes of cardiovascular death such as conduction defects/arrythmias, valvular heart disease and hypertensive cardiovascular disease. The highest risk group was non-Hispanic Black women between 30 and 39 years.

Cardiovascular disease is the leading underlying cause of pregnancy-related deaths, Tennessee, 2017-2021



Other: asthma, neurological disease, CVA, obesity, anesthesia complications, hematologic conditions, systemic lupus. * Utah Criteria2 implemented in 2020 review process

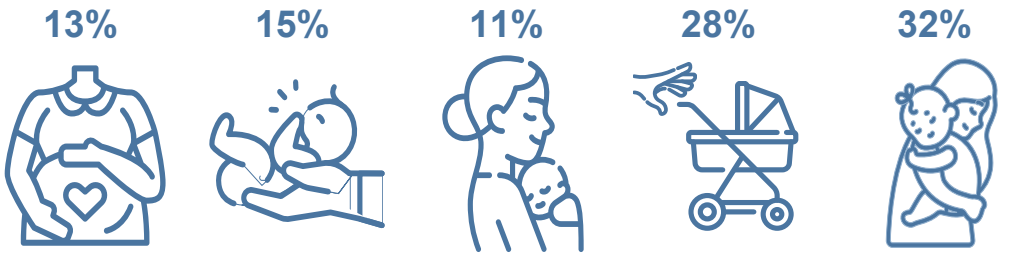
[3] COVID-19 Vaccines While Pregnant or Breastfeeding. Available from https://www.cdc.gov/coronavirus/2019-ncov/vaccines/recommendations/pregnancy.html

Pregnancy-Related Deaths

Deaths that occurred within one year of pregnancy and determined that the pregnancy was the aggravating factor.

Timing of Pregnancy-Related Deaths: 2021

About 2 in 3 pregnancy-related deaths occurred during pregnancy through 42 days postpartum. The cause of death included **cardiovascular disease**, **hemorrhage, COVID-19, and mental health conditions.**



Circumstances Surrounding Pregnancy-Related Deaths: 2021

Obesity contributed to about 2 in 5 (38%, n=20) pregnancy-related deaths. Twelve of these cases had COVID-19 as an underlying cause of death, **making obesity a risk factor for COVID-19 related deaths**.

Substance Use Disorder

Of the 17 pregnancy-related deaths where substance use disorder was a contributing factor, approximately **3 in 4 (76%) had a co-occurring mental health problem**.

Mental Health Conditions contributed to almost 1 in 3 (32%) pregnancy-related deaths. **Two of the 17 cases were confirmed suicide** with one probable suicide.

Preventability of Pregnancy-Related Deaths: 2021

About four in five (79%) of all pregnancy-related deaths were determined to **be preventable**.

Two in five (40%) preventable pregnancy-related deaths were determined to have a good chance of being prevented.

Pregnancy-Related Deaths

Deaths that occurred within one year of pregnancy and determined that the pregnancy was the aggravating factor.

Contributing Factors by Leading Underlying Causes of Death: 2021

COVID-19

- Patients unvaccinated against COVID-19
- Healthcare facilities unable to accept patients for advanced care due to bed shortage
- Provider delay in initiation of treatment including medication, ECMO, intubation, and ventilation
- Discrimination due to obesity and race
- Patient non-adherence to the one-week postpartum follow-up visit
- Patient delay in seeking medical care after the onset of symptoms

Overdose

- Providers did not refer, screen, or give resources to women with substance use disorder and mental health conditions
- Women had a history of substance use disorder
- Women did not seek prenatal care
- Women did not receive timely inpatient rehab for substance use disorder due to medical acuity
- Women were unable to access stable housing and lacked social support

Mental Health Conditions

- Shortage of mental health providers
- No screening for domestic violence or lack of documentation in records
- Absence of good social support
- Delay in seeking care after warning signs were identified

Preeclampsia/Eclampsia

- Provider delay in treatment of the complications of preeclampsia including delay in appropriate care (i.e., initiation of magnesium sulfate, treatment of pulmonary edema, and treatment of Hypertension

Cardiomyopathy

- Patients' history of substance use disorder
- Patients' history of multiple pregnancies, and no documentation of counseling for contraception
- Patients not adhering to prescribed medication regimens
- Patients had multiple co-morbidities

Hemorrhage

- Provider did not counsel the patient in seeking early treatment for any vaginal bleeding in the setting of placenta previa
- Provider did not recognize the source of bleeding or proceed with hysterectomy when all treatment efforts had been exhausted
- Provider delay in additional blood product transfusion
- Provider delay in treating iron deficiency anemia

Pregnancy-Related Deaths: Recommendations

*These recommendations are from 2021 deaths reviewed in 2022-2023.

Pregnancy-Related Recommendations

Community and Statewide Agencies

Of the 17 cases where substance use disorder contributed to the death, approximately 3 in 4 **(76%) pregnancy-related deaths had co-occurring mental and substance use disorder**.

1. The State should **improve access to and availability of mental health providers** for outpatient and in-patient treatment of substance use and mental health disorders.
2. Government agencies should **promote**, **encourage**, **and incentivize people to enter the mental health field** immediately to have more access to the growing crisis.
3. **Patients who are incarcerated for substance misuse should be offered routine prenatal care** and be provided with care coordination during pregnancy.

Clinics and Hospital Systems

Hemorrhage was the leading cause of death for women who died the day of delivery.

1. Facilities should require delivering providers to **maintain competencies in the management of obstetric hemorrhage** through Continuing Medical Education (CME) and obstetric simulation to maintain privileges.
2. Facilities should ensure **training**, **education**, **and implementation of protocols** for all healthcare providers on the **management of pregnancy and postpartum complications** (up to a year postpartum) in all inpatient and emergency department settings.
3. Facilities should **be equipped with blood products or have quick access** to blood products prior to performing surgery on patients at high risk for hemorrhage during delivery or the immediate postpartum period.

Healthcare Providers

Of the 15 women who died between 7 and 42 days postpartum, 11 died from COVID-19. Over half (n=6) of these COVID-19 deaths occurred during the delta variant surge of the COVID-19 virus.

1. The **COVID-19 vaccine should be offered to all pregnant women** and there should be documentation of vaccine decline.
2. Providers should **be aware of the improved outcomes with the use of early ECMO** in young patients with COVID-19 during pregnancy.

Substance Use Disorder including acute overdose was the leading cause of death among women who died 43 to 365 days postpartum.

1. Providers should **offer referral for substance use treatment to those with substance use disorders before discharge** from the Emergency Department/Hospital.

Women and their Friends and Families

1. Family and friends **should support and identify any mental health concerns or seek assistance on behalf of the patient** once identified.

Pregnancy-Associated, COVID-19 Deaths

Pregnancy-Associated COVID-19 Deaths

Deaths that occurred within one year of pregnancy from COVID-19 infection.

Table 2: Demographics of Pregnancy-Associated COVID-19 Deaths

In 2021, there were 22 pregnancy-associated COVID-19 deaths. These deaths were mostly pregnancy-related (n=18), and the decedents were mostly unvaccinated against the virus (n=18).

