



**Texas Maternal Mortality
and Morbidity Review
Committee and Department
of State Health Services Joint
Biennial Report 2022**



TEXAS

**Health and Human
Services**

**Texas Department of
State Health Services**

**As Required by
Texas Health and Safety Code, Section
34.015**

December 2022

*This report covers a partial cohort for
maternal deaths that occurred in 2019.
DSHS will issue an update to the report
following final analysis of the 2019 cohort.*

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Executive Summary

As required by [Texas Health and Safety Code, Section 34.015](#), the Texas Maternal Mortality and Morbidity Review Committee (MMMRC) and Department of State Health Services (DSHS) jointly submit their 2022 Biennial Report. This report contains DSHS and MMMRC findings and MMMRC recommendations to help reduce the incidence of pregnancy-related deaths and maternal morbidity in Texas.

MMMRC's case review findings and statewide rates, ratios, and trends show opportunities exist to address maternal mortality, morbidity, and disparity contributors in Texas.

Summary of MMMRC Recommendations

1. Increase access to comprehensive health services during pregnancy, the year after pregnancy, and throughout the preconception and interpregnancy periods to facilitate continuity of care, implement effective care transitions, promote safe birth spacing, and improve lifelong health of women.
2. Engage Black communities and those that support them in the development of maternal and women's health programs.
3. Implement statewide maternal health and safety initiatives and incorporate health equity principles to reduce maternal mortality, morbidity, and health disparities.
4. Increase public awareness and community engagement to foster a culture of maternal health, safety, and disease prevention.
5. Improve integrated behavioral health care access from preconception throughout postpartum for women with mental health and substance use disorders.
6. Improve statewide infrastructure and programs to address violence and intimate partner violence at state and community levels.
7. Foster safe and supportive community environments to help women achieve their full health potential.
8. Support emergency and maternal health service coordination and implement evidence-based, standardized protocols to prevent, identify, and manage obstetric and postpartum emergencies.

9. Improve postpartum care management including education and health care coordination for those with mental health and/or high-risk medical conditions.
10. Prioritize continuing education, diversification, and increasing capacity of the maternal health workforce.
11. Apply continuous process improvement strategies for maternal mortality review protocols to support and increase case review capacity, quality, and recommendation development.

1. Introduction

As required by [Texas Health and Safety Code, Section 34.015](#), the Texas Maternal Mortality and Morbidity Review Committee (MMMRC) and the Department of State Health Services (DSHS) submit a joint report on MMMRC and DSHS findings and the MMMRC's recommendations to the Governor, Lieutenant Governor, Speaker of the House of Representatives, and appropriate committees of the Legislature by September 1 of each even-numbered year.

Statute requires the MMMRC to:

- Study and review:
 - ▶ Cases of pregnancy-related death;
 - ▶ Trends, rates, or disparities in pregnancy-related deaths and severe maternal morbidity (SMM);
 - ▶ Health conditions and factors that disproportionately affect the most at-risk populations; and
 - ▶ Best practices and programs operating in other states with reduced pregnancy-related death rates.
- Compare pregnancy-related death rates based on the mother's socioeconomic status.
- Determine the feasibility of the review committee studying SMM cases.
- Consult with the Perinatal Advisory Council when making recommendations to help reduce pregnancy-related deaths and SMM incidences in this state.

2. Background

[Senate Bill 495, 83rd Legislature, Regular Session, 2013](#), established the Maternal Mortality and Morbidity Task Force, now known as the Texas Maternal Mortality and Morbidity Review Committee (MMMRC), within the Department of State Health Services (DSHS). For a current MMMRC member list, see [Appendix A](#).

The MMMRC uses standard methods to review identified pregnancy-associated death cases to determine cause of death and pregnancy-relatedness. For deaths determined to be pregnancy-related, the MMMRC builds consensus to determine potential preventability, contributing factors, and actionable recommendations. State trends in maternal morbidity and mortality rates and disparities are also studied to aid recommendation development. See [Appendix B](#) for technical term definitions used throughout this report.

In their [2016](#), [2018](#), and [2020 Joint Biennial Reports](#), the MMMRC and DSHS published findings and MMMRC recommendations from the 2012 case cohort and a portion of the 2013 case cohort.

Beginning with the 2013 case cohort, an enhanced four-step case identification method to identify cases of pregnancy-associated death was implemented and continues today.¹ The 2013 and subsequent case cohorts include confirmed death cases among Texas residents that occurred during pregnancy or within one year of the end of pregnancy, including cancer deaths and accidental deaths except external causes of injury involving transport accidents (e.g., motor vehicle crashes).²

Senate Bill 748, 86th Legislature, Regular Session, 2019, amended Health and Safety Code 34.021 to require the executive commissioner to apply to the United States Department of Health and Human Services for grants under the federal Preventing Maternal Deaths Act of 2018. In 2019, DSHS applied and was awarded a Centers for Disease Control and Prevention (CDC) Enhancing Reviews and Surveillance to Eliminate Maternal Mortality (ERASE MM) grant authorized by the

¹ Baeva, S., Saxton, D. L., Ruggiero, K., Kormondy, M. L., Hollier, L. M., Hellerstedt, J., Hall, M., & Archer, N. P. (2018). Identifying Maternal Deaths in Texas Using an Enhanced Method, 2012. *Obstetrics and gynecology*, 131(5), 762–769. Available at static.texastribune.org/media/files/3bbcdf1edab72f678003114f5c8a2722/BaevaMatMort2018-greenjournal.pdf.

² The case cohort included transport deaths involving homicide or suicide.

2018 Federal Preventing Maternal Deaths Act. The grant's objective is to identify pregnancy-associated death case cohorts within one year of the death. DSHS is also required to facilitate case review for all pregnancy-related deaths within two years after the death and enter those findings and decisions into the [CDC Maternal Mortality Review Information Application \(MMRIA\)](#) system. Further, Senate Bill 750, 86th Legislature, Regular Session, 2019 requires DSHS to release information in compliance with the federal Preventing Maternal Deaths Act of 2018.

In recognition of the importance of more contemporary case review and CDC grant requirements, DSHS started case identification and facilitated reviews for the 2019 case cohort. DSHS continued to identify pregnancy-associated death cases and calculate enhanced maternal mortality ratios for deaths occurring during the intervening years (2014-2018).

From March 2021 to June 2022, the MMMRC reviewed 118 of 141 provisionally identified 2019 cohort cases.³ From these cases, the MMMRC determined 52 of the reviewed cases were pregnancy-related. The findings and recommendations in this report are derived from the 52 cases and analyses of statewide trends, rates, and disparities.

The 118 pregnancy-associated death cases reviewed by the MMMRC resulted in 6,162 years of potential life lost by the women who died and left an estimated 184 living children forever impacted by the loss of their mothers.⁴

In December 2018, in response to findings of racial disparities in Texas maternal health outcomes and legislative direction to focus on the most at-risk populations, the MMMRC established the Subcommittee on Maternal Health Disparities (Subcommittee) to further investigate factors contributing to maternal mortality disparities. Subcommittee activities over the last biennium include:

- Studying trends, rates, and disparities among 2013 and 2019 pregnancy-related death cases and state severe maternal morbidity (SMM) data to provide input on maternal health disparities reduction recommendations.
- Continuing the development of the Discrimination Assessment and Social Determinants of Health (DASH) Facilitated Discussion Tool to help support the

³ For timely, contemporary case review, DSHS uses provisional death, birth, and fetal death data for case cohort identification. DSHS' future reporting will describe any case increases in the final case cohort that may occur when using final data.

⁴ "Years of potential life lost" is calculated as the sum of the difference between individual age at time of death from the death certificate and average female life expectancy in 2019.

MMMRC with a standard process to guide discussion on determining what extent social determinants of health, system-level, and community-level factors contributed to a death. The tool aides in completion of the MMRIA Committee Decisions Form where the CDC added the discrimination category to the circumstances surrounding death and the contributing factor key in May 2020 ([Appendix C](#)). According to the CDC, discrimination is “treating someone less or more favorably based on the group, class, or category they belong to resulting from biases, prejudices, and stereotyping. It can manifest as differences in care, clinical communication, and shared decision-making.”⁵ In consultation with the Subcommittee, DSHS designed and conducted a pilot study to test the DASH Tool with seven state maternal mortality review committees. The pilot study is undergoing evaluation.

- Developed the MMMRC Case Presentation Guide resource to create a streamlined, standardized format for initiating MMMRC closed executive sessions to recognize the loss of life reflected in the cases being reviewed and a case presentation format to incorporate language to further humanize the case review process.

The Texas MMMRC Vice-Chair and Subcommittee Chair, Dr. Carla Ortique, served on the national MMRIA Racism and Discrimination Working Group and was a co-author on the article, *Developing Tools to Report Racism in Maternal Health for the CDC MMRIA: Findings from the MMRIA Racism and Discrimination Working Group*. Definitions developed by this workgroup are included on the MMRIA Decisions Form to help guide all state maternal mortality review committees.⁶

⁵ Hardeman, R., Kheyfets, A., Mantha, A., Cornell, A., Crear-Perry, J., Graves, C., Grobman, W., James-Contarelli, S., Jones, C., Lipscomb, B., Ortique, C., Stuebe, A., Welsh, K., & Howell, E. A. (2022). Developing Tools to Report Racism in Maternal Health for the CDC Maternal Mortality Review Information Application (MMRIA): Findings from the MMRIA Racism & Discrimination Working Group. *Maternal and child health journal*, 26(4), 661–669. Available at link.springer.com/article/10.1007/s10995-021-03284-3.

3. Findings

The following section presents findings from the Texas Maternal Mortality and Morbidity Review Committee's (MMMRC) review of pregnancy-related deaths and analyses of statewide trends, rates, and disparities. These findings inform the MMMRC's recommendations described later in this report.

MMMRC Case Cohort Review Findings

The MMMRC's primary duty is studying and reviewing pregnancy-related death cases. The MMMRC studies conditions around each pregnancy-associated case to determine pregnancy-relatedness by answering the question, "*If she had not been pregnant, would she have died?*"

From March 2021 to June 2022, the MMMRC reviewed 118 of the 141 provisionally identified 2019 pregnancy-associated death cases to determine pregnancy-relatedness. For each pregnancy-related death, the MMMRC worked to determine the underlying cause of death, if the death was potentially preventable, what were the critical factors contributing to the death, and recommendations and actions that can address and meaningfully impact the contributing factors.³ The MMMRC used the Centers for Disease Control and Prevention (CDC) [Maternal Mortality Review Information Application \(MMRIA\) Committee Decisions Form](#) (found in [Appendix C](#)) to document case review findings.

Preparation and review of the 2019 case cohort's remaining 23 cases continues. DSHS will determine the final 2019 pregnancy-related mortality ratios by race and ethnicity after the MMMRC completes their full review of the 2019 case cohort. The final complete 2013 MMMRC pregnancy-related mortality ratio was calculated and additional pregnancy-related death findings from case cohort review will be presented at the September 2022 MMMRC open meeting.

Finding #1 – 44 percent of the reviewed pregnancy-associated deaths from the 2019 case cohort are pregnancy-related.

The MMMRC determined of the 118 reviewed pregnancy-associated death cases, 52 (44 percent) were pregnancy-related, and 42 (36 percent) were pregnancy-associated, but not related. The MMMRC was unable to determine pregnancy-relatedness for 24 (20 percent) of reviewed cases.

Finding #2 – Most pregnancy-related deaths were preventable.

The MMMRC determines a pregnancy-related death was preventable if they find there was at least some chance of averting the death by one or more feasible changes to the circumstances of the patient, provider, facility, systems, or community factors contributing to the death. The MMMRC determined there was at least some chance for preventability in 90 percent (n=47) of reviewed 2019 case cohort pregnancy-related deaths (N=52).

Finding #3 –Six underlying causes of death accounted for 79 percent of all reviewed 2019 case cohort pregnancy-related deaths.

Obstetric hemorrhage was the most frequently observed leading cause of pregnancy-related death (25 percent; n=13; N=52), followed by mental health conditions (17 percent; n=9), non-cerebral thrombotic embolism (12 percent; n=6), and injury (10 percent; n=5). Cardiovascular conditions and infection tied for the fifth most frequent underlying causes of death at eight percent each (n=4 each).⁶

Finding #4 – Multiple underlying causes contributed to reviewed pregnancy-related deaths caused by obstetric hemorrhage.

Among the reviewed 2019 case cohort pregnancy-related deaths (n=52), obstetric hemorrhage was the leading cause of death accounting for 25 percent (n=13). Ruptured ectopic pregnancy was the top underlying hemorrhage cause (N=13), accounting for 23 percent of pregnancy-related hemorrhage deaths (n=3). Uterine rupture, placental abruption, and placenta accreta spectrum (n=2 each) were tied as the second leading underlying hemorrhage causes.

Finding #5 – Obesity, mental disorders, discrimination, and substance use disorder each contributed to pregnancy-related death.

Through case review, the MMMRC identified the following circumstances surrounding death which contributed to many pregnancy-related deaths (N=52).

- Obesity contributed to 21 percent of pregnancy-related deaths (n=11);

⁶ According to the World Health Organization, the underlying cause of death is the disease or injury that initiated the chain of events leading to death or the circumstances of the accident or violence that produced the fatal injury.

- Mental disorders, other than substance use disorder (SUD), contributed to 21 percent of pregnancy-related deaths (n=11);
- Discrimination contributed to 12 percent of pregnancy-related deaths (n=6);⁷⁸ and SUD, including SUD-associated with mental disorders, contributed to eight percent of pregnancy-related deaths (n=4).

Finding #6 – Violence contributed to pregnancy-related death.

Violent pregnancy-related deaths with a manner of death of suicide or homicide represented 27 percent of pregnancy-related death (n=14; N=52).⁹ The MMMRC found violence, including intimate partner violence, contributed to death. The most frequent means of fatal injury resulting in pregnancy-related death were firearms and airway restriction such as hanging, strangulation, and suffocation. Partners were most likely to be perpetrators of homicide among reviewed homicide cases.

Finding #7 – A complex interaction of factors and characteristics contribute to preventable death.

Factors contributing to a pregnancy-related death may impact a woman over her entire life. The MMMRC identified 390 factors that contributed to the 2019 preventable pregnancy-related cases (N=47), an average of 8.3 contributing factors per case. These factors help cause or aggravate the conditions or events leading up to and surrounding the death of a woman during her pregnancy or up to one year of the end of her pregnancy. Contributing factors are categorized within domains that indicate targeted prevention action levels. Identified contributing factors for preventable pregnancy-related death were distributed among the patient and family (29 percent), provider (30 percent), facility (14 percent), systems of care (12 percent), and community (15 percent) domains.

See [Appendix D](#) for more details about these contributing factors.

⁷ In May 2020, the CDC added the discrimination category, including discrimination, structural racism, and interpersonal racism to the MMRIA Committee Decisions Form’s Contributing Factor Key. See [Appendix C](#) for definitions of these terms.

⁸ The nature of discrimination identified by the MMMRC for the six cases varied and did not show a specific trend.

⁹ The manner of death is the determination of how the injury or disease leads to death. There are five manners of death (natural, accident, suicide, homicide, and undetermined).

Finding #8 – Disparities persist in maternal mortality with Non-Hispanic Black women being most disproportionately impacted.

The final pregnancy-related mortality ratio in 2013 for Non-Hispanic Black women was over twice that for Non-Hispanic White women and over four times higher than Hispanic women ([Appendix E](#)). Preliminary assessment of the 2019 case cohort reviewed to date suggests persistence of this trend. DSHS will determine the final 2019 pregnancy-related mortality ratios by race and ethnicity upon MMMRC completion of full review of the 2019 case cohort.

Findings from Statewide Rates and Trends

DSHS studied rates and trends for maternal mortality and severe maternal morbidity (SMM)-related in-hospital deliveries over multiple years to identify health conditions disproportionately impacting the most at-risk populations.¹⁰

Finding #9 – The enhanced maternal mortality ratio remained relatively stable from 2013-2017.¹¹

From 2013-2017, the enhanced maternal mortality ratio fluctuated between 18.3 percent and 20.7 percent.¹² See [Appendix F](#) for more information on the 2016 and 2017 ratios.

- 2013: 18.9 maternal deaths/100,000 live births
- 2014: 20.7 maternal deaths/100,000 live births
- 2015: 18.3 maternal deaths/100,000 live births
- 2016: 20.7 maternal deaths/100,000 live births
- 2017: 20.2 maternal deaths/100,000 live births

¹⁰ CDC defines SMM as unexpected outcomes of labor and delivery that result in significant short- or long-term consequences to a woman's health. SMM is closely related to maternal mortality because it involves conditions that, if left untreated, could result in death. Estimated SMM delivery hospitalization rates use information on hospital discharge records to identify SMM indicators, including specific potentially life-threatening conditions and life-saving medical procedures.

