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

As Required by

Texas Health and Safety Code,

Section 34.015

Maternal Mortality and

Morbidity Review Committee

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Executive Summary

The Texas Maternal Mortality and Morbidity Review Committee (MMMRC) and Department of State Health Services (DSHS) jointly submit their 2020 Biennial Report as required by Health and Safety Code, Section 34.015. The report contains DSHS and MMMRC findings and MMMRC recommendations to help reduce the incidence of pregnancy-related deaths and maternal morbidity in Texas.

Findings from the MMMRC's case reviews and statewide rates, ratios, and trends show that opportunities exist to address contributors to maternal mortality, morbidity, and disparities in Texas.

Summary of Recommendations

- Increase access to comprehensive health services during pregnancy, the year after pregnancy, and throughout the preconception and interpregnancy periods to facilitate continuity of care, enable effective care transitions, promote safe birth spacing, and improve the lifelong health of women.
- Engage Black communities and apply health equity principles in the development of maternal and women's health programs.
- Improve access to integrated behavioral health care from preconception through one-year postpartum for women with mental and substance use disorders.
- Improve statewide infrastructure and programs to address violence and intimate partner violence at the state and community levels.
- Implement statewide maternal health and safety initiatives to reduce preventable maternal mortality and morbidity.
- Foster supportive community environments and leverage programs and services that help women of childbearing age achieve their full health potential.
- Support coordination between emergency and maternal health services, and implement evidence-based, standardized protocols to identify and manage obstetric and postpartum emergencies.
- Improve postpartum care management and discharge education for patients and families.

- Continue and strengthen activities to increase public awareness and prevention.
- Support strategies to continuously improve maternal mortality investigation and case review processes.

1. Introduction

Per Health and Safety Code, Chapter 34, the Texas Maternal Mortality and Morbidity Review Committee (MMMRC) and the Department of State Health Services (DSHS) are required to submit a joint report on the findings and recommendations of the MMMRC 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.

The duties of the MMMRC were expanded by Senate Bill 17, 85th Texas Legislature, First Called Session, 2017, and by the 86th Texas Legislature, Regular Session, 2019. See Appendix A for actions of the 86th Texas Legislature, Regular Session, 2019, relating to the MMMRC.

Statute requires the MMMRC to engage in the following activities.

- Study and review
  - cases of pregnancy-related deaths;
  - trends, rates, or disparities in pregnancy-related deaths and severe maternal morbidity;
  - health conditions and factors that disproportionately affect the most at-risk populations; and
  - best practices and programs operating in other states that have reduced rates of pregnancy-related deaths.
- Compare rates of pregnancy-related deaths based on socioeconomic status of the mother.
- Determine the feasibility of the review committee studying cases of severe maternal morbidity.
- Consult with the Perinatal Advisory Committee when making recommendations to help reduce the incidence of pregnancy-related deaths and severe maternal morbidity in this state.

2. Background

Senate Bill 495, 83rd Texas Legislature, Regular Session, 2013 (promulgated under Health and Safety Code (HSC), Chapter 34) 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). See Appendix B for a current list of MMMRC members appointed by the DSHS Commissioner.

The MMMRC uses standard methods to review cases of pregnancy-associated death to determine which were pregnancy-related. The MMMRC studies case information to identify what contributes to pregnancy-related deaths and determine whether these deaths were potentially preventable. The MMMRC then uses the findings from the review of cases and statewide data to develop recommendations for preventing maternal mortality and morbidity. Technical terms regarding maternal mortality will be used throughout this report; the reader is encouraged to review a list of key terms under Appendix C before continuing with the report.

Previous to the current report, the MMMRC and DSHS published their findings and recommendations based on the review of identified pregnancy-associated deaths occurring in 2012 (the 2012 case cohort) in their 2018 Joint Biennial Report.

Findings from the 2012 and 2013 case cohorts may not be comparable because of enhancements to MMMRC methods and procedures. DSHS and the MMMRC published information about an enhanced case identification method in 2018.[1] Using this method, DSHS was able to identify previously undiscovered pregnancy-associated death cases. DSHS applied additional enhanced methods beginning with the 2013 case cohort to further improve the identification of cases (see Appendix D). Additionally, for the 2013 case cohort, DSHS expanded the types of cases they would review. For instance, in the 2012 case cohort, DSHS excluded cancer deaths and accidental deaths from further case review or analysis. However, for the 2013 case cohort, DSHS included all deaths among Texas residents where pregnancy was confirmed within one year of the end of pregnancy (DSHS continued to exclude cases related to motor vehicle crashes not involving vehicular homicide or suicide).

[1] Baeva S, Saxton DL, Ruggiero K, et al. Identifying Maternal Deaths in Texas Using an Enhanced Method, 2012. *Obstet Gynecol*. 2018;131(5):762-769.

As a result of these changes, the 2013 case cohort includes 175 pregnancy-associated cases. From June 2018 through June 2020, the MMMRC completed their review for 137 of these cases. Of these, the MMMRC determined that 54 cases were related to pregnancy. The recommendations in this report are based on the findings from these 54 cases.

In December 2018, the MMMRC established the Subcommittee on Maternal Health Disparities (Subcommittee) to further investigate factors contributing to disparities in maternal mortality. To date, the Subcommittee has engaged in the following activities.

- Studied pregnancy-related death cases in the 2012 case cohort and the association of women's race or ethnicity with the number and types of contributing factors that the MMMRC identified during their review.
- Provided consultation to DSHS on the development of the Texas Socio-Spatial Context Dashboard (Appendix E) to provide community-level context when studying pregnancy-associated deaths.[2] The MMMRC began to use the dashboard as part of its standard review process in November 2019.
- Drafted a discussion tool for social determinants that may impact a woman's health, health care experiences, and health disparities throughout her life and in the time leading up to her death (called the *Social Determinants of Health and Discrimination Assessment Facilitated Discussion Tool)*. The MMMRC is testing the use of this tool during case review to enhance their identification of factors that contribute to preventable maternal mortality.

Dr. Carla Ortique, MMMRC Vice-Chair and Subcommittee Chair, participated in a national workgroup to develop standard definitions for state maternal mortality review committees to use during case review to better identify racism and discrimination as contributing factors to pregnancy-related death.[3] These definitions were released in April 2020 by the Centers for Disease Control and Prevention (CDC) in the Maternal Mortality Review Information Application (MMRIA) Committee Decisions Form.

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[2] Inspired by work of Kramer MR in Building U.S. Capacity to Review and Prevent Maternal Deaths. (2018). Report from nine maternal mortality review committees. p.52-53. See also Kramer MR, Strahan AE, Preslar J, et al. Changing the conversation: applying a health equity framework to maternal mortality reviews. *Am J Obstet Gynecol*. 2019;221(6):609.e1-609.e9.

[3] For more information, go to reviewtoaction.org/content/using-mmria-document-discrimination-and-racism.

As required by HSC § 34.021, DSHS applied for a CDC funding opportunity developed from the Federal Preventing Maternal Deaths Act of 2018. DSHS was awarded the Enhancing Reviews and Surveillance to Eliminate Maternal Mortality (ERASE MM) grant program beginning September 2019. As a grantee, DSHS must identify pregnancy-associated deaths within one year of the death, assure that cases of pregnancy-related death are reviewed, and enter findings into the CDC's MMRIA data portal within two years after death. DSHS is currently identifying and preparing cases from 2019, to meet the grant requirements, and plans to begin review of the 2019 case cohort in March 2021.

The MMMRC Chair, Dr. Lisa Hollier, co-authored *Maternal Mortality from Coronavirus Disease 2019 (COVID-19) in the United States*. The manuscript highlights the role of maternal mortality review committees in understanding emerging health issues and the utility of contemporary case review.[4]

[4] Metz TD, Collier C, Hollier LM. Maternal Mortality From Coronavirus Disease 2019 (COVID-19) in the United States. *Obstet Gynecol*. 2020;136(2):313-316.

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.

Pregnancy-Related Death Case Review Findings

A primary responsibility of the MMMRC is to study cases of pregnancy-related death. 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 June 2018 to June 2020, the MMMRC completed the review of 137 of the 175 pregnancy-associated cases in the 2013 case cohort to determine pregnancy-relatedness and to identify underlying causes, contributing factors, and the potential preventability of pregnancy-related deaths. The MMMRC documented their findings using the Maternal Mortality Review Information Application (MMRIA) Maternal Mortality Review Committee Decisions Form. Preparation and review of the remaining 38 cases continues.

Finding #1 — Nearly 40 percent of the reviewed 2013 pregnancy-associated cases were identified as being pregnancy-related.

The MMMRC determined that, of the 137 reviewed cases, 54 cases (39 percent) were pregnancy-related, and 59 cases (43 percent) were pregnancy-associated but not related. The MMMRC was unable to determine pregnancy-relatedness for 24 (18 percent) of reviewed cases. The percentage of deaths identified among reviewed cases as pregnancy-related is consistent with findings from other states.[5]

Finding #2 — Eight underlying causes of death accounted for 82 percent of all pregnancy-related death among reviewed 2013 cases.