Pregnancy-Associated COVID-19 Deaths in Tennessee, 2021	
Characteristics	**2021**
Age at death	
30-39 years	**14 (64%)**
Other Age Groups	8 (36%)
Race/Ethnicity	
Non-Hispanic White	**11 (50%)**
Non-Hispanic Black	9 (41%)
Other*	2 (9%)
Education	
High School Diploma or Less	10 (45%)
More than High School	**12 (55%)**
Insurance at Live Birth Delivery[1]	
TennCare	**9 (53%)**
Private	8 (47%)
Area of Residence[2]	
Metropolitan county	**17 (77%)**
Rural county	5 (23%)
Grand Division	
West TN	6 (27%)
Middle TN	7 (32%)
East TN	**9 (41%)**
Total	**22**

1. Insurance status defined for women with a live birth. This variable excludes insurance status for women with an out-of-state delivery and those without a live birth, i.e., women who died during pregnancy, following a miscarriage, or after a fetal death.
2. Metropolitan County includes: Davidson, Hamilton, Knox, Madison, Shelby, and Sullivan Counties.
Percentages may not add to 100 due to rounding.
* Other: this category may refer to individuals with missing or unknown race category, or who are of Hispanic ethnicity, or Non-Hispanics of Asian, Pacific Islander, American Indian/Alaskan Native, or other race.
Data sources: Tennessee Department of Health, Division of Family Health and Wellness, Maternal Mortality Review Program. Tennessee Department of Health, Office of Vital Records and Health Statistics, Birth Statistical File, 2017-2021. Population estimates based on interpolated data from the U.S. Census's Annual Estimates of the Resident Population.

Pregnancy-Associated COVID-19 Deaths

Deaths that occurred within one year of pregnancy from COVID-19 infection.

Pregnancy-Associated COVID-19 Deaths: 2021

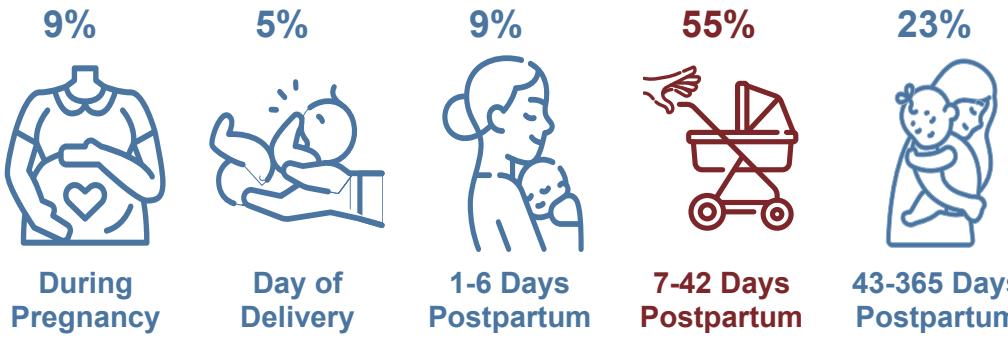
Sixteen percent (n=22) of all pregnancy-associated deaths were related to a COVID-19 infection. In 18 of these cases, the death was determined to be pregnancy-related in which pregnancy was an aggravating factor contributing to the death.

Most (86%) cases with the leading cause of death as COVID-19 were determined to be preventable at patient/family, provider, hospital, community, or system levels.

Obesity was a contributing factor in 64% of all pregnancy-associated COVID-19 deaths. Obesity is a higher risk factor for severe illness with COVID-19.

Timing of Pregnancy-Associated COVID-19 Deaths: 2021

Over half (55%) of the pregnancy-associated deaths due to COVID-19 occurred within the 7-42 days postpartum period.



Contributing Factors in Pregnancy-Associated COVID-19 Deaths: 2021

Eighteen out of twenty-two women who died from COVID-19 were unvaccinated against COVID-19

Provider delay in treatment (i.e., ECMO and monoclonal antibodies) and referral to higher level of care

Medical history significant for comorbidities/risk factors such as obesity and asthma

Pregnancy-Associated COVID-19 Deaths

Deaths that occurred within one year of pregnancy from COVID-19 infection.

Recommendations for Pregnancy-Associated COVID Deaths: 2021

*These recommendations are from 2021 deaths reviewed in 2022-2023

Over half (55%) of the pregnancy-associated deaths due to COVID-19 occurred within the 7-42 days postpartum period.

1. Providers should **encourage pregnant and postpartum women on the importance of COVID-19 vaccination**. If the vaccine is offered, and declined, there should be documentation of the decline.
2. **Methadone clinics should coordinate with healthcare entities to provide COVID-19 vaccination** in coordination with Methadone appointments.
3. Providers and institutions should **have annual implicit bias training** that includes culturally- and linguistically-appropriate healthcare standards to improve health outcomes.
4. Hospitals should **have policies in place to reduce hospital acquired infections** during inpatient stays.
5. Providers should **ensure appropriate management of COVID-19 positive patients**.

Pregnancy-Associated, but NOT Related Deaths

Pregnancy-Associated, but NOT Related Deaths

Deaths that occurred within one year of pregnancy and determined that the pregnancy was not related.

Table 3: Demographics of Pregnancy Associated, but NOT Related Deaths

Pregnancy-Associated, but NOT Related Deaths in Tennessee, 2017-2021			
Characteristics	**2020**	**2021**	**2017-2021**
Age at death			
Less than 30 years	18 (43%)	40 (63%)	**134 (56%)**
30-39 years	23 (55%)	20 (32%)	96 (40%)
40+ years	1 (2%)	3 (5%)	10 (4%)
Race/Ethnicity			
Non-Hispanic White	21 (50%)	33 (52%)	**157 (65%)**
Non-Hispanic Black	18 (43%)	26 (41%)	71 (30%)
Other*	3 (7%)	4 (6%)	12 (5%)
Education			
Less than high school	6 (14%)	14 (22%)	55 (23%)
High school diploma/GED	23 (55%)	32 (51%)	**109 (45%)**
More than high school	13 (31%)	17 (27%)	75 (31%)
Insurance at Live Birth Delivery[1]			
TennCare	23 (74%)	39 (83%)	**143 (76%)**
Private	6 (19%)	3 (6%)	28 (15%)
Other	0 (0%)	1 (2%)	4 (2%)
None	2 (7%)	3 (6%)	12 (6%)
Unknown	0 (0%)	1 (2%)	2 (1%)
Area of Residence[2]			
Metropolitan county	23 (55%)	40 (63%)	120 (50%)
Rural county	19 (45%)	23 (37%)	120 (50%)
Grand Division			
West TN	18 (43%)	20 (32%)	76 (32%)
Middle TN	14 (33%)	24 (38%)	**82 (34%)**
East TN	10 (24%)	18 (29%)	80 (33%)
Total	**42**	**63**	**240**

1. Insurance status defined for women with a live birth. This variable excludes insurance status for women with an out-of-state delivery and those without a live birth, i.e., women who died during pregnancy, following a miscarriage, or after a fetal death.
2. Metropolitan County includes: Davidson, Hamilton, Knox, Madison, Shelby, and Sullivan Counties.
Percentages may not add to 100 due to rounding.
* Other: this category may refer to individuals with missing or unknown race category, or who are of Hispanic ethnicity, or Non-Hispanics of Asian, Pacific Islander, American Indian/Alaskan Native, or other race.
Data sources: Tennessee Department of Health, Division of Family Health and Wellness, Maternal Mortality Review Program. Tennessee Department of Health, Office of Vital Records and Health Statistics, Birth Statistical File, 2017-2021. Population estimates based on interpolated data from the U.S. Census's Annual Estimates of the Resident Population.