¹¹ The enhanced method is different from methods used by others to calculate maternal mortality rates or ratios. Therefore, calculated enhanced maternal mortality ratios cannot be compared with other maternal mortality rates or ratios. DSHS researchers will continue to apply the refined four-step enhanced methodology to confirm maternal deaths and calculate enhanced maternal mortality ratios for trend analysis.

¹² DSHS calculates an enhanced maternal mortality ratio of the number of identified maternal deaths per 100,000 live births in a given year.

Finding #10 – From 2016-2020, demographic and geographic disparities in severe maternal morbidity rates related to in-hospital deliveries persist.

DSHS calculated overall SMM rates related to in-hospital deliveries for 2016-2020 using the recently updated 2021 federal SMM definition.¹³ The provisional 2020 Texas SMM rate related to in-hospital deliveries is 72.7 cases per 10,000 delivery hospitalizations. The rate increased from 58.2 in 2018.

The following groups of women experienced the highest rates of SMM:

- Non-Hispanic Black women;
- Women without private payer coverage for delivery;
- Women with a 12th-grade education or less; and
- Women with advanced maternal age (35 or older).

Rates of SMM varied across the state:

- North Central Texas and Southeast Texas along the Gulf Coast had the highest rates;
- South Texas had the lowest rate;
- Rates were higher among women living in urban areas, with a widening gap between urban and rural counties;
- Rates were lower in border than in non-border counties.

See [Appendix G](#) for more information.

Finding #11 – Overall severe maternal morbidity rates show improvement in obstetric hemorrhage delivery hospitalizations while sepsis and preeclampsia rates increased. Disparities in severe maternal morbidity still persist for Non-Hispanic Black women.

The obstetric hemorrhage SMM delivery hospitalization rate in 2020 (27.5 deliveries per 10,000 delivery hospitalizations) was the lowest since 2017 (27.0). However,

¹³ "This measure continues to apply a 2021 revised SMM code set that helps to bridge the ICD-10-CM/PCS transition and that excludes blood transfusion due to poor specificity in the absence of other SMM indicators." (Page 14.) MCHB. Federally Available Data (FAD) Resource Document. 2022; Rockville, MD: HRSA. Available at mchb.tvisdata.hrsa.gov/Admin/FileUpload/DownloadContent?fileName=FadResourceDocument.pdf&isForDownload=False

disparities still persist with the obstetric hemorrhage SMM rate increasing 9.8 percent among Non-Hispanic Black women from 36.9 to 40.5 deliveries from 2016 to 2020. In addition, the overall SMM-related in-hospital delivery rates among Non-Hispanic Black women increased 28.1 percent from 91.6 to 117.3 deliveries over that same time period.

Preeclampsia-associated SMM rates increased 37 percent between 2017 and 2020 (16.3 deliveries versus 22.4 deliveries per 10,000 delivery hospitalizations). From 2019 to 2020, rates remained stable among Non-Hispanic White populations, declined in Non-Hispanic Other populations, and increased among Non-Hispanic Black and Hispanic populations.

Sepsis-associated SMM rates more than doubled between 2017 and 2020 (5.1 versus 11.7 deliveries per 10,000 delivery hospitalizations).

For more information, see [Appendix G](#).

Finding #12 – Beginning in April 2020, severe maternal morbidity associated with COVID-19 appeared to show disproportionate impacts to Hispanic women .¹⁴

From April to December 2020, Hispanic women were disproportionately impacted by COVID-associated SMM. They represented only 48.3 percent of delivery hospitalizations during this time but 70.1 percent of all delivery hospitalizations involving COVID-19-associated SMM ([Appendix H](#)).

¹⁴ These findings were from a time relatively early in the pandemic and prior to broad COVID-19 testing availability or the COVID-19 vaccine. DSHS will continue to study COVID-19's association with SMM and maternal mortality in future analyses.

4. Best Practices and Programs from Other States

Over the 2021-22 biennium, the Texas Maternal Mortality and Morbidity Review Committee (MMMRC) identified the following best practices and programs from other states:

- As part of a larger initiative to improve mental health services accessibility, the Florida State College of Medicine’s Center for Behavioral Health Integration and the Florida Maternal Mental Health Collaborative partnered to create the [Florida Behavioral Health Impact](#) program. The program provides telephone consultations with psychiatrists for prenatal and postpartum health care providers who are seeking resources, including perinatal mental health management, assessment tools information, a mental health provider list, and patient resources. The psychiatrist consultation is not meant to treat or diagnose but to share best practices in the detection, assessment, and treatment of mental health conditions; and
- The Montana Department of Public Health and Human Services created the [Montana Obstetric and Maternal Support \(MOMS\)](#) program, a telemedicine network that provides specialist consultation to rural area health care providers treating high-risk pregnant and postpartum women including women with substance use disorder.¹⁵

The 2020 Joint Biennial Report also described best practices and programs other states use to reduce maternal mortality and morbidity, including strategies from the Centers for Medicare and Medicaid Services’ Accountable Health Communities Model initiative and the Florida Pregnancy-Associated Mortality Review’s Urgent Maternal Mortality Message to Providers.

¹⁵ While similarly named, the Montana MOMS program is not affiliated with the Texas Maternal Opioid Misuse (MOM) model, which is a program to help women participating in Texas Medicaid to get treatment for opioid use disorder during and after pregnancy. (See the [Texas HHS MOM Model webpage](#)).

5. MMMRC Recommendations

The Texas Maternal Mortality and Morbidity Review Committee (MMMRC) considered findings from their review of pregnancy-related death cases and additional analyses to apply their collective multidisciplinary expertise to make the following prevention and process improvement recommendations.

MMMRC Recommendation #1 – Increase access to comprehensive health services during pregnancy, the year after pregnancy, and throughout the preconception and interpregnancy periods to facilitate continuity of care, implement effective care transitions, promote safe birth spacing, and improve lifelong health of women.

The MMMRC continues to find pregnancy-related death occurring up to 12 months postpartum with 27 percent of the reviewed 2019 pregnancy-related deaths occurring 43 days to 1 year after the end of pregnancy. Comprehensive health services during pregnancy, the year after pregnancy, and throughout the preconception and interpregnancy periods provide opportunities for reproductive life planning, health risk screening, vaccinations, and acute and chronic condition prevention and management. These services can reduce morbidity and mortality risks, improve future birth outcomes, and promote lifelong health.

The American College of Obstetricians and Gynecologists (ACOG) reinforces the importance of the postpartum period and the concept of the “fourth trimester” and states that, “... to optimize the health of women and infants, postpartum care should become an ongoing process, rather than a single encounter, with services and support tailored to each woman’s individual needs.”^{16,17}

Strides to increase access have been made in Texas, with the amendment of [Human Resources Code, Section 32.024](#), by the Texas Legislature in 2021, which extends medical assistance for eligible women for at least six months following pregnancy. However, the MMMRC continues to recommend extending health care

¹⁶ McKinney, J., Keyser, L., Clinton, S., & Pagliano, C. (2018). ACOG Committee Opinion No. 736: Optimizing Postpartum Care. *Obstetrics and gynecology*, 132(3), 784–785. Available at journals.lww.com/greenjournal/Fulltext/2018/05000/ACOG_Committee_Opinion_No_736_Optimizing.42.aspx.

¹⁷ The fourth trimester: a critical transition period with unmet maternal health needs. *American journal of obstetrics and gynecology*, 217(1), 37–41. Available at [ajog.org/article/S0002-9378\(17\)30498-2/fulltext](https://ajog.org/article/S0002-9378(17)30498-2/fulltext).

coverage to 12 months postpartum to help identify and properly manage health conditions before they become life-threatening.

The MMMRC recommends using health risk prevention, identification, and management strategies throughout the reproductive years by increasing access to evidence-based, patient-centered care.^{18,19} Increasing access to care should include removing provider barriers to strengthen appropriate diagnosis, referral, and treatment for maternal health populations, regardless of an individual's financial or health care coverage status.

Effective coordination and management of complex health needs, continuity of care, and provider transitions require health information portability and accessibility. The MMMRC recommends strategies to support a woman's ability to access, understand, and share her health information. A portable, consolidated, patient-controlled medical history supports care continuity across facilities, care teams, specialties, and care episodes.

MMMRC Recommendation #2 – Engage Black communities and those that support them in the development of maternal and women's health programs.

As one of five aims for health care quality improvement, equitable health care is an essential pillar of health care quality.^{20,21} The MMMRC found persistent disparities in maternal health outcomes. Health care quality improvement efforts are necessary but insufficient to address maternal mortality and morbidity, especially for most at-risk populations. To address maternal health disparities, the MMMRC recommends relevant stakeholder organizations coordinate efforts and use upstream approaches

¹⁸ The Institute of Medicine (IOM) defines patient-centered care as "Providing care that is respectful of, and responsive to, individual patient preferences, needs and values, and ensuring that patient values guide all clinical decisions." See the [Agency for Healthcare Research and Quality \(AHRQ\) Six Domains of Health Care Quality webpage](#).

¹⁹ The federal AHRQ defines evidence-based practice as using the best available evidence together with a clinician's expertise and a patient's values and preferences in making health care decisions. See the [AHRQ Evidence-Based Decisionmaking webpage](#).

²⁰ Institute of Medicine (IOM) Committee on Quality of Health Care in America. (2001). *Crossing the Quality Chasm: A New Health System for the 21st Century*. National Academies Press (NAP). Available at pubmed.ncbi.nlm.nih.gov/25057539/.

²¹ IOM Committee on Understanding and Eliminating Racial and Ethnic Disparities in Health Care, Smedley, B. D., Stith, A. Y., & Nelson, A. R. (Eds.). (2003). *Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care*. NAP. Available at pubmed.ncbi.nlm.nih.gov/25032386/.

that identify and address inequities in health care systems and communities.²² In these efforts, Black communities must be at the center of program planning. The MMMRC recommends institutions, health care organizations, and professional organizations:

- Fully engage Non-Hispanic Black mothers and their support networks in planning, developing, and evaluating maternal health and safety programs and services;
- Require primary and inpatient obstetric care providers to complete the [National Culturally and Linguistically Appropriate Services \(CLAS\) Standards in Maternal Health Care](#) e-learning curriculum or equivalent bias reduction training and incorporate licensure and continuing education program completion requirements;
- Integrate causes of maternal health disparities in graduate medical education curriculum and promote best practice training to reduce health disparities;
- Promote patient-centered care through shared decision-making recognizing women as experts in their values and preferences and supporting informed, collaborative approaches to making health care decisions;²³
- Promote awareness about the prevalence and impact of cumulative trauma across a lifetime and provide education on maternal trauma-informed care principles; and
- Support hospitals, birthing centers, and clinics in the development of policies that reflect respectful maternity care and incorporate healthcare quality improvement.

MMMRC Recommendation #3 – Implement statewide maternal health and safety initiatives and incorporate health equity principles to reduce maternal mortality, morbidity, and health disparities.

The MMMRC found that inadequate clinical skill and quality of care at provider, facility, and system levels led to preventable death. To foster a culture of safety and highly reliable care in Texas, the MMMRC recommends stakeholders continue coordinated efforts to implement maternal health and safety quality improvement

²² “Upstream” interventions target the root causes of an outcome and address the social and structural barriers to optimal health.

²³ The SHARE Approach. Agency for Healthcare Research and Quality, Rockville, MD. Reviewed October 2020. Available at ahrq.gov/health-literacy/professional-training/shared-decision/index.html.

initiatives through the Department of State Health Services (DSHS) [TexasAIM Initiative](#) and the [Texas Collaborative for Healthy Mothers and Babies \(TCHMB\)](#).

TexasAIM should continue to support health systems with implementing evidence-based standards, guidelines, and practices, increasing patient and family engagement, promoting health care quality improvement, and reducing maternal health disparities.

The MMMRC recommends stakeholders:

- Implement the multidisciplinary recommendations from the *American Heart Association's Call to Action: Maternal Health and Saving Mothers: A Policy Statement from the American Heart Association* to prevent death and disability from cardiovascular disease;²⁴
- Train obstetric care providers on risk factors for placenta accreta spectrum disorder (PASD), detailed in [Health and Safety Code, Section 241.1837](#), to standardize approaches for prenatal uterus and placenta ultrasound evaluation for women at risk for PASD and women with PASD to deliver at facilities with the appropriate level of maternal care;
- Implement evidence-based programs such as the federal [Team Strategies and Tools to Enhance Performance and Patient Safety \(TeamSTEPPS\)](#) framework in health care settings to improve communication and teamwork.

MMMRC Recommendation #4 – Increase public awareness and community engagement to foster a culture of maternal health, safety, and disease prevention.

The MMMRC found a lack of knowledge regarding the importance of a severe health event, treatment, or follow up at the patient or family, provider, facility, systems, and community levels ([Appendix D](#), Table D-2). The MMMRC recommends DSHS continue to develop and implement strategies, including [Hear Her Texas](#), to reach and engage diverse stakeholders with focus on populations at risk for poor maternal health outcomes and specific information about the MMMRC's findings and recommendations.

²⁴ Mehta, L.S., Sharma, G., Creanga, A., Hameed, A., Hollier, L., Johnson, J., Leffert, L., McCullough, L.D., Mujahid, M., Watson, K., White, C., on behalf of the American Heart Association Advocacy Coordinating Committee. (2021). Call to action: maternal health and saving mothers: a policy statement from the American Heart Association. *Circulation*, (144), e251–e269. Available at [doi: 10.1161/CIR.0000000000001000](https://doi.org/10.1161/CIR.0000000000001000).

The MMMRC recommends stakeholders:

- Increase awareness about urgent maternal warning signs, risk factors, and circumstances that contribute to poor maternal health outcomes;
- Promote awareness about healthy behaviors and preventive services;
- Foster and build community awareness through strategic community partnerships and use of novel approaches to reach target audiences;
- Increase [Surviving Sepsis Campaign](#) awareness; and
- Support [statewide efforts](#) to combat human trafficking.

MMMRC Recommendation #5 – Improve integrated behavioral health care access from preconception throughout postpartum for women with mental health and substance use disorders.²⁵

The MMMRC found mental health and substance use disorders contribute to pregnancy-related death and were often co-occurring. Integrated behavioral health care can mitigate suicide or unintentional overdose risks. Early mental disorder and substance use disorder (SUD) identification, intervention, treatment, and appropriate referral can prevent pregnancy-related death. Using social work, case management, and similar services can facilitate connections to appropriate community resources.

The MMMRC recommends maternal health care providers are trained on appropriate diagnosis, referral, and treatment for perinatal mood and anxiety disorders (PMAD) and have access to behavioral health care providers, through networks such as the [Perinatal Psychiatric Access Network \(PeriPAN\)](#), for consultations on care management for pregnant and postpartum patients.²⁶ Providers should also implement the recommendations from the [ACOG Policy Statement: Substance Abuse Reporting and Pregnancy: The Role of the Obstetrician–Gynecologist](#) to support mothers with SUD in pregnancy.

²⁵ For information on behavioral health integration, review: *What Is Integrated Behavioral Health Care (IBHC)?* on the [AHRQ website](#); *SAMHSA-HRSA Center for Integrated Health Solutions* on the [Suicide Prevention Resource Center website](#); and *Center of Excellence for Integrated Health Solutions* on the [National Council for Mental Wellbeing website](#).

²⁶ PeriPAN is only available in four pilot regions in Texas: Texas Tech University Health Sciences Center (Panhandle); The University of Texas (UT) Southwestern Medical Center (North); Baylor College of Medicine (Southeast); and Dell Medical School at UT-Austin (Central).

To meet the needs of maternal patients with a history of PMAD or SUD, stakeholders should promote [Maternal Levels of Care](#) and the [National Maternal Mental Health Hotline](#). The MMMRC also recommends stakeholders educate families and support networks on PMAD, urgent maternal warning signs, and self-harm risk reduction strategies for pregnant and postpartum populations at increased suicide risk.

MMMRC Recommendation #6 – Improve statewide infrastructure and programs to address violence and intimate partner violence at state and community levels.

The MMMRC found violence, including intimate partner violence (IPV), contributed to death and partners were most likely to be perpetrators of homicide. The MMMRC recommends providers and stakeholders increase competencies, skills, and prevention strategies for violence, IPV, and trauma-informed care. Per ACOG recommendations, providers should routinely screen for IPV at periodic intervals, offer ongoing support, and review available prevention and referral options.²⁷

The MMMRC recommends Texas communities address service gaps and emerging issues experienced by IPV survivors by implementing recommendations in the [Texas Council on Family Violence Texas State Plan](#). Stakeholders should promote and provide residential and economic resources for victims of abuse.