Cardiovascular/coronary conditions and mental disorders (with or without substance

[5] Building U.S. Capacity to Review and Prevent Maternal Deaths (CDC Foundation, CDC, AMCHP). (2018). Report from Nine Maternal Mortality Review Committees. p.14-15. Retrieved from reviewtoaction.org/Report_from_Nine_MMRCs

use) were tied for the most frequently observed leading causes of death. Obstetric hemorrhage (OBH), preeclampsia or eclampsia, infection, and embolism were tied for second (See Appendix F, Chart F-1).[6] These underlying causes of death accounted for 70 percent of the 54 pregnancy-related deaths reviewed to date from the 2013 case cohort. Cardiomyopathy and pulmonary conditions tied for third, collectively accounting for 12 percent of pregnancy-related deaths. These findings are comparable to leading underlying causes of death reported by the Centers for Disease Control and Prevention (CDC).[7]

Finding #3 — Obesity, mental disorders, and substance use disorder each contributed to pregnancy-related death.

The MMMRC identified that the following factors also contributed to many pregnancy-related deaths:

- Obesity contributed to 35 percent of pregnancy-related deaths;
- Mental disorders, other than substance use disorder (SUD), contributed to 16 percent of pregnancy-related deaths; and
- SUD, including SUD associated with mental disorders, contributed to seven percent of pregnancy-related deaths.

Finding #4 — Disparities persist in maternal mortality. Non-Hispanic Black women are disproportionately impacted.

Among reviewed 2013 cases identified as pregnancy-related, 31 percent of deaths were among Non-Hispanic Black women, 41 percent among Non-Hispanic White women, 26 percent among Hispanic women, and 2 percent among women of other races and ethnicities. In contrast, 11 percent of live births in 2013 were among Non-Hispanic Black women, 34 percent among Non-Hispanic White women, 48 percent among Hispanic women, and 6 percent among women of other races and ethnicities.

DSHS will determine the final size and racial-ethnic distribution of 2013 pregnancy-

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[6] Mental disorders include deaths by suicide, overdose or poisoning, and unintentional injuries determined by the MMMRC to be related to a mental disorder. The MMMRC referenced the MMRIA PMSS-MM Decision Tree for Suicides and Overdoses in review of these deaths.

[7] Davis NL, Smoots AN, Goodman DA. Pregnancy-Related Deaths: Data from 14 U.S. Maternal Mortality Review Committees, 2008-2017. Atlanta, GA: Centers for Disease Control and Prevention, U.S. Department of Health and Human Services; 2019.

related deaths after the MMMRC complete their review of the 2013 case cohort.

Finding #5 — Timing of death in relation to pregnancy varies across leading underlying causes of pregnancy-related death.

Among the 54 pregnancy-related deaths from the 2013 case cohort, 29 percent occurred during pregnancy, 40 percent occurred within 42 days of the end of pregnancy, and 31 percent occurred 43 days to 1 year from the end of pregnancy. Appendix F, Chart F-2 shows how the timing of death is distributed across the leading underlying causes of pregnancy-related death.

Finding #6 — Most pregnancy-related deaths were preventable.

A death is considered preventable if the MMMRC finds that there was at least some chance of the death being averted by one or more reasonable changes to the circumstances of the patient, provider, facility, systems, or community factors. The MMMRC determined that there was at least some chance for preventability in 89 percent of pregnancy-related deaths reviewed from the 2013 case cohort. Among the leading underlying causes of death, cases of pregnancy-related death with the highest chance of preventability were caused by infection, hemorrhage, preeclampsia or eclampsia, and cardiovascular/coronary conditions (See Appendix F, Chart F-3).

Finding #7 — A complex interaction of factors contributed to pregnancy-related death.

Factors that contribute to a pregnancy-related death may impact a woman over her life course. The MMMRC identified 367 factors that contributed to the 54 pregnancy-related cases reviewed from the 2013 cohort, an average of 6.8 contributing factors per case. Contributing factors are categorized within domains that indicate the levels at which actions should be targeted for prevention.[8] Identified contributing factors of pregnancy-related death were distributed among the patient and family (34 percent of cases), provider (24 percent of cases), facility (17 percent of cases), systems of care (18 percent of cases), and community (7 percent cases) domains.[9]

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[8] For example, a chronic disease factor identified at the patient and family domain level may inform recommendations for disease prevention and management programs that would be designed for and targeted to women and their families.

[9] Factors are identified through review of information from available case records, including vital events, hospital discharge, medical, and medico-legal records. The MMMRC began using the Texas Socio-Spatial Context Dashboard as a standard part of case review in

See Appendix F, Table F-1 for identified factors by domain.

Finding #8— Violence contributed to pregnancy-related death.

Violent deaths, including suicide and homicide, accounted for 13 percent of pregnancy-related deaths. The MMMRC found that violence and intimate partner violence were leading community level factors contributing to death. The most frequent means of fatal injury resulting in pregnancy-related death were firearms; hanging, strangulation, or suffocation; and poisoning or overdose. Partners and ex-partners were most likely to be perpetrators of homicide among reviewed cases of violent pregnancy-associated death.[10]

Findings from Statewide Rates, Trends, and Committees

The Department of State Health Services (DSHS) studied state rates and trends related to maternal mortality, including maternal deaths.[11] DSHS also analyzed statewide trends of delivery-related hospitalizations involving maternal morbidity to identify health conditions that disproportionately impact the most at-risk populations.

Finding #9 — A complex interaction of factors contributed to disparities in maternal mortality and morbidity.

The Subcommittee on Maternal Health Disparities (Subcommittee) explored the MMMRC's findings, from their review of pregnancy-related death cases in the 2012 case cohort, within the context of race and ethnicity. The Subcommittee presented

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December 2019. The Dashboard was used with 28 percent of the pregnancy-related cases considered in this report, and enhanced MMMRC's identification of community-level factors.

[10] Pregnancy-associated deaths include maternal mortality cases that are pregnancy-related, not pregnancy-related, and undetermined pregnancy-relatedness. (See Appendix C).

[11] "Maternal death" is a vital registration term used for death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and the site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes as indicated by ICD coding. World Health Organization. The WHO application of ICD-10 to deaths during pregnancy, childbirth and the puerperium: ICD-MM. p. 9, Box 3. Geneva, Switzerland: World Health Organization; 2012. Available: https://www.who.int/reproductivehealth/publications/monitoring/9789241548458/en/

their findings at the December 6, 2019, MMMRC public meeting. The Subcommittee examined what contributing factors the MMMRC had identified through their multidisciplinary determination process and grouped the factors into the following categories: individual and family, provider and facility, or community and systems level factors.[12] They then studied the association between the decedents' race and ethnicity and the number of factors the MMMRC had identified in each category.

The Subcommittee found that factors related to the provider and facility were the most frequently identified contributors to pregnancy-related deaths among Non-Hispanic Black (56 percent of factors) and Hispanic women (50 percent of factors). Among Non-Hispanic White women, factors related to the individual and family were the most frequently identified (47 percent) contributors to pregnancy-related death.

The Subcommittee also found that contributors related to the community and systems accounted for a small percentage of identified factors overall. However, when distributed by the race and ethnicity of the decedent, there were observable differences in how often community and system factors were identified as contributing to pregnancy-related death. For instance, while 14 percent of contributing factors for pregnancy-related deaths identified for Non-Hispanic White women were related to the community and systems, 8 percent of identified factors for Hispanic women and 4 percent identified for Non-Hispanic Black women were within this category.

Finding #10 — The Enhanced Maternal Mortality Ratio remained relatively stable from 2013 to 2015.

The standard method for identifying maternal deaths relies on an obstetric cause-of-death code on the official death record. However, because of errors associated with the death certificate, DSHS researchers developed the three-step enhanced method for the identification of maternal deaths in 2012.[13,14] As part of next steps

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[12] Agenda Item #6. Available: https://texashhsc.swagit.com/play/12062019-862.

[13] Baeva S, Saxton DL, Ruggiero K, Kormondy ML, Hollier LM, Hellerstedt J, Hall M, Archer NP. Identifying Maternal Deaths in Texas Using an Enhanced Method, 2012. Obstet Gynecol 2018;131;762-769.

[14] The enhanced method is different from the method used by others to calculate maternal mortality numbers and ratios. Furthermore, calculated enhanced maternal mortality ratios

from the 2012 publication, DSHS has further refined the 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.