Pregnancy-Associated, but NOT Related Deaths

Deaths that occurred within one year of pregnancy and determined that the pregnancy was not related.

In 2021, 63 individuals died from pregnancy-associated, but not related causes. **These deaths accounted for almost half (47%) of all deaths, and most deaths (71%) occurred at 43-365 days postpartum.**

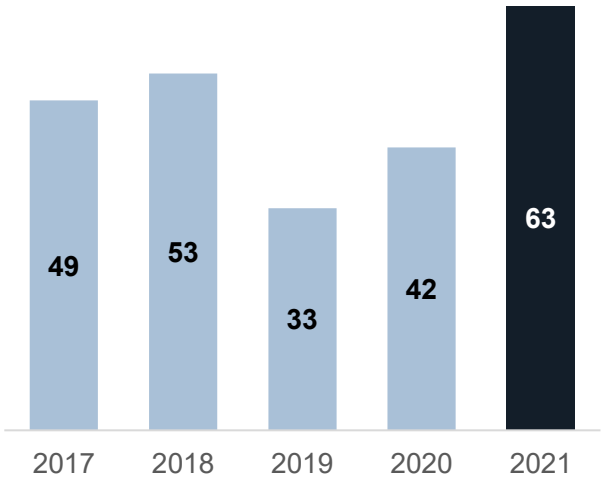
Risk Groups

Non-Hispanic White women had a higher burden of pregnancy-associated but not related deaths than non-Hispanic Black women.

Women less than 30 years of age were more represented in pregnancy-associated, but not related deaths than older women.

Women with TennCare had a higher burden of pregnancy-associated, but not related deaths than women with private health insurance at delivery.

Number of Pregnancy-Associated, but Not Related Deaths: 2017-2021



Location of Death Pregnancy-Associated, but NOT Related Deaths: 2021

Almost 1 in 4 (24%) the pregnancy-associated, but not related deaths **occurred while admitted to the hospital**. The top causes of death were:

- COVID-19
- Sepsis

About 1 in 6 (17%) pregnancy-associated, but not related deaths occurred in the emergency department. **The top cause of death was acute overdose, with 5 in 11 deaths having SUD as a contributing factor**.

Over half (52%) of deaths occurred outside of clinical settings, mostly in home settings and roadways. The **top causes and manner of death were acute overdose, motor vehicle crash, homicide, and suicide**, with 3 in 5 having SUD as a contributing factor and a third of deaths with mental health issues contributing death.

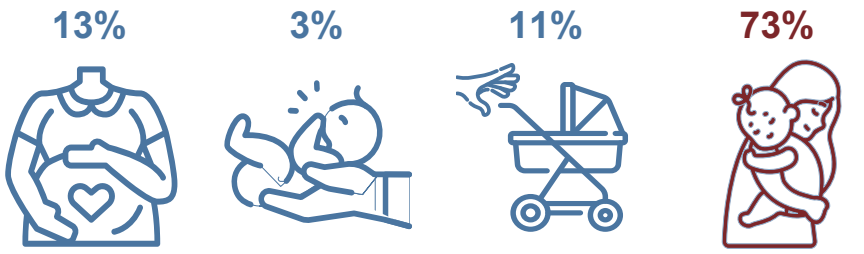
- Acute Overdose
- Others: motor vehicle crash, homicide, and suicide

Pregnancy-Associated, but NOT Related Deaths

Deaths that occurred within one year of pregnancy and determined that the pregnancy was not related.

Timing of Pregnancy-Associated, but NOT Related Deaths: 2021

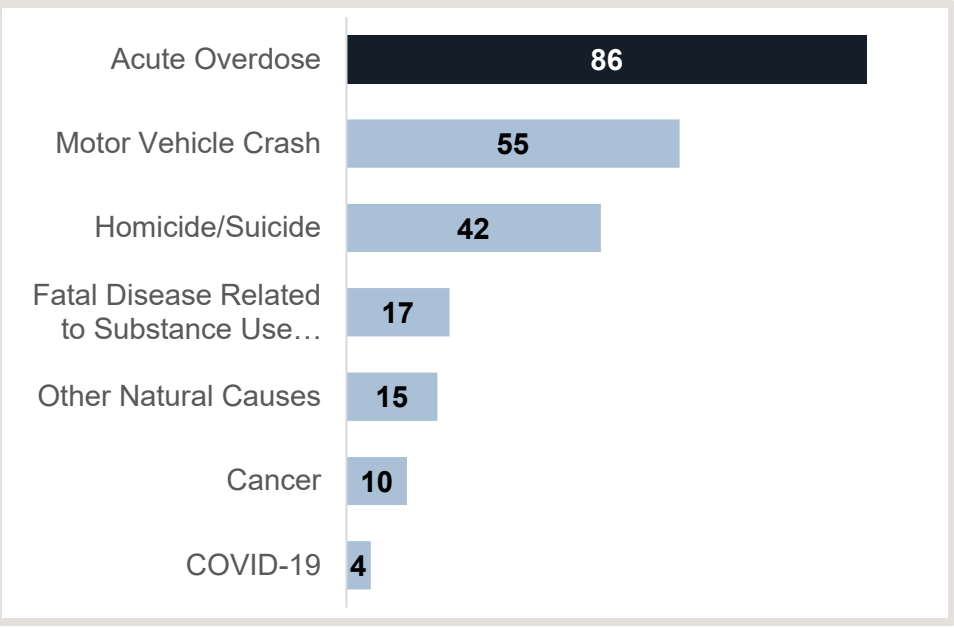
Almost **3 in 4 (73%) pregnancy-associated, but not related deaths occurred within the 43-365 days postpartum period**. The top causes of death that occurred at 43-365 days include acute overdose, motor vehicle crash, homicide, and suicide. No deaths were reported during the 1-6 days postpartum period.



Leading Causes Pregnancy-Associated, but NOT Related Deaths: 2021

The **leading cause of pregnancy-associated, but not related death was acute overdose** (n=86) followed by motor vehicle crash (n=55), and homicide/suicide (n=42).

Acute Overdose is the leading cause of death of Pregnancy-Associated, but not related deaths, Tennessee, 2017-2021



Preventability of Pregnancy-Associated, but NOT Related Deaths: 2021

Two-thirds (67%) of all pregnancy-associated, but not related deaths in 2021 were determined to be preventable, with a third of the deaths having a good chance and two-thirds having some chance of being prevented.