MMMRC Recommendation #7 – Foster safe and supportive community environments to help women achieve their full health potential.

To address community drivers impacting health and improve maternal health outcomes throughout the first postpartum year and between pregnancies, the MMMRC recommends adopting evidence-based policies that support working

²⁷ ACOG Committee Opinion No. 518: Intimate partner violence. (2012). Obstetrics and gynecology, 119(2 Pt 1), 412–417. Available at journals.lww.com/greenjournal/Citation/2012/02000/Committee_Opinion_No_518_Intimate_Partner.51.aspx.

women's ability to protect and care for themselves and their newborns during pregnancy and recuperation from childbirth.^{28,29}

The MMMRC recommends stakeholders:

- Promote available smoking cessation programs to maternal health populations;
- Promote prenatal and postpartum referrals and participation in the Texas Special Supplemental Nutrition Program for Women, Infants, and Children Program;
- Bolster care coordination services and referral systems to address risk factors and prevent harm; and
- Increase community capacity for programs that provide safe and secure housing with transitional services, access to comprehensive case management services, and housing assistance for unhoused pregnant and postpartum people and their families.

MMMRC Recommendation #8 – Support emergency and maternal health service coordination and implement evidence-based, standardized protocols to prevent, identify, and manage obstetric and postpartum emergencies.³⁰

The MMMRC found most pregnancy deaths were preventable. Interaction with emergency medical services is commonly observed during MMMRC case review and sometimes significant in the circumstances that preceded death. Emergency health providers' knowledge about maternal health, as well as communication and coordination with obstetric and women's health professionals, are critical factors in preventing pregnancy-related deaths. The MMMRC recommends stakeholders:

- Optimize coordination between emergency and maternal health services;
- Incorporate emergency department (ED) representation in existing maternal health and safety programs;

²⁸ ACOG Committee Opinion No. 736: Optimizing Postpartum Care. (2018). *Obstetrics and gynecology*, 131(5), e140–e150. Available at journals.lww.com/greenjournal/FullText/2018/09000/ACOG_Committee_Opinion_No_736_Optimizing.50.aspx.

²⁹ Dagher, R.K., McGovern, P.M., & Dowd, B.E. (2014). Maternity Leave Duration and Postpartum Mental and Physical Health: Implications for Leave Policies. *Journal of Health Politics, Policy and Law*, 39(2): 369–416. Available at doi.org/10.1215/03616878-2416247.

³⁰ Emergency services includes all points of emergent care, including emergency medical services, urgent care facilities, hospital-based emergency departments, stand-alone emergency rooms, and walk-in clinics.

- Disseminate maternal early warning system (MEWS), obstetric hemorrhage, hypertension, sepsis, and venous thromboembolism educational materials to emergency department clinical teams;
- Evaluate pregnant and postpartum women’s triage practices and develop standardized care coordination protocols across service lines;
- Promote obstetric provider consultations for pregnant and postpartum patient emergency management;
- Implement emergency medical service (EMS) and private transport team obstetric-specific training and simulations;
- Incorporate obstetric-specific training in trauma levels of care and emphasize obstetric hemorrhage, hypertension, sepsis, and venous thromboembolism maternal safety initiatives; and
- Support pilot programs that embed social and behavioral health service providers in community wellness emergency response teams.

MMMMRC Recommendation #9 – Improve postpartum care management including education and health care coordination for those with mental health and/or high-risk medical conditions.

Pregnancy-related deaths can occur during pregnancy, delivery, or within the year after pregnancy. Since most pregnancy-related deaths occur after pregnancy, health care systems should focus on patient-centered postpartum care. To support postpartum maternal health, the MMMRC recommends providers and stakeholders provide anticipatory guidance to women and their families about the postpartum period; develop systems for identifying and appropriately assessing postpartum women’s needs in ambulatory care settings; and promote best practices in postpartum care and use of maternal health and education services.

MMMRC Recommendation #10 – Prioritize continuing education, diversification, and increasing capacity of the maternal health workforce.

The MMMRC found discrimination contributed to 12 percent of the reviewed 2019 pregnancy-related deaths. To reinforce patient relatability and connection with providers and staff, the MMMRC recommends developing a workforce that reflects the diversity of Texas as shared racial and ethnic identities between patients and

providers has shown to decrease disparities in health outcomes.^{31,32} The MMMRC also recommends expanding provider incentive programs to enhance coverage in rural and women’s health care shortage areas and implementing training on trauma-informed care for all maternal health care providers.

MMMRC Recommendation #11 – Apply continuous process improvement strategies for maternal mortality review protocols to support and increase case review capacity, quality, and recommendation development.

The MMMRC found opportunities exist to improve maternal mortality tracking and analysis. The MMMRC recommends DSHS, professional organizations, and death certifier training programs promote practices for increased accuracy of pregnancy-associated death certification. The practices should include training death certifiers and establishing processes to accurately assess whether deaths occurred during pregnancy or within a year of the end of pregnancy.

The MMMRC recommends including maternal mortality information in the [Texas Justice Court Training Center’s](#) required justices of the peace training on death investigation. The MMMRC also recommends amending [Health and Safety Code, Chapter 34](#), to include new expertise on the committee that are not currently represented, such as an emergency medicine provider, first responder (police or emergency medical technician), cardiologist, and oncologist representative.

³¹ Jetty, A., Jabbarpour, Y., Pollack, J. et al. (2022) Patient-Physician Racial Concordance Associated with Improved Healthcare Use and Lower Healthcare Expenditures in Minority Populations. *J. Racial and Ethnic Health Disparities*, 9(1), 68–81. Available at link.springer.com/article/10.1007/s40615-020-00930-4.

³² Shen MJ, Peterson EB, Costas-Muñiz R, Hernandez MH, Jewell ST, Matsoukas K, Bylund CL. (2018). The Effects of Race and Racial Concordance on Patient-Physician Communication: A Systematic Review of the Literature. *J Racial Ethn Health Disparities*. 2018 Feb;5(1):117-140. Available at pubmed.ncbi.nlm.nih.gov/28275996/.

6. Conclusion

The Texas Maternal Mortality and Morbidity Review Committee (MMMRC) brings together multidisciplinary professionals from across the state to comprehensively study how and why Texas mothers are dying and identify opportunities to prevent future deaths. Maternal mortality and morbidity contributing factors are complex and occur over the life course. The MMMRC focused their findings and recommendations on factors that impact maternal health at the individual, family, provider, facility, systems, and community levels.

This report's findings and MMMRC recommendations represent priority opportunities to reduce preventable maternal mortality. However, just as multiple factors impact maternal health population outcomes, the protection of mothers must be a combined effort across entities, levels, and systems. The MMMRC encourages stakeholders to review these findings and recommendations and identify where they can contribute to efforts to eliminate health disparities and build a culture of maternal health and safety.

An important theme throughout this report is the persistence of maternal health disparities. This theme underscores the importance of continuing the MMMRC's Subcommittee on Maternal Health Disparities work studying factors that contribute to inequitable outcomes and informing prevention activities.

The Department of State Health Services (DSHS) and the MMMRC's participation in federal maternal mortality prevention grant opportunities support multi-state connections and best practice alignment for a fully functional review committee. Strengthening stakeholder communications, outreach, and cross-sector and disciplinary partnerships will continue to help move MMMRC recommendations into action.

Healthier women become healthier mothers, who contribute to healthier infants, families, and communities. The MMMRC and DSHS recognize the loss of one mother is one too many and remain deeply committed to improving maternal health and safety for Texans and those forever impacted by the loss of a mother.

List of Acronyms

Acronym	Full Name
ACOG	American College of Obstetricians and Gynecologists
AIM	Alliance for Innovation on Maternal Health
AHRQ	Agency for Healthcare Research and Quality
CDC	Centers for Disease Control and Prevention
CLAS	Culturally and Linguistically Appropriate Services
DASH	Discrimination Assessment and Social Determinants of Health
DSHS	Department of State Health Services
ERASE MM	Enhanced Reviews and Surveillance to Eliminate Maternal Mortality
HHSC	Health and Human Services Commission
HRSA	Health Resource Services Administration
ICD	International Classification of Diseases
IOM	Institute of Medicine
IPV	Intimate Partner Violence
MCHE	Maternal and Child Health Epidemiology Unit
MCHU	Maternal and Child Health Unit
MEWS	Maternal Early Warning System
MMR	Maternal Mortality Ratio
MMMRC	Texas Maternal Mortality and Morbidity Review Committee
MMRIA	Maternal Mortality and Information Application
MOMS	Montana Obstetric and Maternal Support program
NIH	National Institutes of Health
OB-LOUD	Obstetric Care for Women with Opioid Use Disorder
PASD	Placenta Accreta Spectrum Disorder
PeriPAN	Perinatal Psychiatric Access Network
PMAD	Perinatal Mood and Anxiety Disorders
PRMR	Pregnancy-Related Mortality Ratio
SMM	Severe Maternal Morbidity
SUD	Substance Use Disorder
TeamSTEPPS	Team Strategies and Tools to Enhance Performance & Patient Safety
TCHMB	Texas Collaborative for Healthy Mothers and Babies
THCIC	Texas Health Care Information Collection

Appendix A. Texas Maternal Mortality and Morbidity Member List as of September 2022

Name	Position	Professional/Personal Affiliations and Location
Dr. Carla Ortique (chair)	Physician specializing in Obstetrics	Obstetrician/Gynecologist, Women's Specialists of Houston at Texas Children's Hospital Pavilion for Women, Houston
Dr. Patrick Ramsey (vice-chair)	Physician specializing in Obstetrics, Maternal-Fetal Medicine Specialist	Professor, Chief and Fellowship Director of Maternal-Fetal Medicine, Department of Obstetrics and Gynecology, University of Texas Health, San Antonio
Dr. Manda Hall	Department of State Health Services (DSHS) representative	Associate Commissioner, Community Health Improvement Division, DSHS, Austin
Dr. Kelly Fegan-Bohm	State Epidemiologist or designee	Maternal and Child Health Medical Director, Community Health Improvement Division, DSHS, Austin
Dr. Carey Eppes	Physician specializing in Obstetrics, Maternal-Fetal Medicine Specialist	Associate Professor, Maternal Fetal Medicine Division Director, Baylor College of Medicine, Houston

Name	Position	Professional/Personal Affiliations and Location
Dr. James Hill	Physician specializing in Obstetrics, Maternal-Fetal Medicine Specialist	Director, Maternal-Fetal Medicine Division and Professor, Department of Obstetrics and Gynecology, Baylor College of Medicine, San Antonio
Dr. Sherri Onyiego	Physician specializing in Family Medicine	Medical Director, Equality Health, Texas Market, Houston
Dr. Amy Raines- Milenkov	Researcher of pregnancy-related deaths	Associate Professor, University of North Texas Health Science Center, Fort Worth
Dr. Eumenia Castro	Physician specializing in Pathology	Associate Professor Department of Pathology and Immunology, Texas Children's Hospital and Pavilion for Women, Baylor College of Medicine, Houston
Dr. Kendall Crowns	Medical Examiner	Chief Medical Examiner, Tarrant County Medical Examiner's Office, Fort Worth
Dr. Meitra Doty	Physician specializing in Psychiatry	Faculty Physician and Associate Professor, Department of Psychiatry, University of Texas Southwestern Medical Center and Parkland Health and Hospital System, Dallas

Name	Position	Professional/Personal Affiliations and Location
Nancy Puig	Registered Nurse	Perinatal Clinical Coordinator and Maternal Program Manager, Laredo Medical Center, Laredo
Nakeenya Wilson	Community Advocate	Director of Programming, African American Leadership Institute; Interim Executive Director, Giving Austin Labor Support (GALS); Survivor of Severe Maternal Morbidity, Austin
Dr. Robin Page	Certified Nurse-Midwife	Associate Professor, Texas A&M University School of Nursing, College Station
Vacant	Licensed Clinical Social Worker	
Dr. Lavannya Pandit	Physician specializing in Critical Care	Associate Professor and Staff Physician, Department of Medicine, Baylor College of Medicine/DeBakey VA Medical, Houston
Dr. Christina Murphey	Nurse specializing in Labor and Delivery	Professor of Nursing, Women, Children & Family Science Department; Texas A&M University-Corpus Christi College of Nursing & Health Sciences, Corpus Christi

A special thanks to former members, program partners, and subject matter consultants for their contributions to improving maternal health care in Texas.

Former Members:

- Ms. Armilla Henry (Registered Nurse)
- Dr. D. Kimberley Molina (Medical Examiner)
- Ms. Evelyn Delgado (DSHS Representative)
- Dr. Gary Hankins (Former Vice-Chair, Physician specializing in Obstetrics)
- Dr. James Maher (Physician specializing in Obstetrics, Maternal-Fetal Medicine Specialist)
- Ms. June Hanke (Community Advocate)
- Dr. Kidada Gilbert-Lewis (Physician specializing in Pathology)
- Ms. Kim Williams (Community Advocate)
- Dr. Linda Gaul (State Epidemiologist)
- Dr. Lisa Hollier (Physician specializing in Obstetrics, Maternal-Fetal Medicine Specialist)
- Ms. Nancy Jo Reedy (Certified Nurse Midwife)
- Ms. Nancy Sheppard Alderman (Licensed Clinical Social Worker)
- Dr. Pamela Gessling (Registered Nurse)
- Dr. Ronald Peron (Physician specializing in Family Medicine)

Program Partners:

- University of North Texas Health Science Center Team
- CDC, Enhancing Reviews and Surveillance to Eliminate Maternal Mortality

Subject Matter Expert Consultants:

- Dr. Mildred Ramirez
- Dr. Christina Roland
- Dr. Anjail Sharrief
- Dr. Alison Haddock

Appendix B. Maternal Mortality Case Review Terms

Technical terms have been used throughout the report to describe maternal mortality. This report references the following sources to define these maternal mortality case review terms.

Definitions of the 1986 American College of Obstetricians and Gynecologists (ACOG)/Centers for Disease Control and Prevention (CDC) Maternal Mortality Study Group. Source: Berg C, Danel I, Atrash H, Zane S, Bartlett L (Editors). pp 6. Strategies to reduce pregnancy-related deaths: from identification and review to action. Atlanta: CDC; 2001. Available at stacks.cdc.gov/view/cdc/6537.

The Association of Maternal and Child Health Programs, Centers for Disease Control (CDC) Foundation, CDC Division of Reproductive Health. Review to Action: Building U.S. Capacity to Review and Prevent Maternal Deaths. Definitions. Available at reviewtoaction.org/learn/definitions.

John Richards, MA, Pickett, OP, Wilhite, BS. Maternal and Child Health Library: Life Course and Social Determinants Professional Resource Brief. Available at mchlibrary.org/professionals/lifecourse.php.

Key term definitions used in this report include:

Chance to Alter Outcome - A review committee determination on the degree of preventability. The review committee determines if there was no chance, some chance, or a good chance of averting the death by one or more reasonable changes to patient, family, community, provider, or systems factors.

Contributing Factor - Factors identified by the review committee that contributed to the death. Contributing Factor identification to death allows the review committee to identify prevention and quality improvement opportunities that may have prevented the woman's death and make recommendations to reduce maternal mortality.

Life Course Theory - A theory that approaches health as an integrated continuum rather than as disconnected and unrelated stages. It posits that there is a "complex interplay" of social and environmental factors mixed with biological, behavioral, and

psychological issues that help to define health outcomes across the course of a person's life. In this perspective, each life stage exerts influence on the next stage; social, economic, and physical environments also influence the life course. All these factors impact individual and community health.

Preventability - A death is considered preventable if the committee determines that there was at least some chance of averting the death.

Underlying Cause of Death - The disease or injury that initiated the chain of events leading to death or the circumstances of the accident or violence that produced the fatal injury.

Figure B-1. Terms related to the establishment of pregnancy relatedness

<p style="text-align: center;"><i>Pregnancy-associated death</i></p> <p style="text-align: center;">The death of a woman while pregnant or within one year of the end of pregnancy, regardless of the cause.</p>		
Pregnancy-related death	Pregnancy-associated, but not related death	Pregnancy-associated, but unable to determine pregnancy-relatedness
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.	The death of a woman during pregnancy or within one year of the end of pregnancy from a case that is not related to pregnancy.	The death of a woman while pregnant or within one year of pregnancy, due to a cause that could not be determined to be pregnancy-related or not pregnancy-related.

The ACOG/CDC Maternal Mortality Study Group developed these terms in the U.S. for state or city case review teams to identify deaths for review and action. They expand beyond standardized vital event registration terms to highlight the importance of first identifying all deaths with a temporal relationship to pregnancy (pregnancy-associated deaths) as a group from which to find those deaths caused by or aggravated by pregnancy or its management (pregnancy-related deaths).