The new four-step enhanced method confirms maternal deaths through data matching and record review through the following steps:

- Step 1: Maternal deaths are identified using death certificates matched with birth/fetal deaths
- Step 2: For unmatched deaths, records are reviewed for evidence of pregnancy including miscarriage
- Step 3: All other female deaths matched are with birth/fetal deaths to identify additional deaths
- Step 4: For all other female deaths with 'pregnancy' checked on death certificate, records are reviewed for evidence of pregnancy including miscarriage to identify additional maternal deaths

DSHS began to use this refined four-step enhanced methodology (see Appendix D) to identify maternal deaths in 2013. DSHS then calculated an enhanced maternal mortality ratio for identified maternal deaths that occurred during pregnancy or within 42 days postpartum, as indicated on the death certificate, per 100,000 live births for a given year. The enhanced maternal mortality ratios for Texas for 2013 through 2015 are as follows, and further detailed in Appendix G:

- 2013: 18.9 maternal deaths per 100,000 live births (Appendix G, Figure G-1)
- 2014: 20.7 maternal deaths per 100,000 live births (Appendix G, Figure G-2)
- 2015: 18.1 maternal deaths per 100,000 live births (Appendix G, Figure G-3)

Finding #11 - Severe maternal morbidity (SMM) disproportionately impacts Non-Hispanic Black and Hispanic women. Rates of delivery hospitalizations involving any SMM at delivery vary by county.

cannot be compared with other maternal mortality ratios or rates. DSHS researchers will continue to apply the refined four-step enhanced methodology to confirm maternal deaths and calculate enhanced maternal mortality ratios for additional years so that trends can continue to be assessed.

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. Rates of delivery hospitalizations involving any SMM are estimated using specific information on hospital discharge records related to 21 conditions and procedures that can indicate incidence of severe morbidity.[15,16] While the CDC criteria for measuring SMM may be a reasonable metric at the population-level, there are limitations which underscore the importance of facility-based severe maternal morbidity review. [17,18]

According to data from Texas Hospital Inpatient Discharge Public Use Data Files, the rate of delivery hospitalizations involving any SMM in Texas remained relatively stable from 2011 to 2018. However, the rate of any SMM increased steadily for Non-Hispanic Black women since 2016 with an overall widening of the disparity gap by race and ethnicity. The rate of any SMM per 10,000 delivery hospitalizations for Non-Hispanic Black women in 2018 was 299.4 cases compared to the state rate of 182.3. Higher rates of any SMM were also observed among Hispanic mothers (Appendix H, Figure H-1).

In order to have enough data to have meaningful findings for most Texas counties, DSHS researchers analyzed data combined over a five-year period (2013-2018). Clear geographic differences in delivery hospitalization involving any SMM were

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[15] To identify delivery hospitalizations involving any SMM, CDC uses 21 conditions and procedures as indicators for potential incidence of severe morbidity. Indicators are identified by presence of International Classification of Diseases (ICD) diagnosis and procedure codes in administrative hospital discharge data. The CDC's list of 21 severe morbidity indicators and corresponding ICD-9-CM/ICD-10-CM/PCS codes during delivery hospitalizations can be used to track SMM at a population level when using administrative hospital discharge data from October 2015 and beyond. See the following: https://www.cdc.gov/reproductivehealth/maternalinfanthealth/smm/severe-morbidity-ICD.htm

[16] A delivery hospitalization is an inpatient hospital stay involving obstetric delivery as identified by coding from the Texas Health Care Information Collection inpatient file.

[17] Main EK, Abreo A, McNulty J, Gilbert W, McNally C, Poeltler D, Lanner-Cusin K, Fenton D, Gipps T, Melsop K, Greene N, Gould JB, Kilpatrick S. Measuring severe maternal morbidity: validation of potential measures. *Am J Obstet Gynecol.* 2016 May;214(5):643.e1-643.e10. doi: 10.1016/j.ajog.2015.11.004. Epub 2015 Nov 12. PMID: 26582168.

[18] Obstetric Care Consensus No 5 Summary: Severe Maternal Morbidity: Screening And Review, *Obstetrics & Gynecology*: September 2016 - Volume 128 - Issue 3 - p 670-671 doi: 10.1097/AOG.0000000000001635

evident.[19] Many counties in south and north Texas had higher rates of any SMM than the state rate (Appendix H, Figure H-2).

DSHS calculated the overall rate of any SMM per 10,000 delivery hospitalizations and the rates of each leading SMM indicator per 10,000 delivery hospitalizations for 2018. Blood product transfusions, with or without other indicators of SMM, was the leading procedure indicating any SMM in delivery hospitalizations in 2018 (Appendix H, Figure H-3). Although blood transfusion with or without other indicators of SMM represents the most common indicator of SMM, the metric has limitations when used alone and should be interpreted with caution.[20,21,22]

Finding #12 – Rates of delivery hospitalizations involving hypertensive disorder were highest among Non-Hispanic Black mothers and varied by county.

The overall rate of delivery hospitalizations involving hypertensive disorder diagnoses increased in 2011-2018. Non-Hispanic Black women had the highest rate in delivery hospitalization with hypertension (Appendix H, Figure H-4). High rates of delivery hospitalization with hypertensive disorder were noted throughout the state but were more concentrated in central and southeast Texas counties (Appendix H, Figure H-5).

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[19] A delivery hospitalization is an inpatient hospital stay involving obstetric delivery as identified by coding from the Texas Health Care Information Collection inpatient file.

[20] According to ACOG and SMFM Obstetric Care Consensus, a diagnosis of transfusion of blood products alone is insufficient to constitute a case of severe maternal morbidity if the volume of blood product that was transfused is not known and if blood product transfusion is the only criteria for classifying a case of severe maternal morbidity. As such, institutions and systems should have in place systems and processes to screen and review cases of SMM.

[21] Examples of diagnoses and complications associated with obstetric hemorrhage that constitute severe maternal morbidity include transfusion of four or more units of blood, return to the operating room for any major procedure, an emergency/unplanned peripartum hysterectomy, uterine artery embolization, and/or admission to an intensive care unit for invasive monitoring or treatment.

[22] Obstetric Care Consensus No 5 Summary: Severe Maternal Morbidity: Screening And Review. *Obstet Gynecol*. 2016;128(3):670-671. doi:10.1097/AOG.0000000000001635

4. Best Practices and Programs from Other States

The *2018 Maternal Mortality and Morbidity Task Force and Department of State Health Services Joint Biennial Report* outlined what best practices and programs other states were using to reduce maternal mortality and morbidity. This included strategies from the Association of Maternal and Child Health Programs' *Health for Every Mother: A Maternal Health Resource and Planning Guide for States*, programming from the California Maternal Quality Care Collaborative, and from the federally supported Alliance for Innovation on Maternal Health (AIM) Program. Likewise, the following section outlines additional best practices and programs identified by the Maternal Mortality and Morbidity Review Committee.

In May 2017, Centers for Medicare and Medicaid Services (CMS) launched the Accountable Health Communities Model initiative to improve collaboration between clinical professionals and the communities they serve. The initiative also seeks to test strategies that address health-related social needs that may negatively impact the burden of chronic disease and increase health care costs.[23, 24] Results from the evaluation of this initiative will be available after the initiative concludes in 2022. The initiative's standardized social needs screening tool, designed for use in clinical settings, was released by the National Academy of Medicine in a discussion paper.[25, 26]

The Florida Pregnancy-Associated Mortality Review (PAMR) began, the *Urgent Maternal Mortality Message to Providers* communication campaign initiative to increase awareness among providers in their state about patient safety issues identified through maternal mortality review and to promote action on PAMR

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[23] Alley DE, Asomugha CN, Conway PH, Sanghavi DM. Accountable Health Communities--Addressing Social Needs through Medicare and Medicaid. *N Engl J Med*. 2016;374(1):8-11.

[24] Centers for Medicare and Medicaid. Accountable Health Communities Model. Available: https://innovation.cms.gov/innovation-models/ahcm

[25] The standardized social needs screening tool is available at innovation.cms.gov/files/worksheets/ahcm-screeningtool.pdf.

[26] Billioux, A., K. Verlander, S. Anthony, and D. Alley. 2017. Standardized Screening for Health-Related Social Needs in Clinical Settings: The Accountable Health Communities Screening Tool. *NAM Perspectives.* Discussion Paper, National Academy of Medicine, Washington, DC. Available: https://nam.edu/wp-content/uploads/2017/05/Standardized-Screening-for-Health-Related-Social-Needs-in-Clinical-Settings.pdf

findings and recommendations. Provider messages released by the Florida PAMR to date include messages about opioid use during pregnancy, peripartum cardiomyopathy, hemorrhage associated with placental disorders, and information about the development of maternal early warning systems (MEWS). These reports are disseminated to stakeholders and are available on the Florida PAMR website.

5. Recommendations

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

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, enable effective care transitions, promote safe birth spacing, and improve lifelong health of women.

Preconception and interpregnancy health are defined as the health of women before and between pregnancies. Whether or not future pregnancies are planned, preconception and interpregnancy care are opportunities for education, prevention, and early intervention, which may involve reproductive life planning, health risk screening, vaccinations, and the prevention and management of acute and chronic conditions. These visits can reduce risks associated with morbidity and mortality, improve future birth outcomes, and promote lifelong health.

Among the reviewed 2013 cases of pregnancy-related death, 31 percent occurred 43 days to 1 year after the end of pregnancy. Chronic disease was a top patient-related contributing factor to maternal mortality. In the reviewed cases, the lack of access to care or financial resources contributed to inadequate control of chronic disease as well as to delay or failure to seek care and adherence to medical recommendations.