Pregnancy-Associated, but NOT Related Deaths

Deaths that occurred within one year of pregnancy and determined that the pregnancy was not related.

Leading Causes of Death and Contributing Factors: 2021

Substance Use Disorder

- Of the 37 cases where substance use disorder contributed to pregnancy-associated, but not related death, over half (n= 21) had mental health conditions which also contributed to the death.

Mental Health Conditions

- Mental health conditions contributed to 35% (n=22) of pregnancy-associated, but not related deaths. Two of the 22 cases were confirmed deaths by suicide.

Overdose

- History of substance use/overdose, positive drug screen, unstable housing/homeless, anxiety and depression, unemployed, single mother, and Department of Children Services involvement.
- Lack of referral to substance use treatment facilities, lack of prenatal care, and inadequate screenings in the Emergency Department and at prenatal care visits.
- No coordination of care with addiction medicine treatment, patient leaving against medical advice after delivery, and a delayed response to the administration of Narcan or no Narcan available in the home.

Motor Vehicle Crashes (MVC)

- Two in five women (40%) who died from a MVC did not use a seatbelt.
- **In two cases, the women were killed by drivers who were intoxicated.**

Pregnancy-Associated, but NOT Related Deaths: Recommendations

*These recommendations are from 2021 deaths reviewed in 2022-2023.

Recommendations for Pregnancy-Associated, but NOT Related Deaths: 2021

Community and Statewide Agencies

Acute overdose was the leading cause of death among women who died 43 to 365 days postpartum.

1. **The State should support provision of naloxone to all households** that have a known history of substance use disorder prior to pregnancy, during pregnancy, and at discharge following delivery.
2. The **State should provide outreach and assistance to pregnant women with significant life course issues** to ensure they have what they need to care for themselves and their children, such as childcare services, domestic violence resources, and employment services.

Healthcare Providers

Acute overdose was the leading cause of death among women who died 43 to 365 days postpartum.

1. Outpatient providers should **meet with the patient and family members who actively use and discuss the need for all to be in recovery and provide appropriate resources** to help them achieve a sober living environment.

Homicide was a leading manner of death among women who died 43 to 365 days postpartum.

1. **All women should be screened for domestic violence** by their provider during every medical visit, especially during prenatal care visits.
2. Providers should **coordinate appropriate follow-up to women who screen positive for domestic violence**, including checking for firearm safety and lethality assessment.

Women and their Friends and Families

1. **All pregnant women should seek prenatal care and enroll in presumptive eligibility**, if needed, for prenatal, delivery, and postnatal care services once pregnancy is confirmed.
2. **Women with chronic illnesses who are on pain management should work with their healthcare providers on medication management** to reduce the risk of misusing pain medications.

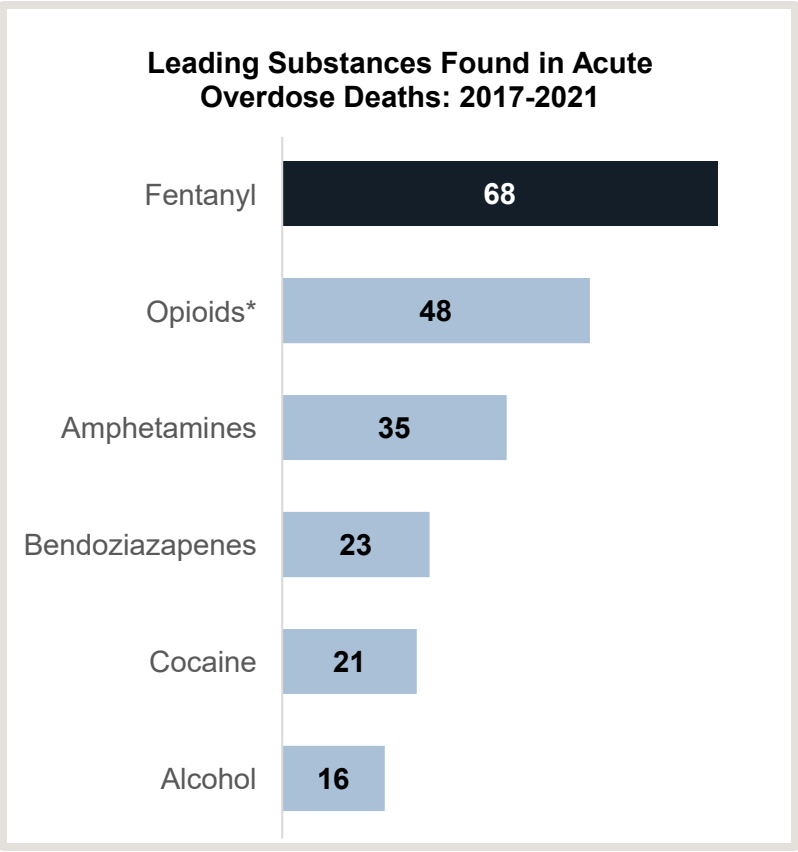
Pregnancy-Associated Deaths:

Substance Use Disorder, Mental Health, Acute Overdose, Violence, and Health Disparities

Pregnancy-Associated, but NOT related Deaths: Acute Overdose

ALL deaths that occurred within one year of pregnancy.

Acute overdose was the leading cause of pregnancy-associated, but not related death in 2021.



*Opiates falling into the 'Other Opioid' category include oxycodone, oxymorphone, morphine, methadone, and buprenorphine

From 2017 to 2021, 87 women died from an acute overdose from causes NOT related to pregnancy. **Substance use disorder (SUD) was prevalent in most (94%) of these deaths.**

In addition, mental health conditions were also predominant in acute overdose deaths categorized as pregnancy-associated, but NOT related: **one in two (52%) women who died of an acute overdose—unrelated to pregnancy—also had mental health conditions contributing to their death**.

Fentanyl was the single most common substance, present in 68 of the 87 (78%) overdose deaths. All but twelve of these incidents involved multiple substances. Thus, the total number of substances shown on the left is greater than the number of overdose deaths.

In Tennessee, women who died from acute overdose within a year of pregnancy:

- Over four in five women **(83%) died between 43 days and 1 year postpartum**
- Most deaths (80%) were preventable
- Over half **(59%)** of deaths **had mental health conditions** as a contributing factor
- **29-years-old was the average age** of women who died from an acute overdose

Pregnancy-Associated Violent Deaths

ALL deaths that occurred within one year of pregnancy.

Table 4: Demographics of Pregnancy-Associated Violent Deaths

From 2017-2021, there were 76 violent (homicide or suicide) deaths in Tennessee that occurred during pregnancy or within a year of pregnancy. Most **(64%) of the violent deaths were preventable**, with 63% of preventable deaths having some chance of preventability.

Pregnancy-Associated Violent Deaths in Tennessee, 2017-2021

Characteristics	Homicides	Suicides
Age at death		
Less than 30 years	**36**	**15**
30 years or older	16	9
Race/Ethnicity		
Non-Hispanic White	20	**17**
Non-Hispanic Black	**29**	6
Other*	3	1
Means of Lethality		
Firearms	39	8
Total	**52**	**24**

*Other: this category may refer to individuals with missing or unknown race category, or who are of Hispanic ethnicity, or Non-Hispanics of Asian, Pacific Islander, American Indian/Alaskan Native, or other race.