Appendix C. Maternal Mortality Review Information Application Committee Decisions Form (Version 21)

MMRIA		MATERNAL MORTALITY REVIEW COMMITTEE DECISIONS FORM v21	1																														
REVIEW DATE <input style="width: 100%;" type="text"/> <small>Month/Day/Year</small>	RECORD ID # <input style="width: 100%;" type="text"/>	COMMITTEE DETERMINATION OF CAUSE(S) OF DEATH <div style="background-color: #2c3e50; color: white; padding: 2px;"> IF PREGNANCY-RELATED, COMMITTEE DETERMINATION OF UNDERLYING* CAUSE OF DEATH <small>Refer to page 3 for PMSS-MM cause of death list.</small> </div> <input style="width: 100%; height: 20px;" type="text"/>																															
PREGNANCY-RELATEDNESS: SELECT ONE <input type="checkbox"/> PREGNANCY-RELATED <small>A death 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</small> <input type="checkbox"/> PREGNANCY-ASSOCIATED, BUT NOT-RELATED <small>A death during pregnancy or within one year of the end of pregnancy from a cause that is not related to pregnancy</small> <input type="checkbox"/> PREGNANCY-ASSOCIATED BUT UNABLE TO DETERMINE PREGNANCY-RELATEDNESS		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #2c3e50; color: white;"> <th style="width: 25%;">TYPE</th> <th>OPTIONAL: CAUSE (DESCRIPTIVE)</th> </tr> </thead> <tbody> <tr><td style="text-align: center;">UNDERLYING*</td><td><input style="width: 100%;" type="text"/></td></tr> <tr><td style="text-align: center;">CONTRIBUTING</td><td><input style="width: 100%;" type="text"/></td></tr> <tr><td style="text-align: center;">IMMEDIATE</td><td><input style="width: 100%;" type="text"/></td></tr> <tr><td style="text-align: center;">OTHER SIGNIFICANT</td><td><input style="width: 100%;" type="text"/></td></tr> </tbody> </table>		TYPE	OPTIONAL: CAUSE (DESCRIPTIVE)	UNDERLYING*	<input style="width: 100%;" type="text"/>	CONTRIBUTING	<input style="width: 100%;" type="text"/>	IMMEDIATE	<input style="width: 100%;" type="text"/>	OTHER SIGNIFICANT	<input style="width: 100%;" type="text"/>																				
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*Underlying cause refers to the disease or injury that initiated the chain of events leading to death or the circumstances of the accident or violence which produced the fatal injury.
 **Encompasses Discrimination, Interpersonal Racism, and Structural Racism as described on page 4.

COMMITTEE DETERMINATION OF PREVENTABILITY

A death is considered preventable if the committee determines that there was at least some chance of the death being averted by one or more reasonable changes to patient, family, provider, facility, system and/or community factors.

WAS THIS DEATH PREVENTABLE?

YES NO

CHANCE TO ALTER OUTCOME

GOOD CHANCE SOME CHANCE
 NO CHANCE UNABLE TO DETERMINE

CONTRIBUTING FACTORS AND RECOMMENDATIONS FOR ACTION (Entries may continue to grid on page 5)

CONTRIBUTING FACTORS WORKSHEET

What were the factors that contributed to this death? Multiple contributing factors may be present at each level.

RECOMMENDATIONS OF THE COMMITTEE

If there was at least some chance that the death could have been averted, what were the specific and feasible actions that, if implemented or altered, might have changed the course of events?

DESCRIPTION OF ISSUE (enter a description for EACH contributing factor listed)	CONTRIBUTING FACTORS (choose as many as needed below)	LEVEL		COMMITTEE RECOMMENDATIONS [Who?] should [do what?] [when?] Map recommendations to contributing factors.	LEVEL		PREVENTION TYPE (choose below)	EXPECTED IMPACT (choose below)	

CONTRIBUTING FACTOR KEY
(DESCRIPTIONS ON PAGE 4)

- Access/financial
- Adherence
- Assessment
- Chronic disease
- Clinical skill/quality of care
- Communication
- Continuity of care/care coordination
- Cultural/religious
- Delay
- Discrimination
- Environmental
- Equipment/technology
- Interpersonal racism
- Knowledge
- Law Enforcement
- Legal
- Mental health conditions
- Outreach
- Policies/procedures
- Referral
- Social support/isolation
- Structural racism
- Substance use disorder - alcohol, illicit/prescription drugs
- Tobacco use
- Trauma
- Unstable housing
- Violence
- Other

DEFINITION OF LEVELS

- **PATIENT/FAMILY:** An individual before, during or after a pregnancy, and their family, internal or external to the household, with influence on the individual
- **PROVIDER:** An individual with training and expertise who provides care, treatment, and/or advice
- **FACILITY:** A physical location where direct care is provided - ranges from small clinics and urgent care centers to hospitals with trauma centers
- **SYSTEM:** Interacting entities that support services before, during, or after a pregnancy - ranges from healthcare systems and payors to public services and programs
- **COMMUNITY:** A grouping based on a shared sense of place or identity - ranges from physical neighborhoods to a community based on common interests and shared circumstances

PREVENTION TYPE

- **PRIMARY:** Prevents the contributing factor before it ever occurs
- **SECONDARY:** Reduces the impact of the contributing factor once it has occurred (i.e., treatment)
- **TERTIARY:** Reduces the impact or progression of what has become an ongoing contributing factor (i.e., management of complications)

EXPECTED IMPACT

- **SMALL:** Education/counseling (community- and/or provider-based health promotion and education activities)
- **MEDIUM:** Clinical intervention and coordination of care across continuum of well-woman visits (protocols, prescriptions)
- **LARGE:** Long-lasting protective intervention (improve readiness, recognition and response to obstetric emergencies/LARC)
- **EXTRA LARGE:** Change in context (promote environments that support healthy living/ensure available and accessible services)
- **GIANT:** Address social determinants of health (poverty, inequality, etc.)

IF PREGNANCY-RELATED, COMMITTEE DETERMINATION OF UNDERLYING CAUSE OF DEATH* PMSS-MM

* PREGNANCY-RELATED DEATH: DEATH 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.

Hemorrhage (Excludes Aneurysms or CVA)

- 10.1 - Hemorrhage – Uterine Rupture
- 10.2 - Placental Abruption
- 10.3 - Placenta Previa
- 10.4 - Ruptured Ectopic Pregnancy
- 10.5 - Hemorrhage – Uterine Atony/Postpartum Hemorrhage
- 10.6 - Placenta Accreta/Increta/Percreta
- 10.7 - Hemorrhage due to Retained Placenta
- 10.10 - Hemorrhage – Laceration/Intra-Abdominal Bleeding
- 10.9 - Other Hemorrhage/NOS

Infection

- 20.1 - Postpartum Genital Tract (e.g., of the Uterus/ Pelvis/Perineum/Necrotizing Fasciitis)
- 20.2 - Sepsis/Septic Shock
- 20.4 - Chorioamnionitis/Antepartum Infection
- 20.6 - Urinary Tract Infection
- 20.7 - Influenza
- 20.8 - COVID-19
- 20.10 - Pneumonia
- 20.11 - Other Non-Pelvic Infection (e.g., TB, Meningitis, HIV)
- 20.9 - Other Infection/NOS

Embolism - Thrombotic (Non-Cerebral)

- 30.1 - Embolism – Thrombotic (Non-Cerebral)
- 30.9 - Other Embolism (Excludes Amniotic Fluid Embolism)/NOS

Amniotic Fluid Embolism

- 31.1 - Embolism - Amniotic Fluid

Hypertensive Disorders of Pregnancy

- 40.1 - Preeclampsia
- 50.1 - Eclampsia
- 60.1 - Chronic Hypertension with Superimposed Preeclampsia

Anesthesia Complications

- 70.1 - Anesthesia Complications

Cardiomyopathy

- 80.1 - Postpartum/Peripartum Cardiomyopathy
- 80.2 - Hypertrophic Cardiomyopathy
- 80.9 - Other Cardiomyopathy/NOS

Hematologic

- 82.1 - Sickle Cell Anemia
- 82.9 - Other Hematologic Conditions including Thrombophilias/TTP/HUS/NOS

Collagen Vascular/Autoimmune Diseases

- 83.1 - Systemic Lupus Erythematosus (SLE)
- 83.9 - Other Collagen Vascular Diseases/NOS

Conditions Unique to Pregnancy

- 85.1 - Conditions Unique to Pregnancy (e.g., Gestational Diabetes, Hyperemesis, Liver Disease of Pregnancy)

Injury

- 88.1 - Intentional (Homicide)
- 88.2 - Unintentional
- 88.9 - Unknown Intent/NOS

Cancer

- 89.1 - Gestational Trophoblastic Disease (GTD)
- 89.3 - Malignant Melanoma
- 89.9 - Other Malignancy/NOS

Cardiovascular Conditions

- 90.1 - Coronary Artery Disease/Myocardial Infarction (MI)/Atherosclerotic Cardiovascular Disease
- 90.2 - Pulmonary Hypertension
- 90.3 - Valvular Heart Disease Congenital and Acquired
- 90.4 - Vascular Aneurysm/Dissection (Non-Cerebral)
- 90.5 - Hypertensive Cardiovascular Disease
- 90.6 - Marfan Syndrome
- 90.7 - Conduction Defects/Arrhythmias
- 90.8 - Vascular Malformations Outside Head and Coronary Arteries
- 90.9 - Other Cardiovascular Disease, including CHF, Cardiomegaly, Cardiac Hypertrophy, Cardiac Fibrosis, Non-Acute Myocarditis/NOS

Pulmonary Conditions (Excludes ARDS-Adult Respiratory Distress Syndrome)

- 91.1 - Chronic Lung Disease
- 91.2 - Cystic Fibrosis
- 91.3 - Asthma
- 91.9 - Other Pulmonary Disease/NOS

Neurologic/Neurovascular Conditions (Excluding CVA)

- 92.1 - Epilepsy/Seizure Disorder
- 92.9 - Other Neurologic Disease/NOS

Renal Disease

- 93.1 - Chronic Renal Failure/End-Stage Renal Disease (ESRD)
- 93.9 - Other Renal Disease/NOS

Cerebrovascular Accident not Secondary to Hypertensive Disorders of Pregnancy

- 95.1 - Cerebrovascular Accident (Hemorrhage/Thrombosis/Aneurysm/Malformation) not Secondary to Hypertensive Disorders of Pregnancy

Metabolic/Endocrine

- 96.2 - Diabetes Mellitus
- 96.9 - Other Metabolic/Endocrine Disorder/NOS

Gastrointestinal Disorders

- 97.1 - Crohn's Disease/Ulcerative Colitis
- 97.2 - Liver Disease/Failure/Transplant
- 97.9 - Other Gastrointestinal Disease/NOS

Mental Health Conditions

- 100.1 - Depressive Disorder
- 100.2 - Anxiety Disorder (including Post-Traumatic Stress Disorder)
- 100.3 - Bipolar Disorder
- 100.4 - Psychotic Disorder
- 100.5 - Substance Use Disorder
- 100.9 - Other Psychiatric Condition/NOS

Unknown COD

- 999.1 - Unknown COD

CONTRIBUTING FACTOR DESCRIPTIONS

LACK OF ACCESS/FINANCIAL RESOURCES

Systemic barriers, e.g. lack or loss of healthcare insurance or other financial duress, as opposed to noncompliance, impacted their ability to care for themselves (e.g. did not seek services because unable to miss work or afford postpartum visits after insurance expired). Other barriers to accessing care: insurance non-eligibility, provider shortage in their geographical area, and lack of public transportation.

ADHERENCE TO MEDICAL RECOMMENDATIONS

The provider or patient did not follow protocol or failed to comply with standard procedures (i.e. non adherence to prescribed medications).

FAILURE TO SCREEN/INADEQUATE ASSESSMENT OF RISK

Factors placing the individual at risk for a poor clinical outcome recognized, and they were not transferred/transported to a provider able to give a higher level of care.

CHRONIC DISEASE

Occurrence of one or more significant pre-existing medical conditions (e.g. obesity, cardiovascular disease, or diabetes).

CLINICAL SKILL/QUALITY OF CARE (PROVIDER OR FACILITY PERSPECTIVE)

Personnel were not appropriately skilled for the situation or did not exercise clinical judgment consistent with standards of care (e.g. error in the preparation or administration of medication or unavailability of translation services).

POOR COMMUNICATION/LACK OF CASE COORDINATION OR MANAGEMENT/ LACK OF CONTINUITY OF CARE (SYSTEM PERSPECTIVE)

Care was fragmented (i.e. uncoordinated or not comprehensive) among or between healthcare facilities or units, (e.g. records not available between inpatient and outpatient or among units within the hospital, such as Emergency Department and Labor and Delivery).

LACK OF CONTINUITY OF CARE (PROVIDER OR FACILITY PERSPECTIVE)

Care providers did not have access to individual's complete records or did not communicate their status sufficiently. Lack of continuity can be between prenatal, labor and delivery, and postpartum providers.

CULTURAL/RELIGIOUS, OR LANGUAGE FACTORS The provider or patient demonstrated that any of these factors was either a barrier to care due to lack of understanding or led to refusal of therapy due to beliefs (or belief systems).

DELAY

The provider or patient was delayed in referring or accessing care, treatment, or follow-up care/action.

DISCRIMINATION

Treating someone less or more favorably based on the group, class or category they belong to resulting from biases, prejudices, and stereotyping. It can manifest as differences in care, clinical communication and shared decision-making. (Smedley et al, 2003 and Dr. Rachel Hardeman).

ENVIRONMENTAL FACTORS

Factors related to weather or social environment.

INADEQUATE OR UNAVAILABLE EQUIPMENT/TECHNOLOGY

Equipment was missing, unavailable, or not functional, (e.g. absence of blood tubing connector).

INTERPERSONAL RACISM

Discriminatory interactions between individuals based on differential assumptions about the abilities, motives, and intentions of others and resulting in differential actions toward others based on their race. It can be conscious as well as unconscious, and it includes acts of commission and acts of omission. It manifests as lack of respect, suspicion, devaluation, scapegoating, and dehumanization. (Jones, CP, 2000 and Dr. Cornelia Graves).

KNOWLEDGE - LACK OF KNOWLEDGE REGARDING IMPORTANCE OF EVENT OR OF TREATMENT OR FOLLOW-UP

The provider or patient did not receive adequate education or lacked knowledge or understanding regarding the significance of a health event (e.g. shortness of breath as a trigger to seek immediate care) or lacked understanding about the need for treatment/follow-up after evaluation for a health event (e.g. needed to keep appointment for psychiatric referral after an ED visit for exacerbation of depression).

INADEQUATE LAW ENFORCEMENT RESPONSE

Law enforcement response was not in a timely manner or was not appropriate or thorough in scope.

LEGAL

Legal considerations that impacted outcome.

MENTAL HEALTH CONDITIONS

The patient had a documented diagnosis of a psychiatric disorder. This includes postpartum depression. If a formal diagnosis is not available, refer to your review committee subject matter experts (e.g. psychiatrist, psychologist, licensed counselor) to determine whether the criteria for a diagnosis of substance use disorder or another mental health condition are met based on the available information.

INADEQUATE COMMUNITY OUTREACH/RESOURCES

Lack of coordination between healthcare system and other outside agencies/organizations in the geographic/cultural area that work with maternal health issues.

LACK OF STANDARDIZED POLICIES/PROCEDURES

The facility lacked basic policies or infrastructure germane to the individual's needs (e.g. response to high blood pressure, or a lack of or outdated policy or protocol).

LACK OF REFERRAL OR CONSULTATION

Specialists were not consulted or did not provide care; referrals to specialists were not made.

SOCIAL SUPPORT/ISOLATION - LACK OF FAMILY/ FRIEND OR SUPPORT SYSTEM

Social support from family, partner, or friends was lacking, inadequate, and/or dysfunctional.

STRUCTURAL RACISM

The systems of power based on historical injustices and contemporary social factors that systematically disadvantage people of color and advantage white people through inequities in housing, education, employment, earnings, benefits, credit, media, health care, criminal justice, etc. (Adapted from Bailey ZD. Lancet. 2017 and Dr. Carla Ortiqie).

SUBSTANCE USE DISORDER - ALCOHOL, ILLICIT/ PRESCRIPTION DRUGS

Substance use disorder is characterized by recurrent use of alcohol and/or drugs causing clinically and functionally significant impairment, such as health problems or disability. The committee may determine that substance use disorder contributed to the death when the disorder directly compromised their health status (e.g. acute methamphetamine intoxication exacerbated pregnancy-induced hypertension, or they were more vulnerable to infections or medical conditions).