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*." [27]

[27] ACOG Committee Opinion No. 736: Optimizing Postpartum Care. *Obstet Gynecol*. 2018;131(5):e140-e150. Available: https://www.acog.org/clinical/clinical-guidance/committee-opinion/articles/2018/05/optimizing-postpartum-care

As such, the MMMRC recommends that health care coverage be extended to 12 months postpartum to help identify and properly manage health conditions before they become life-threatening. The American Medical Association (AMA) adopted a policy in 2019 to support the extension of health coverage to 12 months postpartum.[28]

The MMMRC recommends using strategies to prevent, identify, and manage health risks throughout the reproductive years. This includes the following.

- Individualized care planning and management to address acute and chronic health issues and psychosocial needs before, during, and after pregnancy.
- Interdisciplinary care coordination to increase continuity of care.
- Process improvement to standardize
  - Patient assessment, monitoring, and response protocols for urgent maternal health issues and psychosocial needs;
  - Processes for escalating consultation for high-risk obstetric populations; and
  - Use of cross-disciplinary partnerships and referral systems to connect patients with resources that address their medical and psychosocial needs.

Effective continuity of care and care transitions among providers requires portability and accessibility of health information. To effectively address complex health needs, accurate information-sharing among facilities, care teams, and specialty providers is necessary, including access to a patient's medical record and medical history. The MMMRC recommends using strategies that support a woman's ability to access and share her health information. Examples include the use of patient-held "obstetric passport" records that contain a woman's pertinent medical history, obstetric health smart-phone applications, and other methods that bridge communication between electronic medical records. A consolidated medical history ensures accurate sharing of a patient's medical history among various facilities and providers.

Recommendation #2 — Engage Black communities and apply health equity principles in the development of maternal and women's health programs.

Assuring equitable care is recognized as one of the six essential domains of health

[28] AMA adopts new policies at 2019 Annual Meeting. (2019). Available: https://www.ama-assn.org/press-center/press-releases/ama-adopts-new-policies-2019-annual-meeting

care quality.[29] The findings in this report show that health care improvement is necessary but insufficient to address maternal mortality and morbidity, especially for the most at-risk populations. To address maternal health disparities, the MMMRC recommends that relevant stakeholder organizations (Appendix I, Figure I-1) coordinate their efforts to use upstream approaches that identify and address structural inequities in health care systems and communities. In these efforts, Black communities must be at the center of program planning.[30, 31]

Additional recommendations on how to apply a health equity lens and support patient-centered, culturally competent care are listed in Appendix J.

Recommendation #3 — Improve access to integrated behavioral health care from preconception through one year postpartum for women with mental and substance use disorders.[32,33,34]

Mental disorders, including those associated with substance use disorder (SUD), were a leading underlying cause of pregnancy-related death and occurred most frequently between 43 days to 1 year postpartum. Integrated behavioral health care, where behavioral health and maternal and women's health care providers work together to provide high-quality care, can mitigate the risk for suicide or unintentional overdose. Early identification, intervention, treatment, and

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[29] Institute of Medicine Committee on Quality of Health Care in America. (2001). Crossing the Quality Chasm: A New Health System for the 21st Century. National Academies Press.

[30] "Upstream" interventions are targeted at the root causes of an outcome and address the social and structural barriers to optimal health. See, for example: Williams DR, Costa MV, Odunlami AO, Mohammed SA. Moving upstream: how interventions that address the social determinants of health can improve health and reduce disparities. *J Public Health Manag Pract*. 2008;14 Suppl(Suppl):S8-S17.

[31] "Centering" is a tenet of health care quality related to the ethical principles of autonomy and beneficence. It addresses the adage of "Nothing about me, without me". Centering is defined as having "*a deep respect for* [persons] *as unique living beings, and the obligation to care for them on their terms. Thus,* [persons] *are known… in context of their own social worlds, listened to, informed, respected, and involved in their care*." Epstein RM, Street RL Jr. The values and value of patient-centered care. *Ann Fam Med*. 2011;9(2):100-103.

[32] What Is Integrated Behavioral Health Care (IBHC)? | AHRQ Academy. https://integrationacademy.ahrq.gov/products/behavioral-health-measures-atlas/what-is-ibhc

[33] SAMHSA-HRSA Center for Integrated Health Solutions: https://www.samhsa.gov/integrated-health-solutions

[34] Center of Excellence for Integrated Health Solutions: https://www.thenationalcouncil.org/integrated-health-coe/resources/

appropriate referral for mental disorders and SUD can prevent pregnancy-related death. Use of social work, case management, and similar services can facilitate connection to appropriate community resources.

Additional recommendations for providers and other relevant stakeholders related to integrating behavioral health care are described in Appendix K).

Recommendation #4 — Improve statewide infrastructure and programs to address violence and intimate partner violence at the state and community levels.

Violence and intimate partner violence were among the most frequently identified contributing factors to death at the community factor level.

The MMMRC recommends the following actions for providers and stakeholder organizations (as listed in Appendix I).

- Promote education on and awareness of the prevalence of trauma and importance of trauma-informed care for women and maternal populations.
- Educate health care providers on validated screening tools regarding intimate partner violence and available referral resources.
- Ensure routine screening for intimate partner violence per ACOG recommendations.[35]
- Support implementation of the recommendations in the *Texas Council on Family Violence's Texas State Plan*.

Recommendation #5 — Implement statewide maternal health and safety initiatives to reduce maternal mortality and morbidity.

The MMMRC identified the following as leading factors contributing to pregnancy-related death at the provider and facility level.

- Inadequate clinical skill and quality of care – personnel and the care team were not appropriately skilled for the situation or did not exercise clinical judgement consistent with current standards of care.

[35] ACOG Practice Bulletin No. 518: Intimate Partner Violence. *Obstet Gynecol*. 2012;119(2 Pt 1):412-417. Available: https://journals.lww.com/greenjournal/Citation/2012/02000/Committee_Opinion_No__518__Intimate_Partner.51.aspx

- Delay – Personnel or facilities were delayed in referring or accessing appropriate care, treatment, or follow up.
- Lack of continuity of care – care providers did not communicate woman's status effectively or did not ensure coordinated handoffs between prenatal, intrapartum, and postpartum providers.

To foster a culture of safety and highly reliable care in Texas, the MMMRC recommends that stakeholder organizations (Appendix I) continue their coordinated efforts to implement maternal health and safety quality improvement initiatives through the Department of State Health Services (DSHS) TexasAIM Initiative and the Texas Collaborative for Healthy Mothers and Babies (TCHMB).

The MMMRC also recommends that stakeholder organizations provide coordinated support to the following activities.

- TexasAIM's continued focus on quality improvement efforts for obstetric hemorrhage (OBH), severe hypertension in pregnancy (HTN), maternal early warning systems (MEWS), and obstetric opioid-use disorder (OB-OUD).
- Implementation of obstetric maternal safety initiatives for sepsis, cardiovascular disease (CVD), maternal venous thromboembolism (VTE), and primary cesarean birth.[36]
- The use of a health equity framework during quality improvement initiatives - part of which involves the collection of quality and process improvement data by race, ethnicity, and language to better understand where disparities exist.[37]
- Development and use of MEWS and systems for escalation of Urgent Maternal Warning Signs (UMWS) in all health care settings.
- Programs through the TexasAIM Initiative that support birthing centers to implement maternal safety bundles.
- Implementation of evidence-based programs such as the federal Team Strategies & Tools to Enhance Performance & Patient Safety (TeamSTEPPS) framework in health care settings to improve communication and team work.

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[36] Sepsis and CVD bundles are currently in development by the Alliance for Innovation on Maternal Health (AIM).

[37] See, for example Wyatt R, Laderman M, Botwinick L, Mate K, Whittington J. Achieving Health Equity: A Guide for Health Care Organizations. IHI White Paper. Cambridge, Massachusetts: Institute for Healthcare Improvement; 2016. Available: http://www.ihi.org/resources/Pages/IHIWhitePapers/Achieving-Health-Equity.aspx

- Incorporate requirements within standards, accreditation, and Maternal Levels of Care for team-based training and drills for recognition, escalation, response, and post-event debrief for simulated obstetric emergencies.

Recommendation #6 — Foster supportive community environments and leverage programs and services that help women of childbearing age achieve their full health potential.

To improve health equity and community environments that support maternal health, the MMMRC recommends health care providers, institutions, and stakeholder organizations (Appendix I) take the following actions.