Suicides in Pregnancy-Associated Deaths: 2021

- In 2021, suicide was the manner of death in seven (5%) pregnancy-associated deaths.
- **Non-Hispanic White women (n=5) had a higher proportion of suicide** than others (n=2).
- **Women residing in Middle Tennessee** accounted for half (n=4) of the suicides.
- Mental health conditions contributed to five deaths by suicide while substance use disorder contributed to four of these deaths.

Homicides in Pregnancy-Associated Deaths: 2021

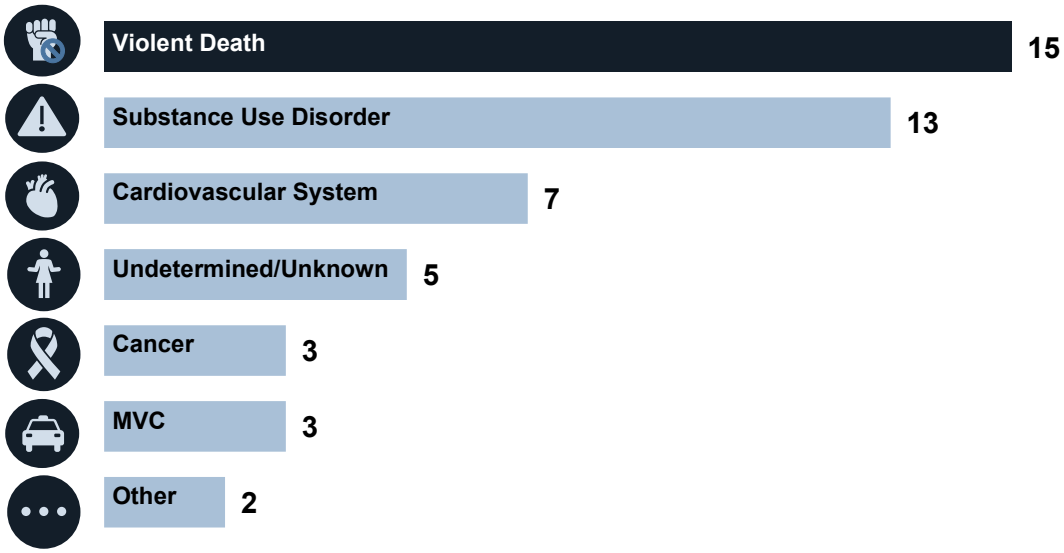
- Homicide was the manner of death in 1 in 9 (n=15, 11%) of all pregnancy-associated deaths.
- **Non-Hispanic Black women (n=11) had a higher proportion of homicide** than women of other race/ethnicities.
- Women who were younger, less than 30 years (n=14) and with a High School diploma or less (n=7) had a higher burden of homicide than others.
- **Most homicides (n=14) were perpetuated by firearm** and 40% (n=6) were killed by an intimate partner.

Pregnancy-Associated, but Unable to Determine Pregnancy Relatedness Deaths

ALL deaths that occurred during or within 1 year of pregnancy, but Committee could not determine pregnancy relatedness

Leading Causes of Pregnancy Associated, but Unable to Determine Pregnancy-Relatedness: 2017-2021

Between 2017 and 2021, 49 pregnancy-associated, but unable to determine pregnancy relatedness deaths were identified. **Over three in five (62%) of these deaths were due to violence (15) or substance use (13).**



Timing & Preventability: 2017-2021

Most pregnancy-associated, but unable to determine relatedness deaths **occurred between 43-365 days postpartum**.

About half (53%) of these deaths were preventable.

Recommendations:

Among women who died between 43 and 365 days postpartum, homicide (7 out of 12) was the leading manner of death.

1. **Healthcare providers** should consistently **screen and refer for substance use** during pregnancy and the postpartum period.
2. **Emergency Departments** should **implement the lethality assessment for all individuals** when seeking services at the hospital.
3. **TDH and TDMHSAS** should **promote training and use of Naloxone** for those with a history of substance misuse during the postnatal period.
4. **TDH** should continue to **provide training to healthcare providers on administering the Edinburgh postpartum depression screen** (EPDS) at least once during the prenatal period and during the postpartum period.
5. **Facilities** should **implement protocols to ensure psych consults are scheduled** for patients prior to discharge when identified as high risk.

Health Disparities in Pregnancy-Associated Deaths

ALL deaths that occurred during pregnancy or within one year of pregnancy.

Pregnancy-Related vs Not Related: 2021

Non-Hispanic Black women are more likely to die from pregnancy-related causes than non-Hispanic White women. Over the past five years in Tennessee, Black women were 2.4x as likely to die from pregnancy-related causes as White women. Our review noted race-specific causes of death. **Black women were more represented in pregnancy-related cardiovascular deaths and homicides while White women were more represented in substance-use disorders.**

Discrimination in Pregnancy-Associated Deaths: 2021

In 2021, discrimination contributed to more than 1 in 5 (22%) pregnancy-associated deaths. Most (90%) of these deaths were deemed preventable. Other contributing factors noted where discrimination was documented include lack of referral or coordination of services, differential treatment due to a history of SUD, and providers not screening and considering women for appropriate COVID-19-management treatment (e.g., ECMO and monoclonal antibodies). Over half **(55%, n=16) of the deaths where discrimination was listed as a contributing factor were classified as pregnancy related, with many dying from COVID-19, cardiovascular disease, and substance use disorders.**

COVID-19 in 2021

COVID-19 deaths affected both non-Hispanic Black and White women. While White women (n=11) had a higher number of pregnancy-associated deaths related to COVID-19 than Black women (n=9), Black women were more impacted since they account for 19% of all live births compared to White women who account for 65% of live-births in Tennessee.

Also, women who died from COVID-19 often had co-morbidities and were unvaccinated. Obesity contributed to 64% of COVID-19-related deaths. **Many women who died from COVID-19 had co-morbidities including obesity, hypertension, asthma, and diabetes that contributed to their death. Over two-thirds (n=18; 82%) of women who died from COVID-19 were not vaccinated.**

Acute Overdose in 2021

In 2021, 43 women died from acute overdose. Three in five (60%) of these deaths were pregnancy-associated but NOT related deaths, making acute overdose the leading cause of death for this category. **Non-Hispanic White women (70%) and those residing in Middle Tennessee (45%) had a larger burden of acute overdose** than other race/ethnicities and grand divisions**.**

Pregnancy-Associated Deaths

Pregnancy-Associated Deaths

ALL deaths that occurred during pregnancy or within one year of pregnancy.

Table 5: Demographics of Pregnancy-Associated Deaths

From 2017 to 2021, 455 Tennessee women have died during pregnancy or within a year of pregnancy.