TOBACCO USE

The patient's use of tobacco directly compromised the patient's health status (e.g. long-term smoking led to underlying chronic lung disease).

TRAUMA

The individual experienced trauma: i.e., loss of child (death or loss of custody), rape, molestation, or one or more of the following: sexual exploitation during childhood plus persuasion, inducement, or coercion of a child to engage in sexually explicit conduct; or other physical or emotional abuse other than that related to sexual abuse during childhood.

UNSTABLE HOUSING

Individual lived "on the street," in a homeless shelter, or in transitional or temporary circumstances with family or friends.

VIOLENCE AND INTIMATE PARTNER VIOLENCE (IPV)

Physical or emotional abuse perpetrated by current or former intimate partner, family member, friend, acquaintance, or stranger.

OTHER

Contributing factor not otherwise mentioned. Please provide description.

“Did Discrimination contribute to death?” was added to the Committee Determinations on Circumstances Surrounding Death section on the MMRIA Committee Decisions Form. This question encompasses Discrimination, Interpersonal Racism, and Structural Racism as described below:

DISCRIMINATION - Treating someone less or more favorably based on the group, class, or category they belong to resulting from biases, prejudices, and stereotyping. It can manifest as differences in care, clinical communication, and shared decision-making.³³

INTERPERSONAL RACISM - Discriminatory interactions between individuals based on differential assumptions about the abilities, motives, and intentions of others and resulting in differential actions toward others based on their race. It can be conscious as well as unconscious, and it includes acts of commission and acts of omission. It manifests as a lack of respect, suspicion, devaluation, scapegoating, and dehumanization.³⁴

STRUCTURAL RACISM - The systems of power based on historical injustices and contemporary social factors that systematically disadvantage people of color and advantage white people through inequities in housing, education, employment, earnings, benefits, credit, media, health care, criminal justice, etc.³⁵

³³ Definition developed by Dr. Rachel Hardeman, MMRIA Racism & Discrimination Working Group, adapted from Smedley, B.D., Stith, A.Y., Nelson, A.R., editors. Institute of Medicine (US) Committee on Understanding and Eliminating Racial and Ethnic Disparities in Health Care. *Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care*. Washington (DC): National Academies Press (US). (2003). PMID: 25032386. Available at nap.nationalacademies.org/read/12875/chapter/1.

³⁴ Definition developed by Dr. Cornelia Graves, MMRIA Racism & Discrimination Working Group, adapted from Jones, C.P. (2000) Levels of racism: a theoretic framework and a gardener's tale. *Am J Public Health*. 90(8):1212-5. doi: 10.2105/ajph.90.8.1212. PMID: 10936998; PMCID: PMC1446334. Available at ajph.aphapublications.org/doi/epdf/10.2105/AJPH.90.8.1212.

³⁵ Definition developed by Dr. Carla Ortique, MMRIA Racism & Discrimination Working Group, adapted from Bailey, Z.D., Krieger, N., Agénor, M., Graves, J., Linos, N., Bassett, M.T. (2017) Structural racism and health inequities in the USA: evidence and interventions. *Lancet*. 389(10077):1453-1463. doi: 10.1016/S0140-6736(17)30569-X. PMID: 28402827. Available at reader.elsevier.com/reader/sd/pii/S014067361730569X?token=DE4A1C7141AA77EFD8733D5654B56A5AB6234E87CC92EEB8264C06CEC94FE7AAF0827E39260B4681571B65BAF7F13EAB&originRegion=us-east-1&originCreation=20220729131401.

Appendix D. Identified Factors by Domain, Certain Factor Classes, Leading Underlying Causes of Death, and Race and Ethnicity

Table D-1. Leading Underlying Causes of Pregnancy-Related Deaths, the Number of Contributing Factors by Underlying Cause of Death, and the Average Number of Contributing Factors by Underlying Cause of Death, Texas, 2019 Reviewed Cases (N=51)

Underlying Cause of Death as determined by MMMRC*	Cases (Count)	Cases (Percent)	Contributing Factors (Count)	Contributing Factors (Average)
Hemorrhage (Excludes Aneurysms or Cerebrovascular Accident)	13	25%	103	7.9
Mental Health Conditions	9	17%	76	8.4
Embolism - Thrombotic (Non-Cerebral)	6	12%	70	11.7
Injury	5	10%	27	5.4
Cardiovascular Conditions	4	8%	36	9.0
Infection	4	8%	32	8.0
Cancer	3	6%	4	1.3
Cardiomyopathy	3	6%	26	8.7
Total	51		390***	7.6**

PREPARED BY: Maternal and Child Health Epidemiology (MCHE) Unit, Community Health Improvement (CHI) Division, Department of State Health Services (DSHS).

DATA SOURCE: MMRIA Decision Forms (available on [Review to Action website](#)).

- * This table excludes underlying causes with less than three cases.
- **This excludes one pregnancy-related death with an underlying cause of death that was not preventable and did not have any contributing factors or MMMRC recommendations associated with the case.
- *** MMMRC members only assign contributable factors to preventable pregnancy deaths.

Table D-2. Top Five Contributing Factors to Pregnancy-Related Deaths Identified by the MMMRC by Factor Domain, 2019 Reviewed Cases (N=51)

Contributing Factor Domain Total Contributing Factors, n=390	Most Common Contributing Factors	% of Total Contributing Factors in Each Contributing Factor Domain
Patient/Family (n=115)	Chronic disease	19% (n=22)
	Lack of knowledge regarding importance of event, of treatment or follow-up	15% (n=17)
	Lack of access/financial resources	14% (n=16)
	Delay or failure to seek care	13% (n=15)
	Mental health conditions	12% (n=14)
Provider (n=118)	Clinical skill/quality of care	24% (n=28)
	Failure to screen/inadequate assessment of risk	19% (n=22)

Contributing Factor Domain Total Contributing Factors, n=390	Most Common Contributing Factors	% of Total Contributing Factors in Each Contributing Factor Domain
	Lack of knowledge regarding importance of event, of treatment or follow-up	18% (n=21)
	Delay in referring or access to treatment	13% (n=15)
	Discrimination*	6% (n=7)
Facility (n=55)	Clinical skill/quality of care	22% (n=12)
	Delay in referring or access to treatment	20% (n=11)
	Lack of knowledge regarding importance of event, of treatment or follow-up	10% (n=10)
	Lack of standardized policies/procedures	9% (n=5)
	Failure to screen/inadequate assessment of risk	9% (n=5)
System (n=45)	Lack of continuity of care	22% (n=10)
	Lack of access/financial resources	16% (n=7)

Contributing Factor Domain Total Contributing Factors, n=390	Most Common Contributing Factors	% of Total Contributing Factors in Each Contributing Factor Domain
	Discrimination*	11% (n=5)
	Clinical skill/quality of care	9% (n=4)
	Lack of standardized policies/procedures	7% (n=3)
	Delay in referring or access to treatment	7% (n=3)
	Lack of knowledge regarding importance of event, of treatment or follow-up	7% (n=3)
Community (n=57)	Lack of family/friend or support system	16% (n=9)
	Lack of access/financial resources	12% (n=7)
	Unstable housing	11% (n=6)
	Discrimination*	11% (n=6)
	Lack of knowledge regarding importance of event, of treatment or follow-up	11% (n=6)

PREPARED BY: MCHE, CHI Division, DSHS.

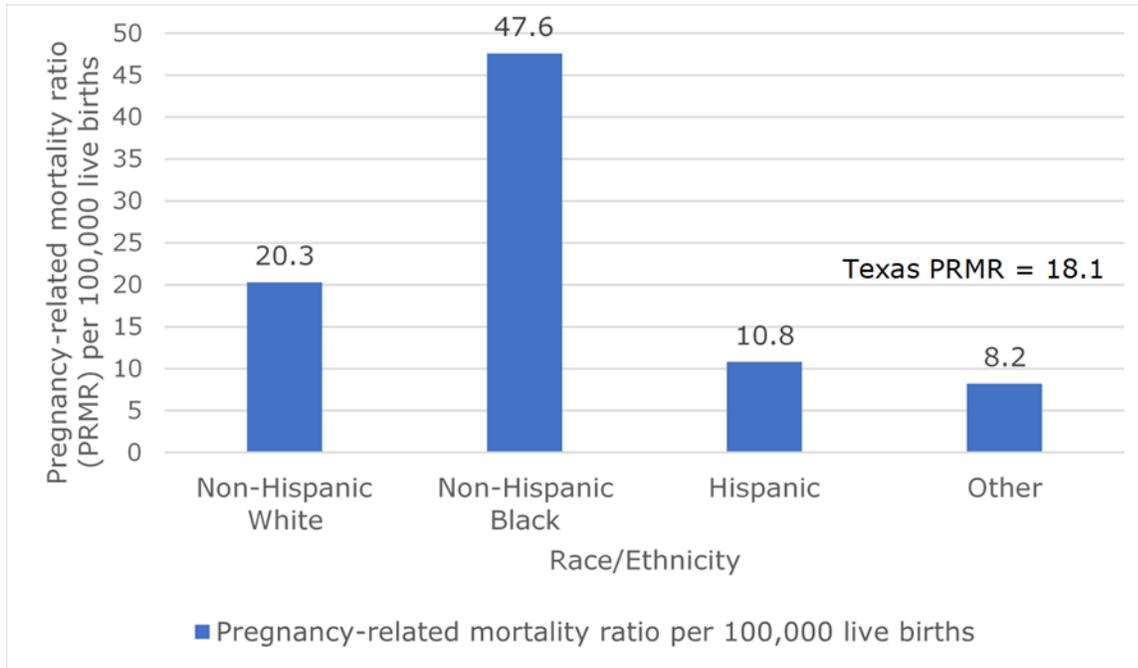
DATA SOURCE: MMRIA Decisions Forms (available on [Review to Action website](#)).

*The nature of discrimination identified by the MMMRC varied and did not show a specific trend.

The MMRIA Committee Decision form pre-populates contributing factors and aggregates by domains determined by the CDC. The list of contributing factors and their descriptions can be found in [Appendix C](#). The MMMRC can assign multiple contributing factors of the same classification to each case within the same domain or different domains.

Appendix E. Texas 2013 Pregnancy Mortality Ratio (PRMR) by Race and Ethnicity

Figure E-1. PRMR by Race and Ethnicity, Texas, 2013



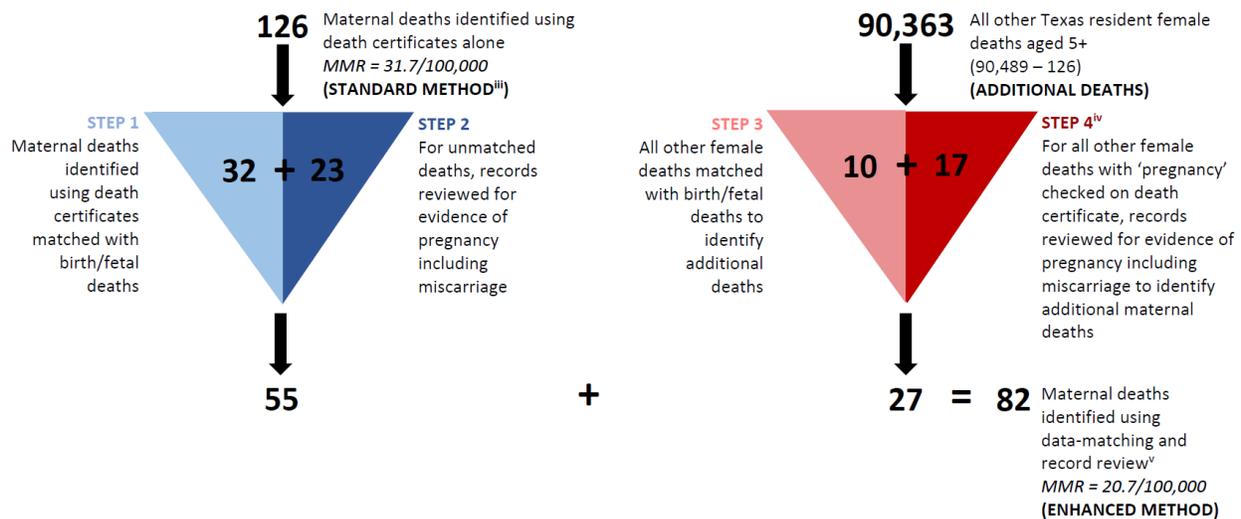
PREPARED BY: Maternal and Child Health Unit (MCHU), Healthy Texas Mothers and Babies (HTMB) Branch, Community Health Improvement (CHI) Division, the Department of State Health Services (DSHS).

DATA SOURCE: 2013 Death Files, 2011-2012 Live Birth and Fetal Death Files. Center for Health Statistics (CHS), DSHS.

NOTES: The MMMRC classified deaths as pregnancy-related through the MMMRC review process. For 2013, the MMMRC reviewed 70 pregnancy-related deaths.

Appendix F. Texas Maternal Mortality and Morbidity Review Committee Enhanced Method Process

Figure F-1. Four-Step Enhanced Method — Number of Maternal Deaths within 42 Days Following End of Pregnancy and Enhanced Maternal Mortality Ratio (MMR) per 100,000 Live Births, Texas, 2016^{i,ii,iii,iv,v}



ⁱ These counts are from probabilistic and deterministic linkage with record review occurring for Steps 2 and 4.

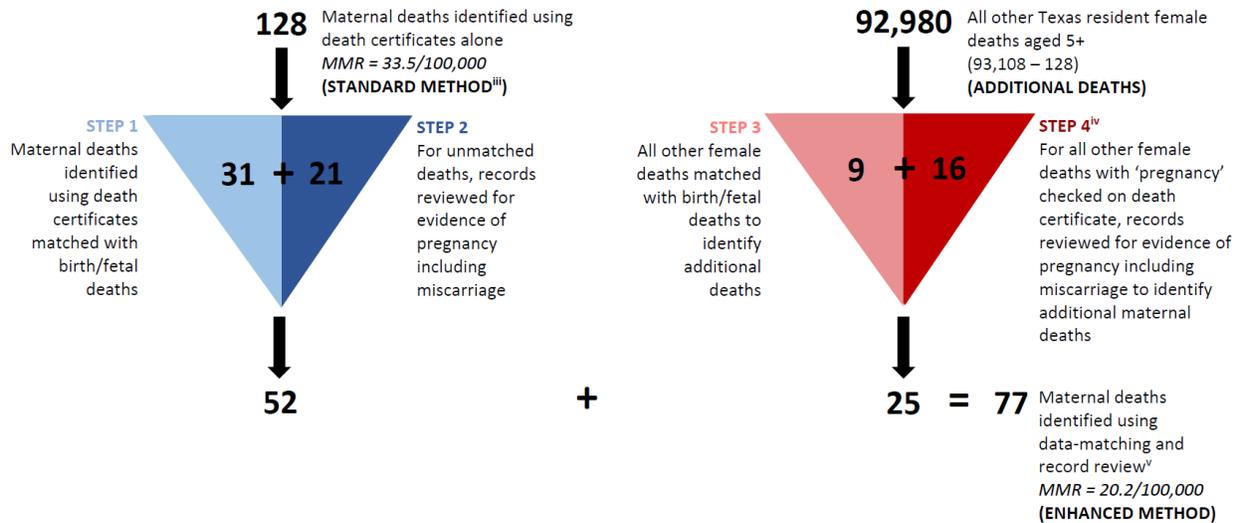
ⁱⁱ MMMRC review was not completed for this cohort year. A maternal death may not have been captured if the decedent died while pregnant or within 42 days of the end of pregnancy following a short interpregnancy interval since the data linkage indicated that their most recent birth or fetal death occurred within 365 days of their death. In 2019 and forward, these short interpregnancy periods are caught during quality assurance in the MMMRC process.

ⁱⁱⁱ The Standard Method uses the underlying cause of death codes. For 42 days following the end of pregnancy, this includes A34 and all obstetric ("O") codes except O96 and O97.

^{iv} From Baeva et al. (2018, Obstet Gynecol): "In the future, we will modify our enhanced method to include a review of medical records for all nonobstetric-coded deaths with a pregnancy status indicating pregnancy at the time of death or within 42 days."

^v All maternal deaths due to transportation accidents ("V" codes with the manner of deaths accident) were not included. MCHS staff could not determine if the decedent was pregnant within 365 days of her death based on provided medico-legal records for five potential cases.

Figure 2. Four-Step Enhanced Method – Number of Maternal Deaths within 42 Days Following End of Pregnancy and Enhanced Maternal Mortality Ratio (MMR) per 100,000 Live Births, Texas, 2017^{i,ii,iii,iv,v}



ⁱ These counts are from probabilistic and deterministic linkage with record review occurring for Steps 2 and 4.