- Continue to support and fund medical-home models in order to provide comprehensive interdisciplinary health care for women of reproductive age.
- Assess 2-1-1 Texas referral algorithms and explore opportunities to make sure there is a single referral system for pregnant women to access pregnancy resources.
- Support initiatives for healthy eating, walkable communities, smoke-free environments, strategies in the *Texas CVD and Stroke Partnership's state plan*, and other chronic disease prevention guidelines.
- Increase 911 bystander cardiopulmonary resuscitation (CPR) education.
- Create and maintain lists of social service resources, including social workers or commercial social service networks, in all patient care settings.
- Work with community-based organizations to improve participation of at-risk populations in health education, health promotion, and health care services.
- Strengthen community coalitions and existing coalition networks to increase multidisciplinary networking, awareness of community needs and resources, and coordinated community-based interventions. Ensure inclusion of rural communities and coordination with Regional Advisory Councils (RACs).
- Work with high-risk communities to assess needs and implement community and environmental health improvement activities.
- Promote air quality improvement and monitoring as a vital issue to the health of those who suffer from asthma and other respiratory illness.
- Educate on the impact of air quality on respiratory illnesses and implement prevention and control programs in communities with poor air quality (as

supported by the ACOG Committee Opinion on Exposure to Toxic Environmental Agents and the AMA Position on Air Pollution).[38,39]

- Partner with community health workers, childbirth educators, doulas, and home visitation programs to educate women and their families about MEWS, perinatal mood and anxiety disorders, and other risk factors during pregnancy, postpartum, and the interpregnancy period. [40,41]
- Promote education on conflict resolution and firearm safety.
- Support hospital staff education and develop practices and protocols for situations when patients refuse blood products. Hospital staff should be encouraged to discuss their patients' religious and cultural practices and how it affects their health care choices. As appropriate and desired, hospital staff may work with patients' support networks, including religious leaders, in discussions about care and acceptable alternatives to blood products.

Recommendation #7 — Support coordination between emergency and maternal health services and implement evidence-based, standardized protocols to identify and manage obstetric and postpartum emergencies.[42]

Women may use emergency medical services for various reasons during and after pregnancy. Emergency health providers' knowledge about maternal physiology and health management, as well as communication and coordination with obstetric and women's health professionals, can be a critical factor in maternal health outcomes. To improve safety of care, the MMMRC recommends the following actions.

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[38] ACOG Committee Opinion No. 575. Exposure to toxic environmental agents. *Obstet Gynecol*. 2013;122(4):931-935.

[39] American Medical Association. AMA Position on Air Pollution H-135.998. 2019. Available: https://policysearch.ama-assn.org/policyfinder/detail/pollution%20health?uri=%2FAMADoc%2FHOD.xml-0-369.xml

[40] See Bohren MA, Hofmeyr GJ, Sakala C, Fukuzawa RK, Cuthbert A. Continuous support for women during childbirth. *Cochrane Database Syst Rev*. 2017;7(7):CD003766.

[41] See: Kozhimannil KB, Hardeman RR, Alarid-Escudero F, Vogelsang CA, Blauer-Peterson C, Howell EA. Modeling the Cost-Effectiveness of Doula Care Associated with Reductions in Preterm Birth and Cesarean Delivery. *Birth*. 2016;43(1):20-27.

[42] 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.

- Hospitals to encourage participation of emergency department representatives in the TexasAIM initiative.
- Hospitals to disseminate educational materials on MEWS, OBH, HTN, sepsis, and Venous Thromboembolism (VTE) to emergency department clinical team members.
- RAC Perinatal Care Region committees to promote consultation with obstetric providers for emergency management of pregnant and postpartum patients.
- Facilities to evaluate triage practices and develop standardized protocols for care coordination across service lines for pregnant and postpartum women.[43]
- RAC Perinatal Care Region committees to partner with urgent care and emergency facilities to standardize processes to assess pregnancy status and start obstetric consultation for patients who are currently pregnant or have been pregnant within the past year.
- RAC Perinatal Care Region committees to support obstetric-specific training and simulations for emergency medical service (EMS) and private transport teams.
- Trauma systems to incorporate obstetric-specific training in trauma levels of care and emphasize OBH, HTN, and VTE maternal safety initiatives.

Recommendation #8 — Improve postpartum care management and discharge education for patients and families.

Pregnancy-related deaths can occur during pregnancy, labor, or within the year after pregnancy. About 40 percent of deaths occur in the first 42 days after the end of pregnancy and approximately one-third occur between 43-365 days after the end of pregnancy. As the vast majority of pregnancy-related deaths occur after pregnancy, there needs to be an increased focus on the care women receive postpartum. To this end, the MMMRC recommends the following actions.

- Stakeholder organizations (Appendix I) to promote and use home visitation programs in the postpartum period, particularly for women with risk factors or comorbidities.

[43] ACOG's Committee on Obstetric Practice. Committee Opinion No. 667: Hospital-Based Triage of Obstetric Patients. *Obstet Gynecol*. 2016;128(1):e16-e19. doi:10.1097/AOG.0000000000001524. Available: https://journals.lww.com/greenjournal/Fulltext/2016/07000/Committee_Opinion_No__667__Hospital_Based_Triage.47.aspx

- Facilities and care providers to standardize and enhance postpartum discharge instruction, with specific attention to health literacy. Ensure women and families understand UMWS and seek help immediately.
- Health professionals across specialties and service lines to assess pregnancy and postpartum status among women of child-bearing age and engage women in reproductive life planning when they present for care.

Recommendation #9 — Continue and strengthen activities to increase public awareness and prevention.

The MMMRC recommends that DSHS support the development of strategies to reach and engage diverse stakeholders with targeted information about the MMMRC's findings and recommendations that are relevant to their priorities and spheres of influence. In turn, the MMMRC recommends that relevant stakeholder organizations (Appendix I) take the following actions.

- Create a single repository or system for information and referrals for pregnant women, including services and resources about pregnancy care.
- Participate in state and national campaigns to empower women, and their social supports, to learn about their health risks, what to watch out for during and after pregnancy, and seeking medical care if experiencing UMWS.
- Develop educational materials/campaigns to increase awareness of the impact of chronic conditions on women during pregnancy.
- Increase awareness of Surviving Sepsis Campaign guidelines and bundles.[44]

Recommendation #10 — Support strategies to continuously improve the maternal mortality investigation and case review process.

Maternal mortality review and the resulting recommendations are part of a cycle of continuous quality improvement for health systems.[45] The quality of case reporting, identification, preparation, and review impact the MMMRC's ability to effectively develop recommendations.

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[44] The Surviving Sepsis Campaign is a joint quality improvement initiative of the Society of Critical Care Medicine and the European Society of Intensive Care Medicine and aims to reduce mortality and morbidity from sepsis and septic shock. More information is available at sccm.org/SurvivingSepsisCampaign/Home.

[45] Building U.S. Capacity to Review and Prevent Maternal Deaths working group (AMCHP, CDC Foundation, CDC) (2020). MMRC Logic Model. Available: https://reviewtoaction.org/content/mmrc-logic-model

To improve availability and quality of comprehensive case information for pregnancy-associated deaths, the MMMRC recommends the following.

- Death certifiers to 1) establish processes to accurately assess whether deaths occurred during pregnancy or within a year of the end of pregnancy and 2) offer autopsies for pregnancy-associated deaths for those cases that do not fall under the jurisdiction of a Medical Examiner.
- The Texas Justice Court Training Center to include information about maternal mortality in the required death investigation training for justices of the peace.
- Health care facilities to discuss options for an autopsy with the family if the cause of a pregnancy-associated death is unknown.
- DSHS to work with medical records experts to implement strategies that will increase the access to psychosocial assessments and social service notes for MMMRC review.
- DSHS to 1) explore data sources used by other state maternal mortality review committee jurisdictions and 2) assess the feasibility of obtaining case information for maternal mortality review from other state programs and agencies, such as the Texas Violent Death Reporting System, the Texas EMS & Trauma Registries, the Texas Prescription Monitoring Program, and the Department of Family and Protective Services.

To continuously improve the quality of maternal mortality review and the development of comprehensive, impactful recommendations, the MMMRC recommends the following actions.

- DSHS to facilitate the option for MMMRC members to participate in nationally recommended training opportunities for maternal mortality review committees, including implicit bias training.
- The Subcommittee on Maternal Health Disparities to continue to study drivers and root causes of racial disparities in maternal mortality and morbidity in Texas.
- Policymakers to amend Health and Safety Code, Chapter 34, to increase the size of the MMMRC to include new expertise not currently represented. Recommended additional membership categories include an emergency medicine provider representative and a patient advocate/survivor of severe maternal morbidity representative.

6. Conclusion

The Texas Maternal Mortality and Morbidity Review Committee (MMMRC) brings together multidisciplinary professionals from across the state in a unique process to study how and why Texas mothers are dying. The factors that contribute to maternal mortality and morbidity are complex and occur over the life course. As such, in the process of developing this report, the MMMRC framed their findings and recommendations around the forces that impact the health of maternal health populations at the individual and family, provider and facility, and community and systems levels.

The findings and recommendations in this report represent priority opportunities to reduce preventable maternal mortality. However, just as multiple factors impact health outcomes for maternal health populations, 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 these efforts.

An important theme throughout this report is the persistence of maternal health disparities. This underscores the importance of the MMMRC's health equity framework and of continued work by the MMMRC's Subcommittee on Maternal Health Disparities to study those factors that contribute to inequitable outcomes to inform prevention activities.