Pregnancy-Associated Deaths in Tennessee, 2017-2021				
Characteristics	**2020**	**2021**	**2017-2021**	**2017-2021 Pregnancy-Associated Mortality Ratio (Deaths per 100,000 live births, PAMR)[3]**
Age at death				
Less than 30 years	44 (45%)	73 (54%)	227 (50%)	92.7
30-39 years	51 (52%)	54 (40%)	204 (45%)	137.5
40+ years	3 (3%)	7 (5%)	24 (5%)	**258.4**
Race/Ethnicity				
Non-Hispanic White	58 (59%)	71 (53%)	273 (60%)	104.4
Non-Hispanic Black	31 (32%)	52 (39%)	151 (33%)	**193.5**
Other*	9 (9%)	11 (8%)	31 (7%)	59.5
Education				
Less than high school	20 (20%)	22 (16%)	92 (20%)	178.2
High school diploma/GED	41 (42%)	69 (51%)	199 (44%)	175.8
More than high school	37 (38%)	42 (31%)	161 (35%)	68.4
Insurance at Live Birth Delivery[1]				
TennCare	51 (76%)	72 (74%)	248 (72%)	**129.3**
Private	12 (18%)	18 (18%)	71 (21%)	40.1
Other	1 (2%)	1 (1%)	7 (2%)	--
None	3 (4%)	5 (5%)	16 (5%)	184.8
Unknown	0 (0%)	2 (2%)	4 (1%)	--
Area of Residence[2]				
Metropolitan county	50 (51%)	76 (57%)	231 (51%)	**132.2**
Rural county	48 (49%)	58 (43%)	224 (49%)	98.3
Grand Division				
West TN	31 (32%)	40 (30%)	146 (32%)	**148.4**
Middle TN	36 (37%)	51 (38%)	163 (36%)	92.3
East TN	31 (32%)	41 (31%)	143 (31%)	112.1
Total	**98**	**134**	**455**	**113.0**

1. Insurance status defined for women with a live birth. This variable excludes insurance status for women with an out-of-state delivery and those without a live birth, i.e., women who died during pregnancy, following a miscarriage, or after a fetal death.
2. Metropolitan County includes: Davidson, Hamilton, Knox, Madison, Shelby, and Sullivan Counties.
Percentages may not add to 100 due to rounding.
3. PAMR: Pregnancy-Associated Deaths per 100,000 live births
With the identification of new deaths, the MMRC can review additional cases and provide updated evidence. Therefore, the count and rate of deaths reported in prior publications may differ from data in this report.
*Other: this category may refer to individuals with missing or unknown race category, or who are of Hispanic ethnicity, or Non-Hispanics of Asian, Pacific Islander, American Indian/Alaskan Native, or other race.
Data sources: Tennessee Department of Health, Division of Family Health and Wellness, Maternal Mortality Review Program. Tennessee Department of Health, Office of Vital Records and Health Statistics, Birth Statistical File, 2017-2021. Population estimates based on interpolated data from the U.S. Census's Annual Estimates of the Resident Population.

Pregnancy-Associated Deaths

ALL deaths that occurred during pregnancy or within one year of pregnancy.

Pregnancy Relatedness of all Deaths, Tennessee, 2017-2021 (N=455)

About half (53%) of deaths were pregnancy-associated, but not related

Just over 1 in 3 (36%) deaths were pregnancy-related

1 in 9 (11%) deaths were pregnancy-associated but unable to determine pregnancy-relatedness

Key Findings of Pregnancy-Associated Deaths: 2017-2021

Over half of pregnancy-associated deaths **(57%) occurred between 43-365 days postpartum**.

Among all pregnancy-associated deaths, about 3 in 4 deaths (**77%**) **could have been prevented** with the appropriate resources and/or interventions.

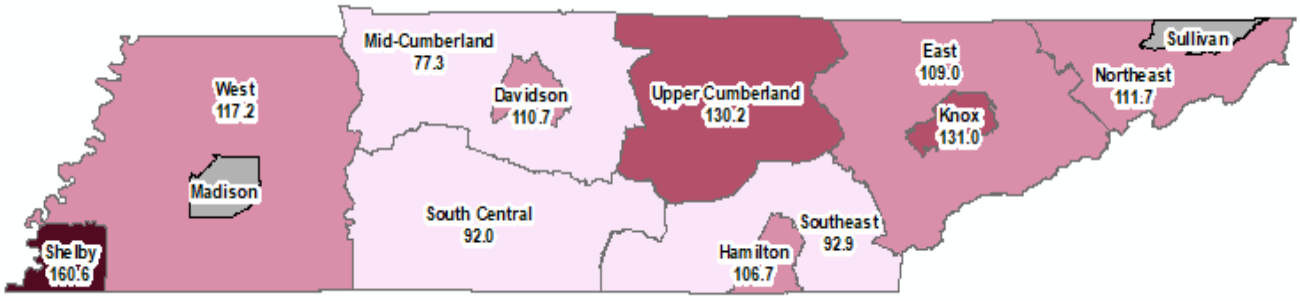
Obesity contributed to about 1 in 7 (14%) pregnancy-associated deaths.

Mental health conditions contributed to 27% (n=121) of all pregnancy-associated deaths, and most women **(n=100; 82%) had substance use disorder as a co-contributing factor**.

Substance use disorders contributed to 39% of all pregnancy-associated deaths.

Pregnancy-Associated Mortality Ratio by Region, Tennessee: 2017-2021

Tennessee Pregnancy-Associated Mortality Ratio (2017-2021):
113.0 Deaths per 100,000 Live Births



Data Source: Tennessee Department of Health, Office of Vital Records and Statistics Maternal Mortality Review Program

Pregnancy-Associated Mortality Ratio

77.3 – 92.9	93.0 – 117.2	117.3 – 131.0	131.1 – 160.6	Data Suppressed Due to Small Counts (<11)

Success Stories 2022-2023

Success Stories: 2022-2023

Community Grants: 2022

In January 2022, four community agencies were awarded up to $20,000 each to implement their proposed projects to reduce maternal mortality by implementing the MMRC recommendations.

East Tennessee State University (ETSU) College of Nursing addressed the critical need for early identification and referral of women who are pregnant and experiencing depression using a unique delivery of virtual and in-person services – reaching the client in their community. The aim of the **R**educing Maternal Morbidity and Mortality through **E**valuation, **A**ssessment, and Improved **C**are in Mental **H**ealth for First-time Mothers in Northeast Tennessee Communities (REACH) Project was to expand services to provide targeted screening, referral, and follow-up to at-risk, first-time mothers who are experiencing depression and risk for suicide in the prenatal and postpartum period. A goal was to ultimately decrease maternal morbidity and mortality – identified as a preventable risk factor among women in Tennessee.

East Tennessee State University (ETSU) Department of Pediatrics continued their program, *Caring for Motherhood.* The goal of the program is to reduce maternal mortality in the East Tennessee region by disseminating education on maternal mortality prevention to providers and community members and by distributing the *Caring for Motherhood* planner widely in the region.