ⁱⁱ MMMRC review was not completed for this cohort year. A maternal death may not have been captured if the decedent died while pregnant or within 42 days of the end of pregnancy following a short interpregnancy interval since the data linkage indicated that their most recent birth or fetal death occurred within 365 days of their death. In 2019 and forward, these short interpregnancy periods are caught during quality assurance in the MMMRC process.

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^v All maternal deaths due to transportation accidents ("V" codes with the manner of deaths accident) were not included. MCHS staff could not determine if the decedent was pregnant within 365 days of her death based on provided medico-legal records for five potential cases.

Appendix G. Statewide Rates, Trends, Disparities, and Health Factor Study for the Most At-Risk Populations

Enhancing Severe Maternal Morbidity (SMM) Data Analytics

In this report, the Department of State Health Services (DSHS) introduced two major enhancements to SMM data analytics: the SMM definition was updated at the federal level to exclude transfusion-only cases, and hospitalizations were linked to their respective birth data records to describe SMM on self-reported race and ethnicity data.

SMM Definition

Before 2022, DSHS used the Centers for Disease Control and Prevention (CDC) definition of 21 conditions and procedures as indicators for potential incidence of severe morbidity, which included transfusion-only cases of SMM. Recent research, however, has indicated blood transfusions remain as the driver of falsely identifying SMM cases when no other indication of SMM exists.³⁶ While blood transfusion is a significant event and can be an indicator of SMM, blood transfusion alone may not always represent an SMM case.

A national effort to standardize SMM measurement led to the development of new recommendations for best practices in calculating SMM in March 2022. The SMM National Workgroup of key national agencies recently advised that SMM identification should exclude blood transfusion-only cases. Both the U.S. Department of Health and Human Services (HHS) in their report on *Healthy Women, Healthy Pregnancies, Healthy Futures: Action Plan to Improve Maternal Health in America* and the Health Resources and Services Administration (HRSA) in

³⁶ Elliott, M., Anisha, A., McNulty, J., Gilbert, W., McNally, C., Poeltler, D., Lanner-Cusin, K., Fenton, D., Gipps, T., Melsop, K., Greene, N., Gould, J., Kilpatrick, S. (2016). Measuring severe maternal morbidity: validation of potential measures, *American Journal of Obstetrics and Gynecology*, Volume (214)5, 643.e1-643.e10, ISSN 0002-9378, Available at reader.elsevier.com/reader/sd/pii/S0002937815022978?token=0EB123707969CE604165AFE1CE35E655F61DF75C57EEA9F1C5D3FC4AFD8AF803EFBE27F8F7298207D528DDD78E601D6&originRegion=us-east-1&originCreation=20220729132140.

their national SMM outcome measure are now excluding transfusion-only cases from their SMM calculations.³⁷

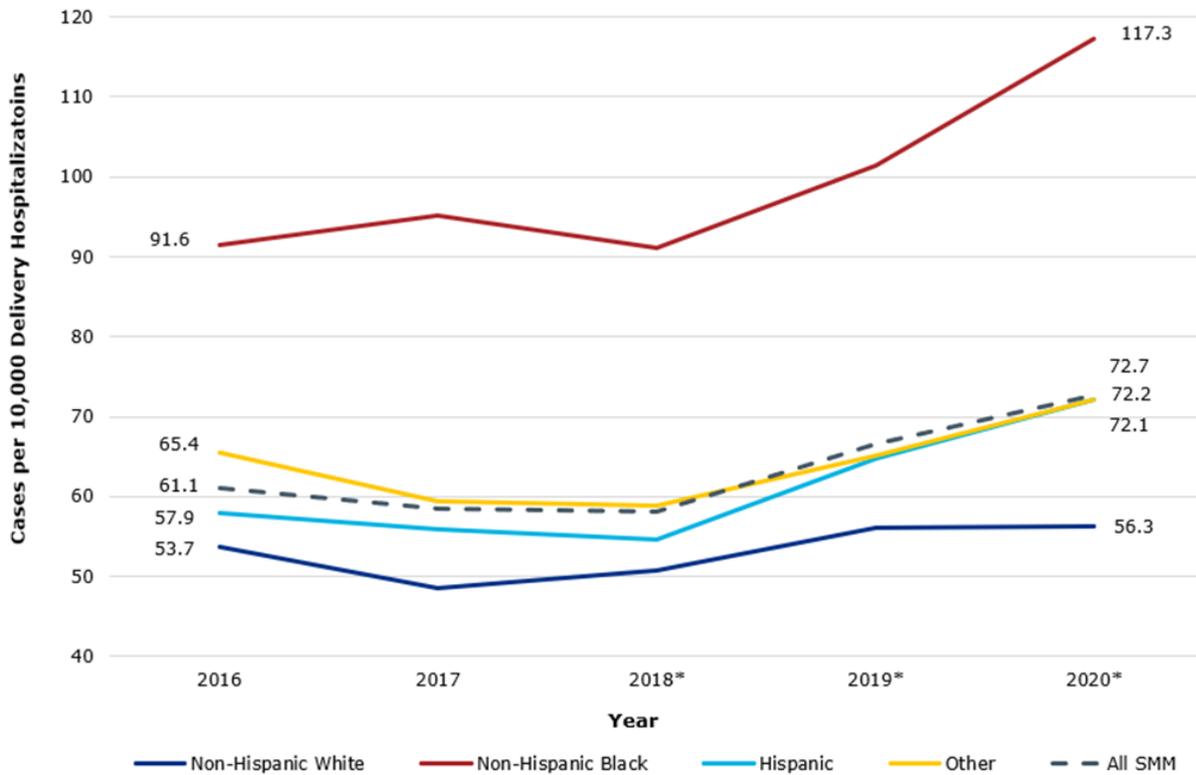
SMM Data Linkage and Analysis Methods

Maternal and Child Health Epidemiology staff probabilistically matched Texas resident delivery hospitalizations from the Texas Health Care Information Collection (THCIC) inpatient research data files and live birth data files from 2016 to 2020. Delivery hospitalizations were identified using the ICD-10 diagnoses codes denoting delivery or a procedure pertaining to delivery.

Delivery hospitalizations and live births were matched using a set of unique identifying variables that included maternal name, date of birth, and address. Only one infant birth was matched per delivery hospitalization record even if the delivery was a multiple birth delivery (e.g., twins, triplets). Thus, each matched record represents a delivery where at least one live birth occurred. Approximately, 90.5 percent to 94.6 percent of delivery hospitalizations were matched with the live birth data file for each year of data studied. DSHS further restricted the matched records to women between 12 to 55 years old, resulting in a final sample of 1,696,227 THCIC/live birth linked delivery hospitalizations for the five years of data.

³⁷ The U.S. Department of Health and Human Services (HHS). (2020). Healthy Women, Healthy Pregnancies, Healthy Futures: Action Plan to Improve Maternal Health in America. Available at aspe.hhs.gov/sites/default/files/private/aspe-files/264076/healthy-women-healthy-pregnancies-healthy-future-action-plan_0.pdf.

Figure G-1. Rate of Delivery Hospitalizations Involving Severe Maternal Morbidity (SMM) in Texas per 10,000 Delivery Hospitalizations by Race and Ethnicity, 2016-2020

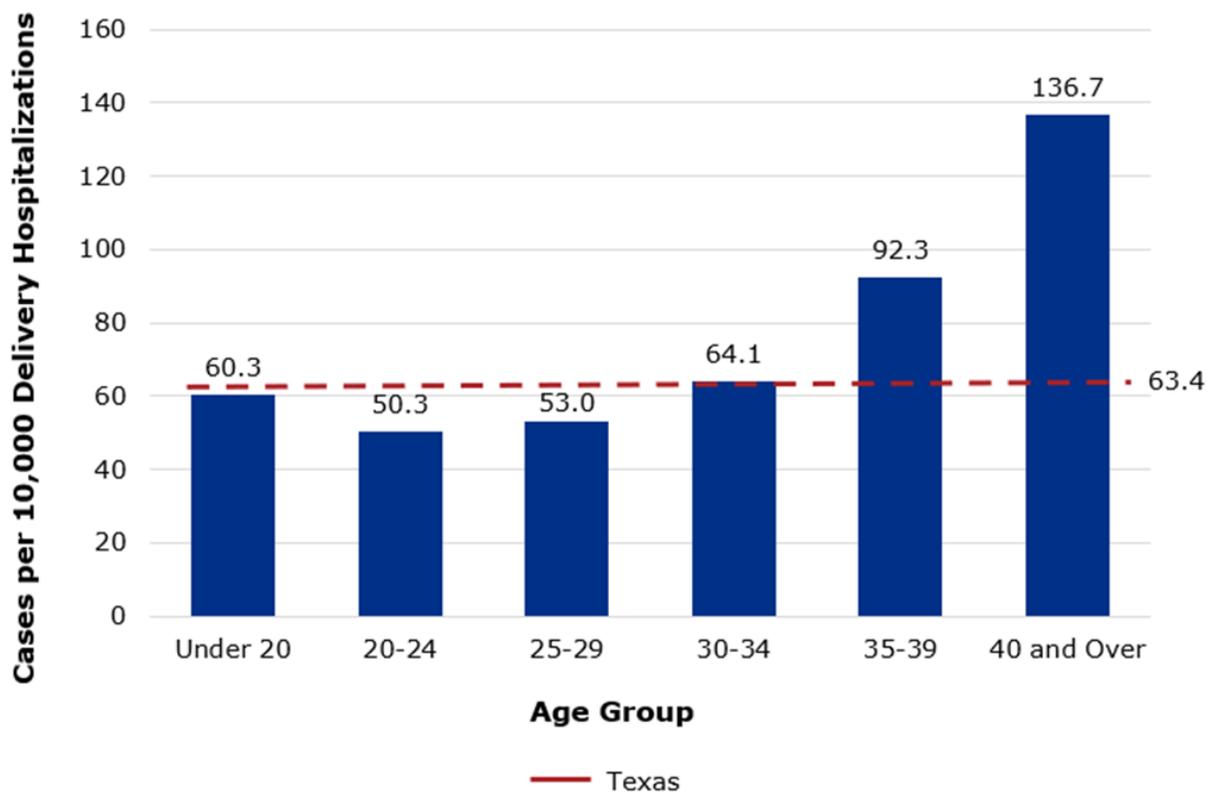


PREPARED BY: Maternal and Child Health Epidemiologists (MCHE), Community Health Improvement (CHI) Division, DSHS.

DATA SOURCE: Hospital Inpatient Discharge Research Data File, 2016-2020. Birth Files, 2016-2020. Center for Health Statistics (CHS), DSHS.

*NOTES: 2018-2020 Birth Files are provisional. SMM calculated using the Updated Alliance for Innovation on Maternal Health (AIM) SMM Codes List, v08-09-2021. The SMM National Workgroup recently advised calculating SMM using SMM indicators while excluding blood transfusion-only cases. Previously reported SMM rates may not be comparable. See: saferbirth.org/wp-content/uploads/Updated-AIM-SMM-Code-List_10152021.xlsx.

Figure G-2. Rate of Delivery Hospitalizations Involving SMM in Texas per 10,000 Delivery Hospitalizations, by Mother’s Age Group, 2016-2020



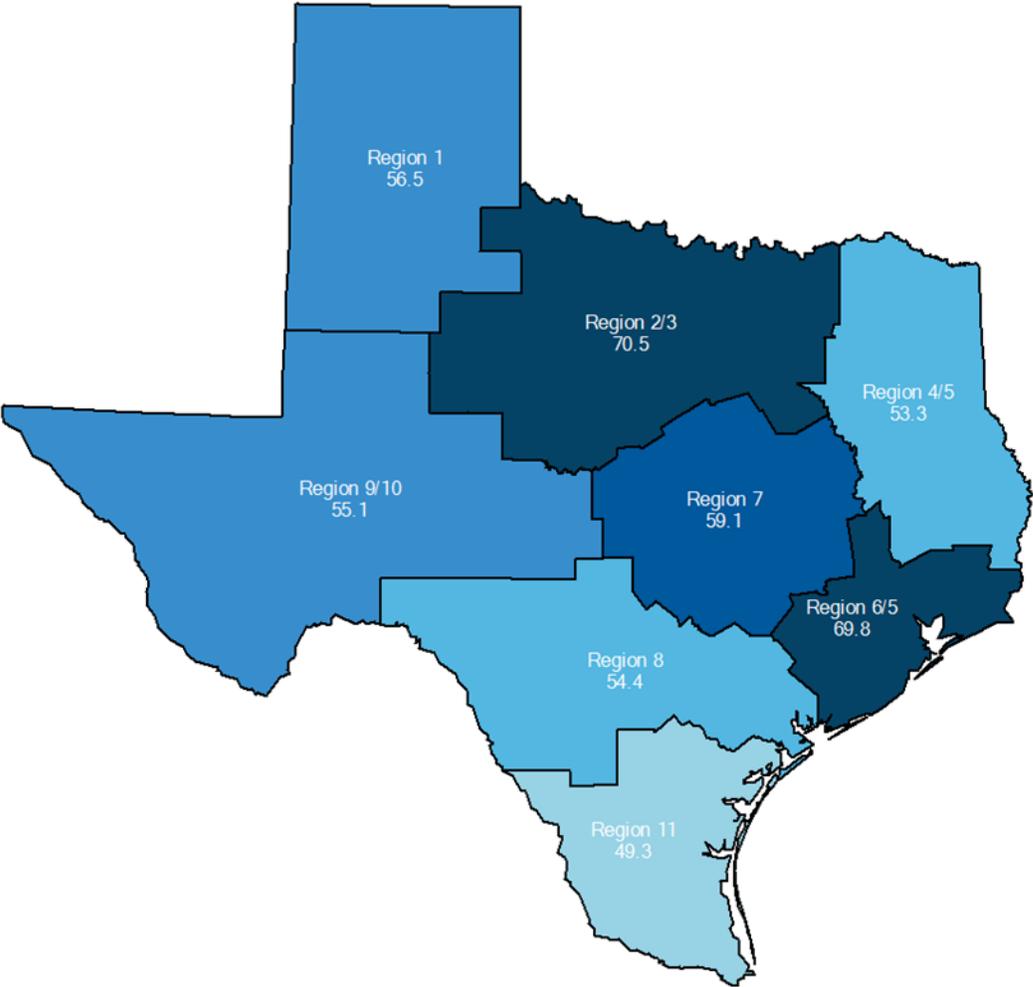
PREPARED BY: MCHE, CHI Division, DSHS.

DATA SOURCE: Hospital Inpatient Discharge Research Data File, 2016-2020. Birth Files, 2016-2020. CHS, DSHS.

NOTES: 2018-2020 Birth Files are provisional. SMM calculated using the Updated AIM SMM Codes List, v08-09-2021. The SMM National Workgroup recently advised calculating SMM using SMM indicators while excluding blood transfusion-only cases. Previously reported SMM rates may not be comparable. See: saferbirth.org/wp-content/uploads/Updated-AIM-SMM-Code-List_10152021.xlsx.

Advanced maternal age includes women 35 years of age or older.