The Department of State Health Services (DSHS) and the MMMRC's participation in federal maternal mortality grant opportunities has supported connections with other states and alignment with best practices for a fully functional review committee. Efforts to strengthen communications, outreach, partnerships, and coordination among stakeholders will continue to help move MMMRC recommendations into action.

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

List of Acronyms

Acronym	Full Name
AABC	American Association of Birth Centers
AAEM	American Academy of Emergency Medicine
AAFP	American Academy of Family Physicians
AANA	American Association of Nurse Anesthetists
AAP	American Academy of Pediatrics
ACNM	American College of Nurse-Midwives
ACOG	American College of Obstetricians and Gynecologists
AHA	American Heart Association
AHRQ	Agency for Healthcare Research and Quality
AIM	Alliance for Innovation on Maternal Health
AMA	American Medical Association
AMCHP	Association on Maternal and Child Health Programs
ANA	American Nurses Association
APA	American Psychiatric Association
ASAM	American Society of Addiction Medicine
ASHRM	American Society for Healthcare Risk Management
ASTHO	Association of State and Territorial Health Officials
ATM	Association of Texas Midwives

Acronym	Full Name
AWHONN	Association of Women's Health, Obstetric, and Neonatal Nurses
BHAC	Behavioral Health Advisory Committee
CDC	Centers for Disease Control and Prevention
CHW	Community Health Workers
CMS	Centers for Medicare and Medicaid Services
COVID-19	Coronavirus Disease 2019
CPR	Cardiopulmonary Resuscitation
CPSWHC	Council on Patient Safety in Women’s Health Care
CTCNM	Consortium of Texas Certified Nurse Midwives
CVD	Cardiovascular Disease
DIC	Disseminated Intravascular Coagulation
DSHS	Department of State Health Services
DFPS	Department of Family and Protective Services
EMS	Emergency Medical Services
ENA	Emergency Nurses Association
ERASE MM	Enhancing Reviews and Surveillance to Eliminate Maternal Mortality
FDA	The Food and Drug Administration
FTEs	Full Time Employees
GME	Graduate Medical Education

Acronym	Full Name
GETAC	Governor 's Emergency Medical Services (EMS) and Trauma Advisory Council
HB	House Bill
HHSC	Health and Human Services Commission
HRSA	Health Resource Services Administration
HSC	Health and Safety Code
HTMB	Healthy Texas Mothers and Babies
HTN	Hypertension
HTW	Healthy Texas Women
IHI	Institute for Healthcare Improvement
IOC	Interagency Obesity Council
ICEA	The International Childbirth Education Association
LMHA	Local Mental Health Authorities
MAT	Medication-Assisted Treatment
MCHB	Maternal and Child Health Bureau
MEWS	Maternal Early Warning System
MIECHV	Maternal, Infant, and Early Childhood Home Visiting Program
MMMRC	Texas Maternal Mortality and Morbidity Review Committee
MMRIA	Maternal Mortality and Information Application

Acronym	Full Name
NACCHO	National Association of County and City Health Officials
NAM	National Academy of Medicine
NASW Texas	National Association of Social Workers Texas
NICHD	Eunice Kennedy Shriver National Institute of Child Health and Human Development
NIH	National Institutes of Health
NPWH	Nurse Practitioners in Women's Health
NQF	National Quality Forum
OBH	Obstetric Hemorrhage
OB-OUD	Obstetric Care for Women with Opioid Use Disorder
OSAR	Outreach Screening and Referral Centers
OWH	Office on Women's Health
PAC	Perinatal Advisory Council
PAMR	Pregnancy-Associated Mortality Review
PCRs	Perinatal Care Regions
PMD	Preventing Maternal Deaths Act Grant of 2018
PQIN	Perinatal Quality Improvement Network
QI	Quality Improvement
RACs	Regional Advisory Councils
SAMHSA	Substance Abuse and Mental Health Services Administration

Acronym	Full Name
SB	Senate Bill
SBHCC	Statewide Behavioral Health Coordinating Council
SCCM	Society of Critical Care Medicine
SDN	Shared Decision Making
SHCC	Statewide Health Coordinating Council
SMFM	The Society for Maternal and Fetal Medicine
SMM	Severe Maternal Morbidity
SMMCAC	State Medicaid Managed Care Advisory Committee
SOAP	Society for Obstetric Anesthesia and Perinatology
SUD	Substance Use Disorder
TANA	Texas Association of Nurse Anesthetists
TAFP	Texas Academy of Family Physicians
TAOG	Texas Association of Obstetricians and Gynecologists
TAWHONN	Association of Women's Health, Obstetric and Neonatal Nurses- Texas Section
TCCDS	Texas Council on Cardiovascular Disease and Stroke
TDC	Texas Diabetes Council
TFBHO	Task Force of Border Health Officials
TCEQ	Texas Commission on Environmental Quality
TCHMB	Texas Collaborative for Healthy Mothers and Babies
THA	Texas Hospital Association

Acronym	Full Name
TJC	The Joint Commission
TMA	Texas Medical Association
TNA	Texas Nurses Association
TPS	Texas Pediatric Society
UMWS	Urgent Maternal Warning Signs
USDA	U.S. Department of Agriculture
VTE	Venous Thromboembolism
WIC	Special Supplemental Nutrition Program for Women, Infants, and Children

Appendix A. Acts 2019, 86th Texas Legislature, Regular Session

Actions of the 86th Texas Legislature, Regular Session, 2019, relating to the Texas Maternal Mortality and Morbidity Review Committee (MMMRC) include:

Senate Bill (SB) 436 - amended Texas Health and Safety Code (HSC), Chapter (Ch.) 34, by adding § 34.0158 to direct the Department of State Health Services (DSHS), in collaboration with the MMMRC, to develop statewide initiatives to improve maternal and newborn health for women with opioid use disorder.

SB 748 - amended HSC Ch. 34 to direct the Health and Human Services Commission (HHSC) to collaborate with the MMMRC to perform annual data collection of specific information from the Medicaid and Healthy Texas Women (HTW) programs, to consult with the MMMRC for development of a telehealth or telemedicine services program, and conduct program evaluations including to explore expanding certain services. The bill added § 34.021 to direct the HHSC Executive Commissioner (via DSHS), to apply for grants under the Federal Preventing Maternal Deaths Act of 2018 (PMD). The bill also amended HSC Ch. 1001 by adding Subchapter K, which charges DSHS to develop and implement a high-risk maternal care coordination services pilot program in one or more areas of the state.

SB 750 - amended HSC Ch. 34 to change the committee's name from the "Maternal Mortality and Morbidity Task Force" to the "Texas Maternal Mortality and Morbidity Review Committee" and added a provision making limited allowances for reporting in compliance with the Federal Preventing Maternal Deaths Act (PMD).

SB 2132 - added HSC § 531.0995 and directs HHSC to consult with the MMMRC on improving the process for providing required information to women enrolled in the HTW program.

2020-21 General Appropriations Act, House Bill (HB) 1 (Article II, Health and Human Services, Rider 28) - over the biennium, appropriated

- $1.33 million and six Full Time Employees (FTEs) to implement maternal safety initiatives statewide,
- $1.17 million and two FTEs to develop and establish the previously mentioned high-risk maternal care coordination services pilot, and

- $1 million to increase public awareness and prevention activities related to maternal mortality and morbidity.

HB 25 - added HSC § 531.024141 directing HHSC to collaborate with the MMMRC to develop and implement a pilot program for providing services to certain women and children under the Medicaid medical transportation program.

Appendix B. Review Committee Members

Table B-1: Texas Maternal Mortality and Morbidity Review Committee Members as of September 2020

Name	Position	Professional Affiliations and Location
Dr. Lisa Hollier (Chair)	Physician specializing in Obstetrics, Maternal Fetal Medicine Specialist	Professor, Baylor College of Medicine, Houston
Dr. Carla Ortique (Vice-Chair)	Physician specializing in Obstetrics	Obstetrician/Gynecologist, Texas Children's Hospital, Houston
Dr. Manda Hall	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. Patrick Ramsey	Physician specializing in Obstetrics, Maternal Fetal Medicine Specialist	Professor of Obstetrics/Gynecology and Maternal-fetal Medicine, University of Texas Health, San Antonio
Dr. James Maher	Physician specializing in Obstetrics, Maternal Fetal Medicine Specialist	Associate Professor, Department of Obstetrics and Gynecology - Texas Tech University Health Sciences Center and Director of Maternal Fetal Medicine, Medical Center Hospital, Odessa
Dr. Sherri Onyiego	Physician specializing in Family Medicine	Interim Director, Nutrition & Chronic Disease Prevention, Nutrition and Chronic Disease Prevention Division, Harris County Public Health, Houston