ETSU offered several collaborative series, covering a variety of topics including the prevention of motor vehicle injuries, strong pregnancies, and strong starts, domestic violence risk assessment, best practices for identifying and intervening with pregnant smokers, supporting, and advocating for improved maternal mental health care for families, community-based parenting, and social media utilization to promote child and family lifestyles and wellbeing. In addition to *Caring for Motherhood,* ETSU developed a new podcast series, *Growing Stronger Together* that can be found on Apple Podcasts, Spotify, and Google Podcasts. Topics include *Moms on Mondays, Teens on Tuesdays, and Family Fridays.*

Success Stories: 2022-2023

Renewal House hosted two virtual trainings to increase awareness of maternal mortality. Medical expert and treatment specialist, Dr. Stephen Lloyd, facilitated the sessions. *Session 1* focused on medical providers and *Session 2* focused on substance use disorder (SUD) treatment providers, clergy, and community members. Additionally, Renewal House distributed more than 800 rack cards and hosted 3 rounds of PSAs, raising awareness of maternal mortality in Tennessee. The first round of 60 PSA slots aired on radio stations 92Q and 103.3 during the weeks of June 27, 2022, and July 4, 2022, reaching 370,000 listeners. The second round of 180 additional PSA slots aired on September 16, 2022 through October 2, 2022. The third round of PSAs aired on WXNA FM, which pledged to read the service announcement during commercial breaks. WXNA FM reaches approximately 600,000 potential listeners through radio and reaches another 7,200 listeners via their website, wxnafm.org.

University of Tennessee piloted the program Maternal Overdose Mortality Prevention Education: Preventing Maternal Substance and Opioid Use Morbidity and Mortality in the Postnatal Period (Project MOM). The Department of Anesthesia and the Department of Women and Infants created an English and Spanish educational video to increase knowledge and awareness about the adverse effects of opioids, what pain level women should expect after delivery, and alternative pain management techniques during the postpartum period. This project served counties located in East Tennessee, including Knox, Green, Blount, Sevier, Scott, Polk, Union, Anderson, Loudon, Campbell, Monroe, Claiborne, Jefferson, Hawkins, and Morgan counties. As of September 15, 2022, there were 64 participants who completed the first pre-test/post-test questionnaire that accompanied the video education. Pre-test and post-test comparisons revealed that the opioid education video provided a significant change in knowledge for three of the six questions with moderate effect.

Community Grants: 2023

In January of 2023, one community agency was awarded up to $20,000 to implement their proposed projects to reduce maternal mortality by implementing the MMRC recommendations.

Metro Drug Coalition implemented a project to reduce the contributing factors of poor pregnancy outcomes by educating pregnant women about the effects of substance use and misuse through healthcare professionals in Knox County and throughout the East Tennessee region. In addition, they provided outreach to medical providers on the science of addiction, SBIRT process, treatment options, and counseling women to prevent pregnancy while on a controlled substance.

Postpartum Extension

April 1st, 2022, the Division of TennCare officially expanded health care benefits for pregnant and postpartum TennCare members. Healthcare coverage for women expanded from sixty days to twelve months after pregnancy, which is called “postpartum”. Pregnant and postpartum mothers also now have a comprehensive dental benefit as part of this new coverage.

Doula Services Advisory Committee

In 2023, TCA 63-15-103 authorized the creation of a Doula Services Advisory Committee. The Tennessee Department of Health will recruit three doulas to join the Doula Service Advisory Committee to make recommendations to the legislature on creating core competencies and standards for doula services, propose multiple options for a Medicaid reimbursement plan, propose incentive-based programs such as fee waivers, and examine outcomes, findings, and reports from existing doula-related pilot programs.

MMR Rule Change

In June 2023, the Maternal Mortality Review and Prevention, Review Procedures Rule (1200-15-04) was amended and approved by the Government Operations Committee, allowing the program to contact family members to request their voluntary participation in an informant interview. Informant interviews provide greater context around factors and events leading up to the death.

Success Stories: 2022-2023

Collaboration

Tennessee Department of Health has continued its partnership with TIPQC and THA.

Tennessee Initiative for Perinatal Quality Care (TIPQC) initiated the Severe Maternal Hypertension bundle with 16 hospitals actively participating from across the state. In February of 2023, 750 blood pressure cuff kits were distributed to 25 birthing hospitals. The kits were distributed to women that are preeclamptic, and high-risk, to utilize at home. Since continuing with the project, 4,000 kits have been purchased and distributed to 34 different hospitals. In March of 2023, TIPQC printed 50,395 Postpartum Support International magnets that were distributed to 47 hospitals. TIPQC continues to host their *Healthy Mom, Healthy Baby* podcast. These podcasts have included perinatal mood and anxiety disorder training, *Caring for Motherhood*, maternal mental health support, a journey through postpartum depression and anxiety, birth trauma, and trauma-informed care. TIPQC's new project is the Promotion of Vaginal Deliveries. The project aim is to promote safe vaginal delivery for all in the birthing population presenting with a nulliparous, term, singleton, vertex pregnancy and thus decrease NTSV cesarean delivery rates to < 23.6% (Health People Goal 2030) in all participating Tennessee birthing facilities by Summer of 2024.

Tennessee Hospital Association (THA) implemented training focused on topics identified by the MMRC and the needs assessment including, but not limited to, recognizing pre-eclampsia and hemorrhage protocols. In collaboration with TIPQC, education efforts were divided. TIPQC educated delivery hospitals while THA provided a focus on non-delivery hospitals. In 2022, THA continued working with perinatal educators to conduct simulation training focused on identifying and treating pre-eclampsia. In 2022, THA Maternal Mortality Reduction project collaborated with TIPQC to engage non-OB as well as OB facilities using the ACOG AIM bundles and providing resources for healthcare staff and patients/families. On-site education and simulation for physicians and nurses on a proper assessment of pregnant and postpartum mothers for signs/symptoms of pre-eclampsia, eclampsia, and hypertension to be followed by postpartum hemorrhage. To date, THA has had a total of 155 Emergency Department staff at the 20 participating non-delivery hospitals undergo training.

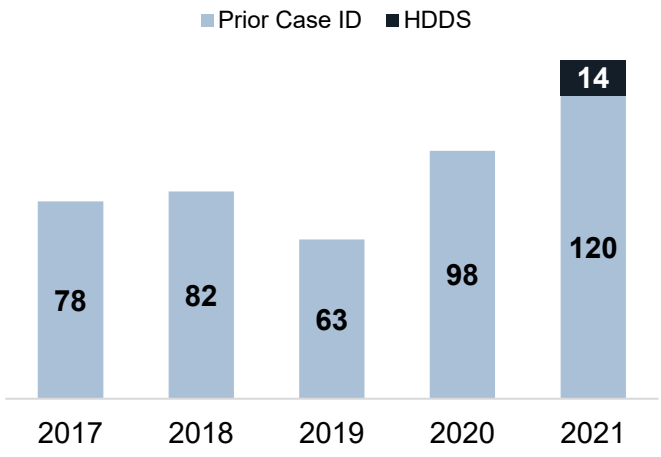
Success Stories: 2022-2023

Maternal Health Innovation Grant

The Tennessee Department of Health received a $5 million competitive federal grant to fund community and clinical programs that improve Tennessee's maternal health outcomes. The TDH Division of Family Health and Wellness received the Maternal Health Innovation grant from the U.S. Dept. of Health and Human Services to fund several initiatives in the next five years: Expand membership in the state maternal health task force which will create a maternal health strategic plan for Tennessee; Strengthen capacities for data collection and analysis to implement maternal health clinical quality improvement projects; Create materials to educate patients about the early warning signs of pregnancy emergencies; Collaborate with local community agencies on projects to address maternal health needs; Share and support the lived experiences of women who survived pregnancy complications, and the experiences of relatives for women who didn't, through public outreach efforts; and Build a comprehensive maternal health website.