Figure G-3. Rate of Delivery Hospitalizations Involving SMM in Texas per 10,000 Delivery Hospitalizations, by Public Health Region, 2016-2020

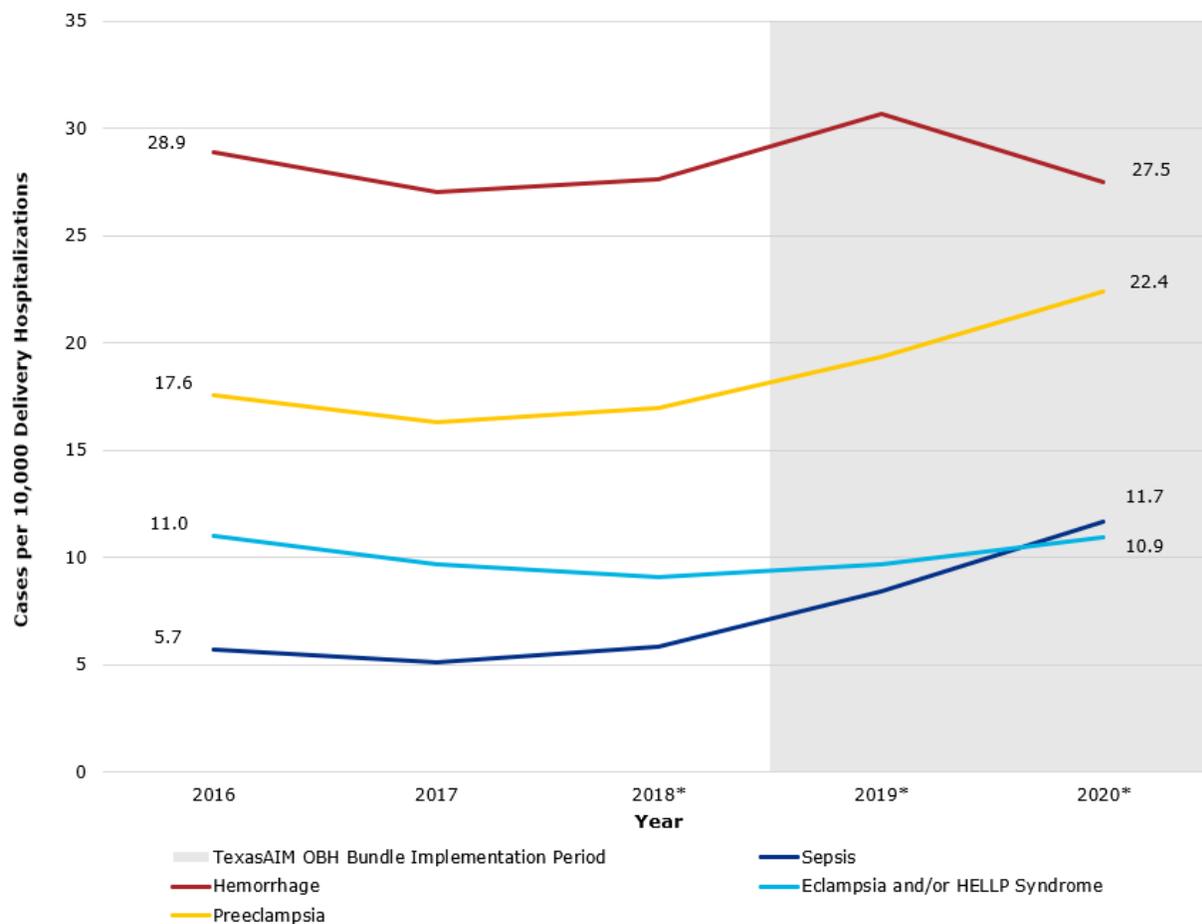


PREPARED BY: MCHE, CHI Division, DSHS.

DATA SOURCE: Hospital Inpatient Discharge Research Data File, 2016-2020. Birth Files, 2016-2020. CHS, DSHS.

NOTES: 2018-2020 Birth Files are provisional. SMM calculated using the Updated AIM SMM Codes List, v08-09-2021. The SMM National Workgroup recently advised calculating SMM using SMM indicators while excluding blood transfusion-only cases. Previously reported SMM rates may not be comparable. See: saferbirth.org/wp-content/uploads/Updated-AIM-SMM-Code-List_10152021.xlsx. For more information on Texas Public Health Regions, see dshs.texas.gov/regions/default.shtm.

Figure G-4. Rate of Delivery Hospitalizations Involving Severe Maternal Morbidity (SMM) in Texas per 10,000 Delivery Hospitalizations by SMM Indicator, 2016-2020



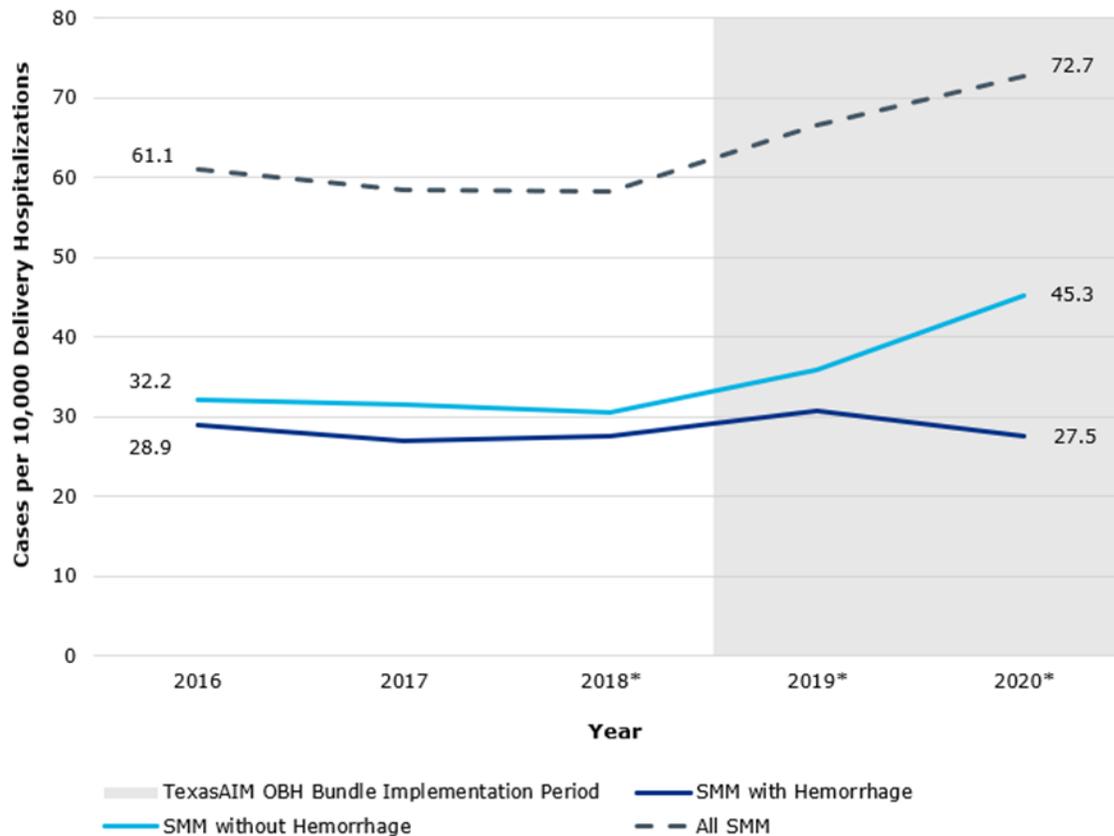
PREPARED BY: MCHE, CHI Division, DSHS.

DATA SOURCE: Hospital Inpatient Discharge Research Data File, 2016-2020. Birth Files, 2016-2020. CHS, DSHS.

NOTES: 2018-2020 Birth Files are provisional. SMM calculated using the Updated AIM SMM Codes List, v08-09-2021. The SMM National Workgroup recently advised calculating SMM using SMM indicators while excluding blood transfusion-only cases. Previously reported SMM rates may not be comparable. See: saferbirth.org/wp-content/uploads/Updated-AIM-SMM-Code-List_10152021.xlsx.

Eclampsia is a severe complication of preeclampsia characterized by one or more seizures during pregnancy or postpartum period. HELLP syndrome is one of the most severe forms of preeclampsia. It can lead to liver injury, a breakdown of red blood cells, and lowered platelet count.

Figure G-5. Rate of Delivery Hospitalizations Involving SMM in Texas Associated with or without Hemorrhage per 10,000 Delivery Hospitalizations, 2016-2020

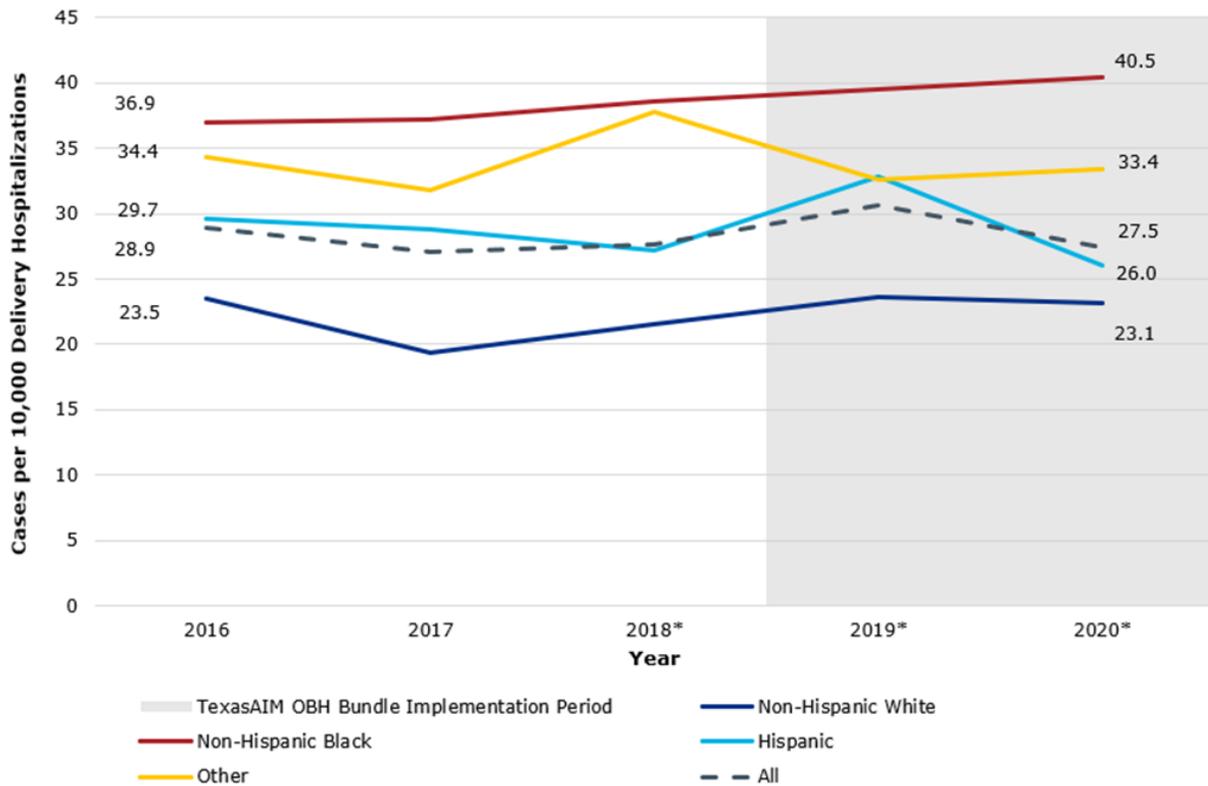


PREPARED BY: MCHE, CHI Division, DSHS.

DATA SOURCE: Hospital Inpatient Discharge Research Data File, 2016-2020. Birth Files, 2016-2020. CHS, DSHS.

NOTES: 2018-2020 Birth Files are provisional. SMM calculated using the Updated AIM SMM Codes List, v08-09-2021. The SMM National Workgroup recently advised calculating SMM using SMM indicators while excluding blood transfusion-only cases. Previously reported SMM rates may not be comparable. See: saferbirth.org/wp-content/uploads/Updated-AIM-SMM-Code-List_10152021.xlsx.

Figure G-6. Rate of Delivery Hospitalizations Involving SMM in Texas Associated with Hemorrhage, by Race and Ethnicity, per 10,000 Delivery Hospitalizations, 2016-2020

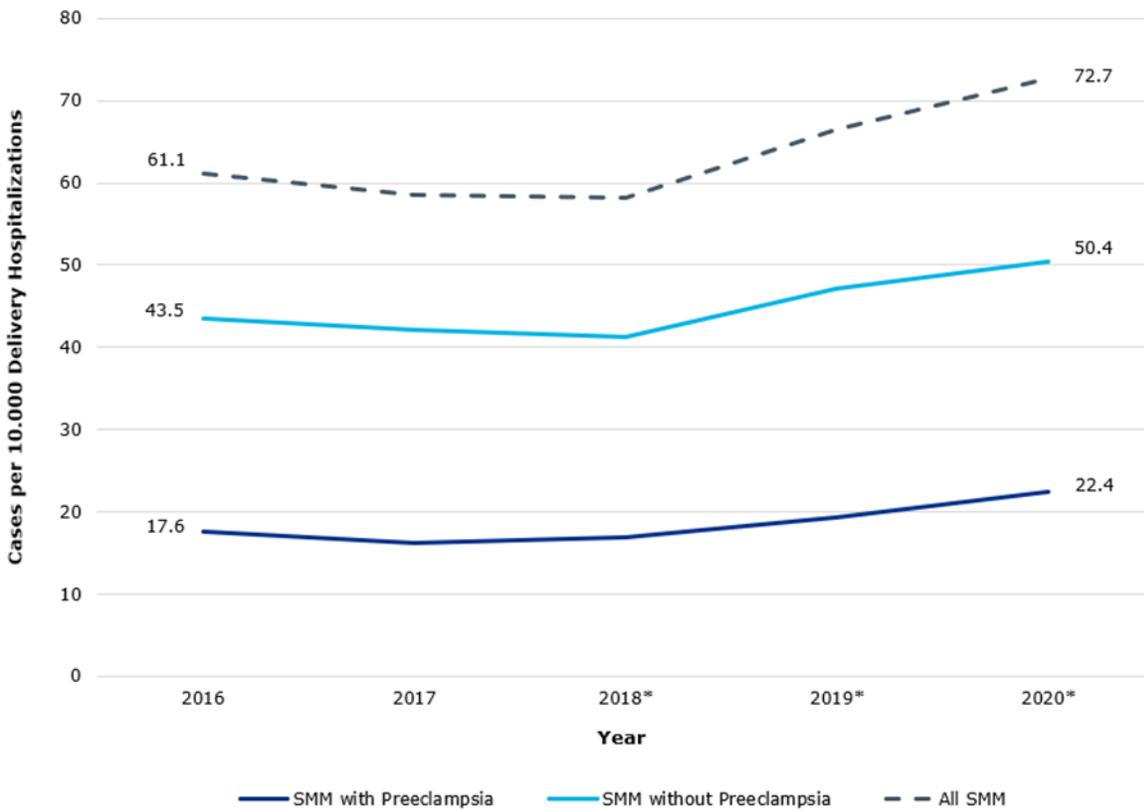


PREPARED BY: MCHE, CHI Division, DSHS.

DATA SOURCE: Hospital Inpatient Discharge Research Data File, 2016-2020. Birth Files, 2016-2020. CHS, DSHS.

*NOTES: 2018-2020 Birth Files are provisional. SMM calculated using the Updated AIM SMM Codes List, v08-09-2021. The SMM National Workgroup recently advised calculating SMM using SMM indicators while excluding blood transfusion-only cases. Previously reported SMM rates may not be comparable. See: saferbirth.org/wp-content/uploads/Updated-AIM-SMM-Code-List_10152021.xlsx.

Figure G-7. Rate of Delivery Hospitalizations Involving SMM in Texas Associated with or without Preeclampsia per 10,000 Delivery Hospitalizations, 2016-2020

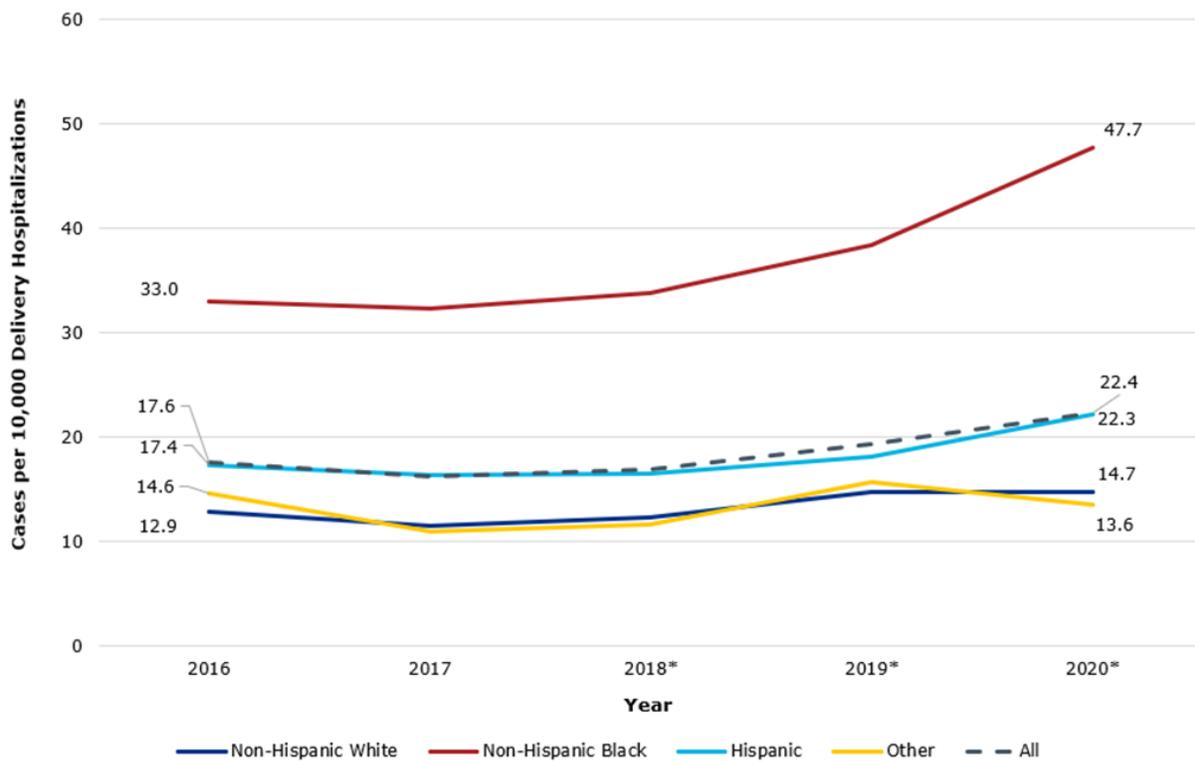


PREPARED BY: MCHE, CHI Division, DSHS.