Name	Position	Professional Affiliations and Location
Dr. Amy Raines-Milenkov	Researcher of pregnancy-related deaths	Assistant 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. D. Kimberley Molina	Medical Examiner	Chief Medical Examiner, Bexar County Medical Examiner's Office, San Antonio
Dr. Meitra Doty	Physician specializing in Psychiatry	Faculty Physician, Department of Psychiatry, University of Texas Southwestern Medical Center and Parkland Health and Hospital System, Dallas
Dr. Pamala Gessling	Registered Nurse	Nurse Director of Nursing, Methodist, Dallas Medical Center, Dallas
Recently Vacant	Community Advocate	
Nancy Jo Reedy	Certified Nurse-Midwife	Registered Nurse, Instructor and Clinical Faculty Advisor, Georgetown University, Arlington
Nancy Sheppard Alderman	Licensed Clinical Social Worker	Founder and Coordinator of Central Texas Perinatal Coalition, Private Social Work Practice, Cedar Park
Dr. Lavannya Pandit Physician	Physician specializing in Critical Care	Staff Physician, Baylor College of Medicine/DeBakey VA Medical; Assistant Professor of Medicine
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

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)
- Ms. Evelyn Delgado (DSHS Representative)
- Dr. Gary Hankins (Former Vice-Chair, Physician specializing in Obstetrics)
- Ms. June Hanke (Community Advocate)
- Dr. Kidada Gilbert-Lewis (Physician specializing in Pathology)
- Ms. Kim Williams (Community Advocate)
- Dr. Linda Gaul (State Epidemiologist)
- Dr. Ronald Peron (Physician specializing in Family Medicine)

Program Partners:

- University of North Texas Health Science Center Team
- Centers for Disease Control and Prevention, Enhancing Reviews and Surveillance to Eliminate Maternal Mortality

Subject Matter Expert Consultants:

- Dr. Christina Roland
- Dr. Mildred Ramirez

Appendix C. Maternal Mortality Review Terms

Technical terms have been used throughout the report to describe maternal mortality. This area of study uses standard terminology for maternal mortality review processes in the United States.

For the purposes of this report, the following sources have been used in defining these terms.

Definitions of the 1986 American College of Obstetricians and Gynecologists/Centers for Disease Control 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: Centers for Disease Control and Prevention; 2001. Available: https://reviewtoaction.org/content/strategies-reduce-pregnancy-related-deaths-identification-and-review-action.

AMCHP, CDC Foundation, CDC Division of Reproductive Health. Review to Action: Building U.S. Capacity to Review and Prevent Maternal Deaths. Definitions. Available: https://reviewtoaction.org/learn/definitions.

The following are definitions of the key terms used in this report.

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 which produced the fatal injury.

Preventability: A death is considered preventable if the committee determines that there was at least some chance of the death being averted.

Chance to Alter Outcome: A determination of the review committee on the degree of preventability. The review committee determines if there was no chance, some chance, or a good chance of the death being averted 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. Identification of contributing factors 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.

Table C-1. Terms related to establishment of pregnancy relatedness[i]

Pregnancy-associated death

The death of a woman while pregnant or within one year of the end of pregnancy, regardless of the cause.

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 the 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.

[i] These terms were developed in the United States by the American College of Obstetricians and Gynecologists/Centers for Disease Control Maternal Mortality Study Group 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 D. Pregnancy-Associated Death Identification Methodology

The current process for pregnancy-associated death review in Texas includes the following methods for the identification of pregnancy-associated deaths, excluding motor vehicle accidents, with the exception of cases of crashes including vehicular homicide or suicide:

- Linkage of all Texas female death certificates to all birth and fetal death certificates from the same year and one year prior;
- Records requests for pregnancy verification of all Texas female deaths with an obstetric-coded underlying cause of death; and
- Records requests for pregnancy verification of all Texas female deaths with a pregnancy checkbox indicating pregnancy at death or within a year of the date of death.

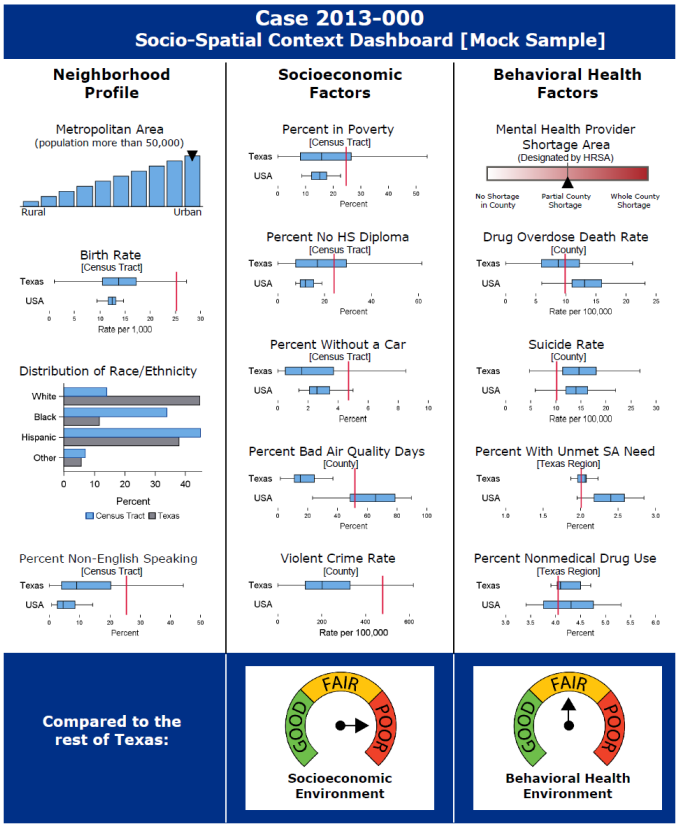
The Healthy Texas Mothers and Babies Epidemiology Team (HTMB Epi Team) within the Maternal and Child Health Epidemiology Unit (MCH Epi) probabilistically links female deaths, births, fetal deaths, and Texas Health Care Information Collection (THCIC) inpatient and outpatient files, and selects records based on known or suspected female death cases. The HTMB Epi Team combines the deterministically- and probabilistically-linked data to identify potential pregnancy-associated deaths.

After combining the deterministically- and probabilistically-linked data, HTMB Epi Team identifies prenatal, intrapartum, and postpartum hospitalizations. All inpatient and outpatient (e.g., emergency department) medical records for the decedent are requested from identified providers by HTMB Epi Team. Once received, medical records are visually scanned to identify potential outpatient encounters (e.g. prenatal-, primary-, and specialty care). A request of outpatient records is made if available medical records contain information suggestive of outpatient care and if there is sufficient identifying information in the record to facilitate identification of contact information. Autopsy reports and death inquest reports are also requested using certifier data on the death certificate.

Appendix E. Socio-Spatial Context Dashboard, Guide, and Indicators

The following pages come from a document titled *Socio-Spatial Context Dashboard Template, Reading Guide, and Indicators Description*, developed in 2019 by the Maternal & Child Health Unit within the Department of State Health Services.

Socio-Spatial Context Dashboard Reading Guide

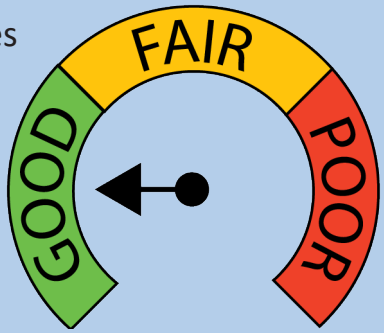


Reading the Dashboard

The dashboard provides estimates of a woman's environment around the year of her death. Its purpose is to give her death a context that would not otherwise be found in medical records in order to inform the Review Committee's decisions and recommendations.

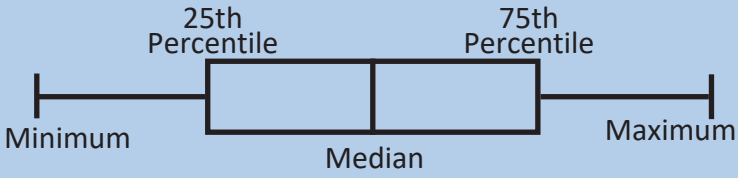
Understanding the Gauge

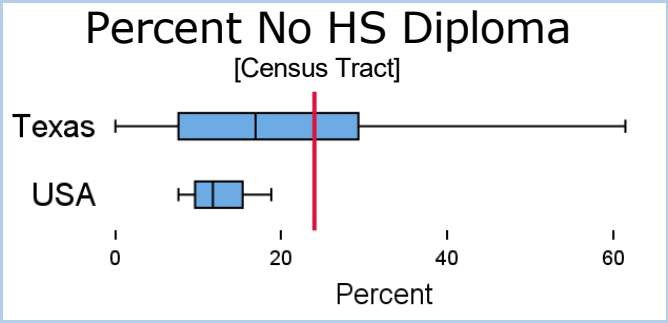
The gauge summarizes the set of indicators for each factor and determines the experience for the individual compared to the rest of Texas.



Interpreting a Box and Whisker Plot

A box-whisker plot displays the distribution of data values. The median is the middle value- 50% of values fall above or below the median. Twenty-five percent of values fall below the box's leftmost boundary (25th percentile) and 75% of values fall below the box's rightmost boundary (75th percentile).