Hospital Discharge Data

In 2020, the Tennessee MMR team partnered with the CDC to explore the benefit of using Hospital Discharge Data System (HDDS). We searched 2018 to 2020 inpatient and outpatient records for potential pregnancy associated deaths not captured in our previous case identification using birth records, fetal deaths, pregnancy checkbox, and relevant ICD-10 codes. For 2018 deaths, we identified 28 extra cases not captured from our routine case identification process.



Over a two-year period, the MMR program partnered with Division of Population Health Assessment and THA to get access to the provisional hospitalization discharge data. The goal of this partnership was to improve access to hospitalization data by shortening lag from 9 months to 5 months to meet the MMR's review timeline. This earlier access helps the MMR program in reviewing all pregnancy-associated deaths and informs comprehensive recommendations for preventing maternal deaths.

In 2022, the MMR program incorporated HDDS into the regular process for case identification of 2021 pregnancy-associated deaths. An additional 32 cases that were not captured in prior case identification were discovered; and 14 of these cases were verified true pregnancy-associated deaths. Of all 14 verified HDDS cases, 4 of them were pregnancy-related deaths with cardiovascular disease, COVID-19, and substance use disorders as the cause of death. Most (79%) of the pregnancy associated deaths identified by HDDS were deemed preventable.

Resources

COVID-19:

Guidelines for Obstetric Providers: www.tipqc.org/covid-19

American College of Obstetricians and Gynecologists, COVID-19 Vaccine Info: www.acog.org/covid-19

Overdose and Substance Use

FindHelpNowTN.org is a substance use treatment locator website maintained by the Tennessee Department of Health, in partnership with the University of Kentucky. This platform provides near real-time, location-based openings and a description of services available at substance use treatment facilities across the state. Individuals can search facility listings using up to 60 different filters, such as the type of treatment types, accepted payment options, pregnancy status, and the availability of wrap-around services.

Tennessee Recovery Navigators are people in long-term recovery who meet patients who have recently overdosed in the Emergency Department and connect them with the substance abuse treatment and recovery services they need: tinyurl.com/TN-Recovery-Navigators.

Tennessee Department of Mental Health and Substance Abuse Services state's mental health and substance abuse authority, and is responsible for setting policy, and quality standards, system monitoring and evaluation, and advocating for persons of all ages who have mental illness, serious emotional disturbance, or substance abuse disorder: www.tn.gov/behavioral-health.html.

The Overdose Response Coordination Office provides structure and support to the Department's efforts, oversees grant-funded activities, and cultivates and expands partnerships to strengthen the state's public health response to the overdose crisis: tinyurl.com/health-FHW-ORCO.

Renewal House provides specialized addiction treatment to women and their children: www.renewalhouse.org/about-us/.

Firefly combines prenatal and postpartum care with treatment for opioid use disorder for women facing the dual challenge of pregnancy and recovery in Middle Tennessee. Participation in the program is free: fireflytn.org.

The Next Door is the treatment program that provides expert care for substance use and co-occurring disorders in a faith-based and compassionate setting to empower women for lifetime recovery: https://thenextdoor.org.

Mental Health

Maternal Mental Health Hotline and Perinatal Mental Health Alliance for People of Color: www.postpartum.net/perinatal-mental-health-alliance-for-people-of-color.

Postpartum Support International provides current information, resources, education, and advocates for further research and legislation to support perinatal mental health: www.postpartum.net.

Resources

Domestic Violence

Tennessee Domestic Violence Resources for all: https://tncoalition.org/get-help/help-in-your-area/

Tennessee Domestic Violence Helpline: 1-800-356-6767. The Statewide Domestic Violence Helpline is a referral and counseling helpline for victims of domestic violence.

Tennessee Voices for Victims has a wealth of information on the court process, accessing victim services, and services for homicide victims. A Tennessee County resource list is here: www.tnvoicesforvictims.org/tennessee-state-county-resources.

DV Evidence Project is led by the National Resource Center on Domestic Violence. This online resource houses a comprehensive evidence review of domestic violence core services, programs, and innovative practices, including the review summaries and the theory of change: www.dvevidenceproject.org.

Promising Futures: Best Practices for Serving Children, Youth, and Parents Experiencing Domestic Violence, which is led by Futures Without Violence, developed online resource and capacity-building website compiled with existing evidence and interventions to assist programs serving children: http://promising.futureswithoutviolence.org.

Prevent Intimate Partner Violence is led by the National Resource Center on Domestic Violence. This searchable collection of resources generated in the field includes training tools, campaigns, promising programs, evidence, policies, and other materials that can be adapted in each community to advance the prevention of IPV: http://www.preventipv.org/materials.

National Coalition Against Domestic Violence (NCADV): www.ncadv.org

National Resource Center on Domestic Violence (NRCDV): www.nrcdv.org

Appendices

Appendix A— Glossary of Acronyms

- **ACOG:** American College of Obstetricians and Gynecologists
- **AIM:** Alliance for Innovation on Maternal Health
- **CDC:** Centers for Disease
- **CME:** Continuing Medical Education
- **CSMD:** Controlled Substance Monitoring Database
- **CVA:** Cerebrovascular Accident
- **CVD:** Cardiovascular Disease
- **DV:** Domestic Violence
- **ECMO:** Extracorporeal membrane oxygenation, is an advanced form of life support - targeted at the heart and lungs.
- **EPDS:** Edinburgh Postpartum Depression Screen
- **HDD:** Hospital Discharge Data
- **ICD-10:** International Classification of Diseases, 10th Revision
- **IPV:** Intimate Partner Violence
- **MMR:** Maternal Mortality Review
- **MMRC:** Maternal Mortality Review Committee
- **MVC:** Motor Vehicle Crash
- **NCADV:** National Coalition Against Domestic Violence
- **NRCDV:** National Resource Center on Domestic Violence
- **OB:** Obstetrician
- **ORCO:** Overdose Response Coordination Office
- **PAMR:** Pregnancy-Associated Mortality Ratio
- **PRMR:** Pregnancy-Related Mortality Ratio
- **PSA:** Public Service Announcement
- **PSI:** Postpartum Support International
- **SBIRT:** Screening, Brief Intervention, and Referral to Treatment
- **SUD:** Substance Use Disorder
- **TDH:** Tennessee Department of Health
- **TDMHSAS:** Tennessee Department of Mental Health and Substance Abuse Services
- **THA:** Tennessee Hospital Association
- **TIPQC:** Tennessee Initiative for Perinatal Quality Care
- **U.S. DHHS:** United States Department of Health and Human Services

Appendices

Appendix B— Tables

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