DATA SOURCE: Hospital Inpatient Discharge Research Data File, 2016-2020. Birth Files, 2016-2020. CHS, DSHS.

NOTES: 2018-2020 Birth Files are provisional. SMM calculated using the Updated AIM SMM Codes List, v08-09-2021. The SMM National Workgroup recently advised calculating SMM using SMM indicators while excluding blood transfusion-only cases. Previously reported SMM rates may not be comparable. See: saferbirth.org/wp-content/uploads/Updated-AIM-SMM-Code-List_10152021.xlsx.

Figure G-8. Rate of Delivery Hospitalizations Involving SMM in Texas Associated with Preeclampsia, by Race and Ethnicity, per 10,000 Delivery Hospitalizations, 2016-2020

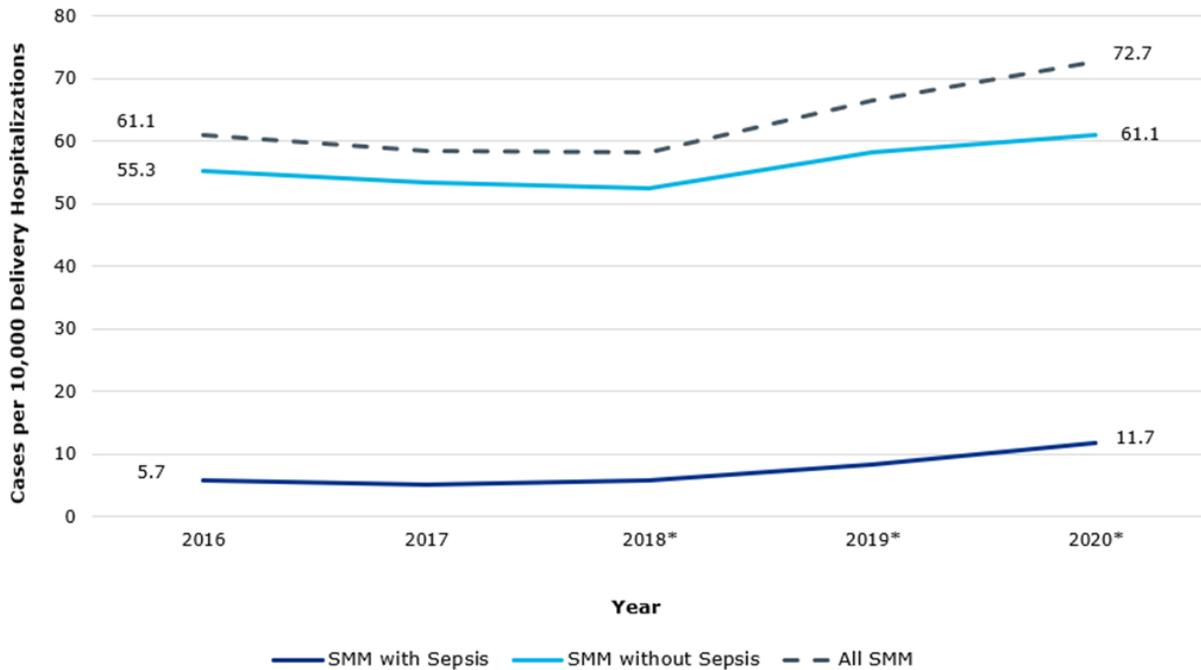


PREPARED BY: MCHE, CHI Division, DSHS.

DATA SOURCE: Hospital Inpatient Discharge Research Data File, 2016-2020. Birth Files, 2016-2020. CHS, DSHS.

*NOTES: 2018-2020 Birth Files are provisional. SMM calculated using the Updated AIM SMM Codes List, v08-09-2021. The SMM National Workgroup recently advised calculating SMM using SMM indicators while excluding blood transfusion-only cases. Previously reported SMM rates may not be comparable. See: saferbirth.org/wp-content/uploads/Updated-AIM-SMM-Code-List_10152021.xlsx.

Figure G-9. Rate of Delivery Hospitalizations Involving SMM in Texas Associated with or without Sepsis per 10,000 Delivery Hospitalizations, 2016-2020

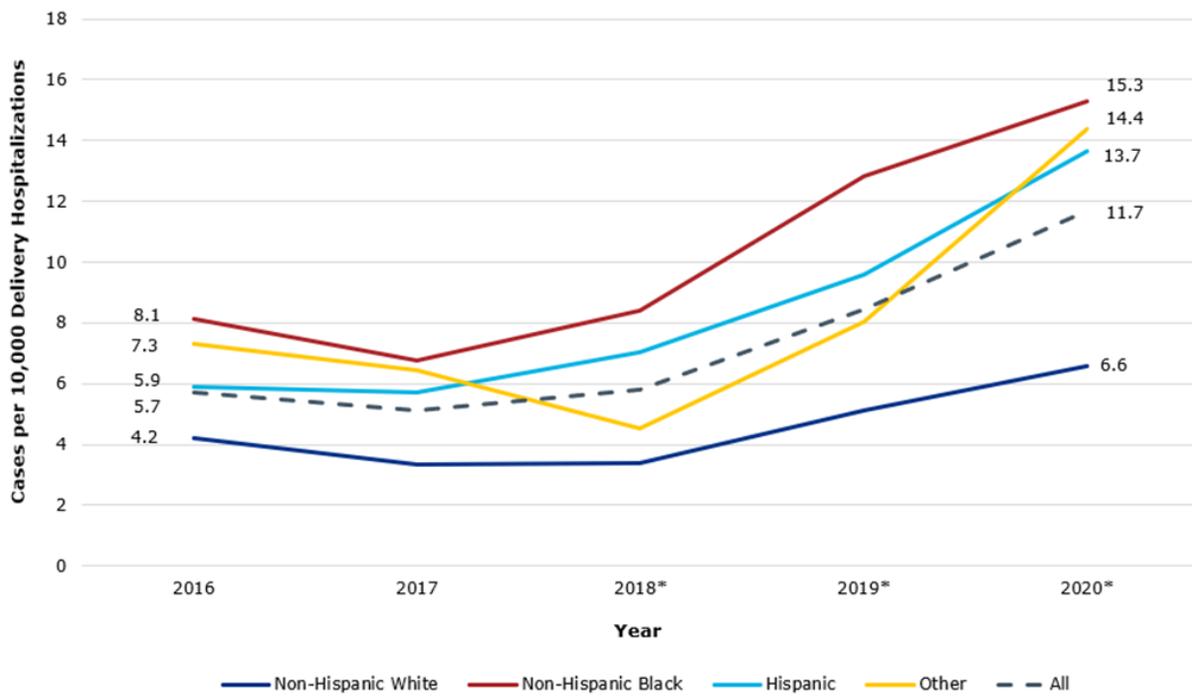


PREPARED BY: MCHE, CHI Division, DSHS.

DATA SOURCE: Hospital Inpatient Discharge Research Data File, 2016-2020. Birth Files, 2016-2020. CHS, DSHS.

*NOTES: 2018-2020 Birth Files are provisional. SMM calculated using the Updated AIM SMM Codes List, v08-09-2021. The SMM National Workgroup recently advised calculating SMM using SMM indicators while excluding blood transfusion-only cases. Previously reported SMM rates may not be comparable. See: saferbirth.org/wp-content/uploads/Updated-AIM-SMM-Code-List_10152021.xlsx.

Figure G-10. Rate of Delivery Hospitalizations Involving SMM in Texas Associated with Sepsis, by Race and Ethnicity, per 10,000 Delivery Hospitalizations, 2016-2020



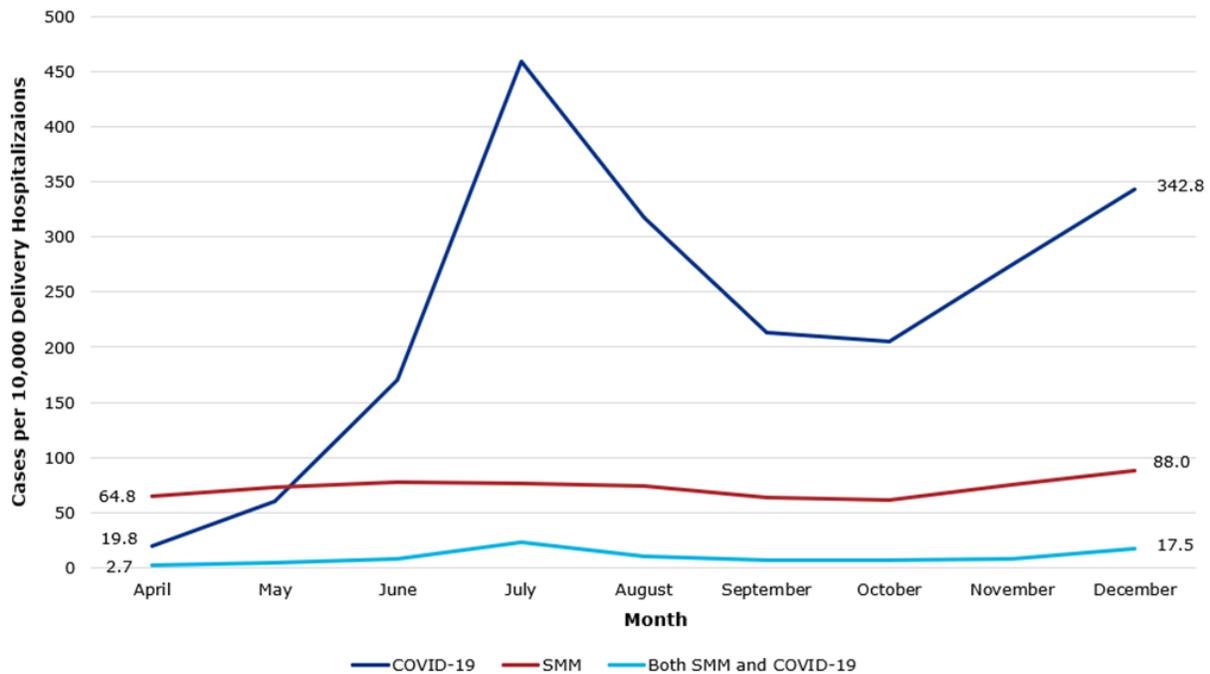
PREPARED BY: MCHE, CHI Division, DSHS.

DATA SOURCE: Hospital Inpatient Discharge Research Data File, 2016-2020. Birth Files 2016-2020. CHS, DSHS.

NOTES: 2018-2020 Birth Files are provisional. SMM calculated using the Updated AIM SMM Codes List, v08-09-2021. The SMM National Workgroup recently advised calculating SMM using SMM indicators while excluding blood transfusion-only cases. Previously reported SMM rates may not be comparable. See: saferbirth.org/wp-content/uploads/Updated-AIM-SMM-Code-List_10152021.xlsx.

Appendix H. Statewide COVID-19-Related Delivery Hospitalization Rates, Trends, and Disparities for the Most At-Risk Populations

Figure H-1. Delivery Hospitalizations Involving SMM and/or COVID-19 Infection in Texas per 10,000 Delivery Hospitalizations from April to December 2020



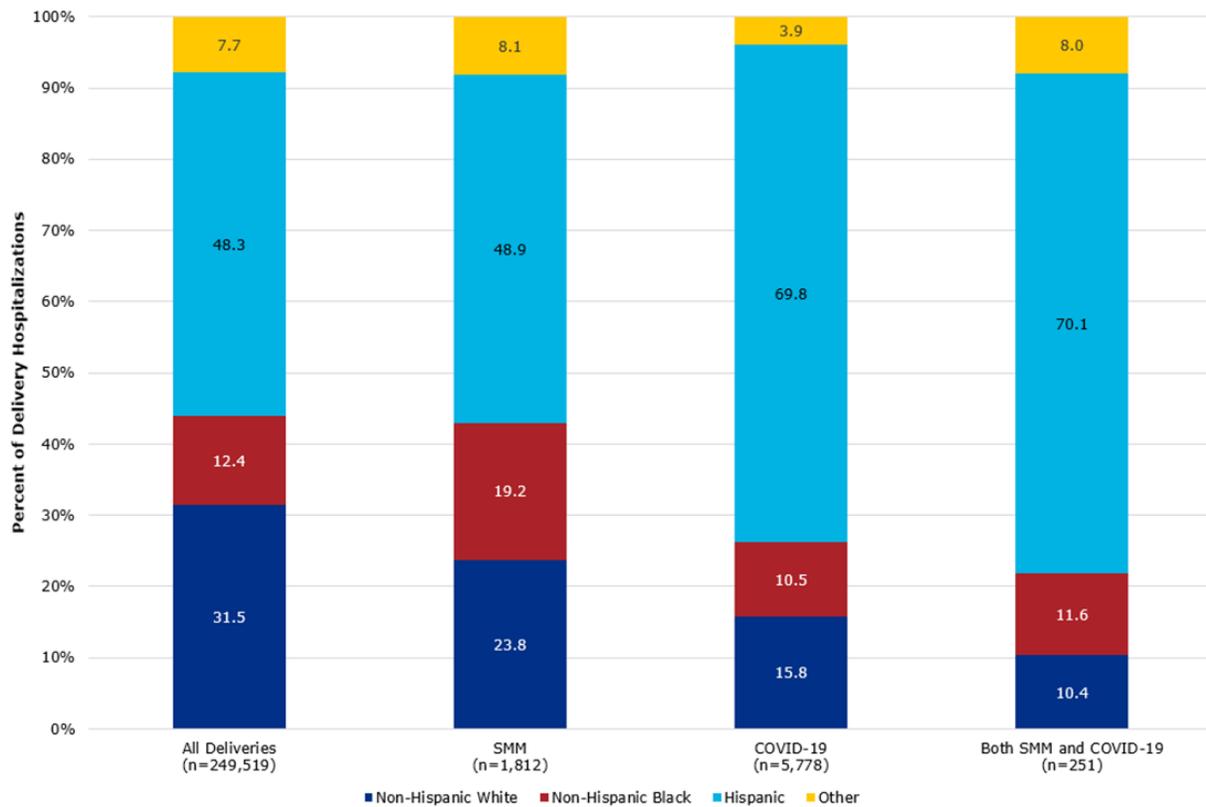
PREPARED BY: Maternal and Child Health Epidemiologists (MCHE), Community Health Improvement (CHI) Division, Department of State Health Services (DSHS).

DATA SOURCE: Hospital Inpatient Discharge Research Data File, 2020. Provisional Birth File, 2020. Center for Health Statistics (CHS), DSHS.

NOTES: 2018-2020 Birth Files are provisional. SMM calculated using the Updated Alliance for Innovation on Maternal Health (AIM) SMM Codes List, v08-09-2021. The SMM National Workgroup recently advised calculating SMM using SMM indicators while excluding blood transfusion-only cases. Previously reported SMM rates may not be comparable. See: saferbirth.org/wp-content/uploads/Updated-AIM-SMM-Code-List_10152021.xlsx.

COVID-19 cases were determined by the ICD-10 diagnosis code U07.1 in the Hospital Inpatient Discharge Research Data File.

Figure H-2. Delivery Hospitalizations Involving SMM and/or COVID-19 Infection in Texas per 10,000 Delivery Hospitalizations by Race and Ethnicity from April to December 2020



PREPARED BY: MCHE, CHI Division, DSHS.

DATA SOURCE: Hospital Inpatient Discharge Research Data File, 2020. Provisional Birth File, 2020. CHS, DSHS.

NOTES: 2018-2020 Birth Files are provisional. SMM calculated using the Updated AIM SMM Codes List, v08-09-2021. The SMM National Workgroup recently advised calculating SMM using SMM indicators while excluding blood transfusion-only cases. Previously reported SMM rates may not be comparable. See: saferbirth.org/wp-content/uploads/Updated-AIM-SMM-Code-List_10152021.xlsx.

COVID-19 cases were determined by the ICD-10 diagnosis code U07.1 in the Hospital Inpatient Discharge Research Data File.