- The red line indicates the **estimate for the census tract** in which the woman was living at the time of her death.
- The top plot shows the range of values for **all census tracts in Texas**. The median percent of people without a high school dipoma in Texas is about 18 percent.
- The bottom plot shows the range of values for **all states in the United States**.

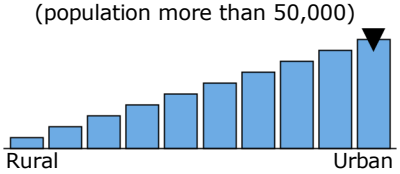
Interpretation: This woman lived in a census tract where the percent of people without a high school diploma is higher than that of most census tracts in Texas and much higher than that of other states within the United States.

PREPARED BY: Maternal & Child Health Epidemiology, Division for Community Health Improvement, DSHS. 2019.

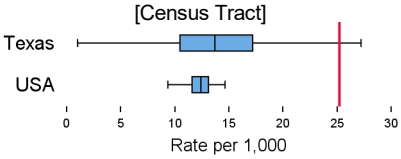
Case 2013-000
Socio-Spatial Context Dashboard [Mock Sample]

Neighborhood Profile

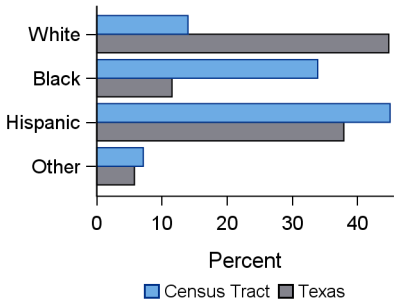
Metropolitan Area
(population more than 50,000)



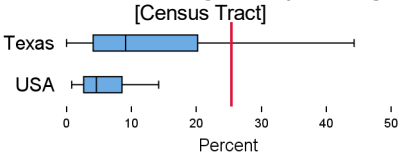
Birth Rate
[Census Tract]



Distribution of Race/Ethnicity

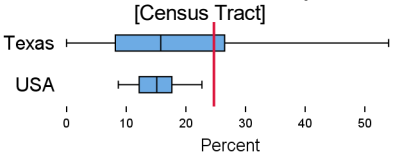


Percent Non-English Speaking
[Census Tract]

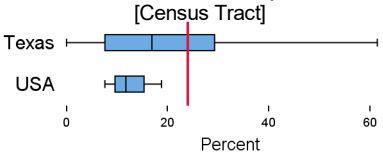


Socioeconomic Factors

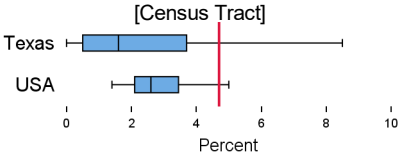
Percent in Poverty
[Census Tract]



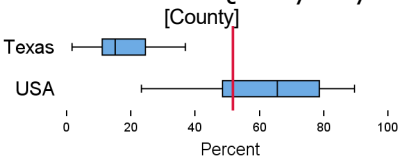
Percent No HS Diploma
[Census Tract]



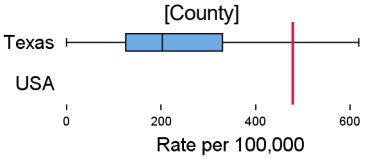
Percent Without a Car
[Census Tract]



Percent Bad Air Quality Days
[County]

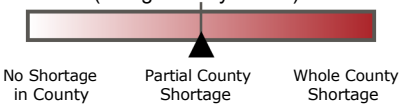


Violent Crime Rate
[County]

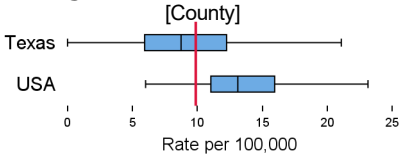


Behavioral Health Factors

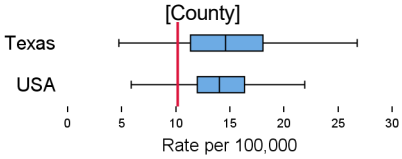
Mental Health Provider Shortage Area
(Designated by HRSA)



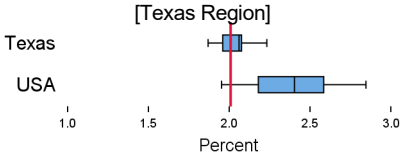
Drug Overdose Death Rate
[County]



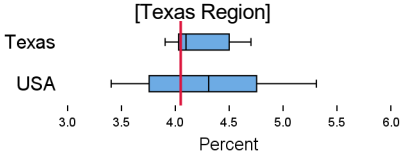
Suicide Rate
[County]



Percent With Unmet SA Need
[Texas Region]



Percent Nonmedical Drug Use
[Texas Region]



Compared to the rest of Texas:

Socioeconomic Environment

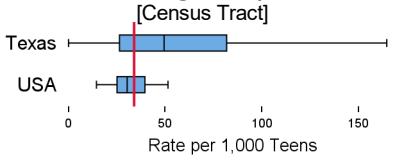
Behavioral Health Environment

HS=High School, HRSA=Health Resources & Services Administration, SA=Substance Abuse
NOTE: 'Suppressed' indicates that numbers for the area of interest were too small or missing.
PRODUCED BY: Maternal & Child Health Epidemiology, Texas DSHS.

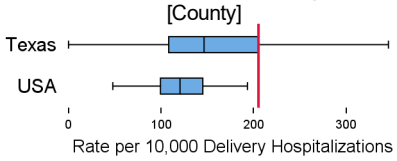
Case 2013-000
Socio-Spatial Context Dashboard [Mock Sample]

Reproductive Health Factors

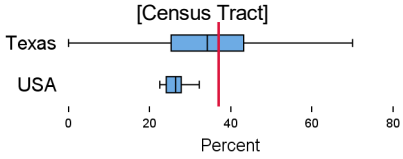
Teen Pregnancy Rate
[Census Tract]



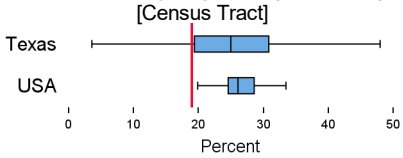
Severe Maternal Morbidity Rate
[County]



Percent Late to Prenatal Care
[Census Tract]

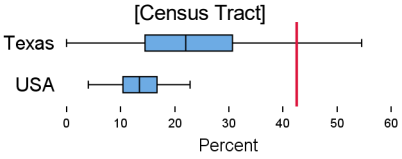


Percent Pre-pregnancy Obesity
[Census Tract]

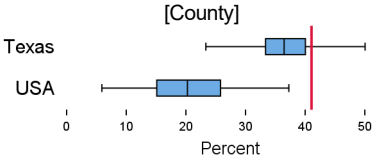


Healthcare Access Factors

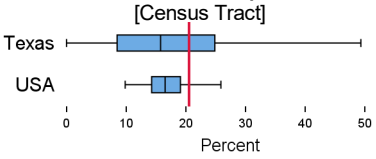
Percent Uninsured
[Census Tract]



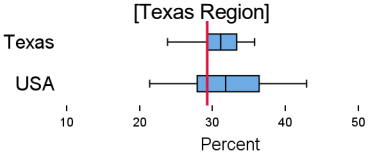
Percent Uninsured with FP Needs
[County]



Percent Covered by Medicaid
[Census Tract]

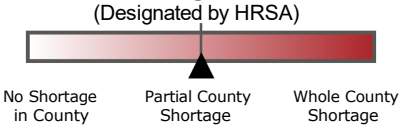


Percent No Annual Checkup
[Texas Region]

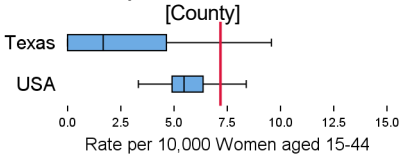


Healthcare Availability Factors

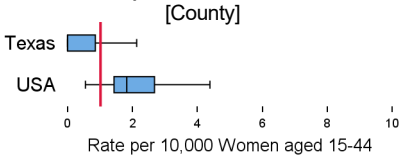
Primary Care Provider Shortage Area
(Designated by HRSA)



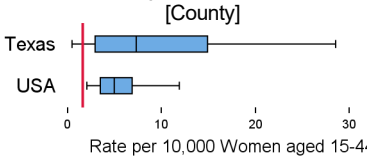
OBGYNs per 10,000 Women
[County]



Midwives per 10,000 Women
[County]



FP Centers per 10,000 Women
[County]



Reproductive Health Environment

Healthcare Access

Healthcare Availability

FP=Family Planning, OBGYNs=Obstetrics & Gynecology providers
NOTE: 'Suppressed' indicates that numbers for the area of interest were too small or missing.
PRODUCED BY: Maternal & Child Health Epidemiology, Texas DSHS.

Indicator Sources

Category	Title	Level	Source	Gauge Equation
Neighborhood Profile	Rural-Urban Gauge	Census tract	United States Department of Agriculture (USDA) - Economic Research Service	N/A
	Birth Rate	Census tract	Texas Center for Health Statistics (CHS); American Community Survey (ACS); National Vital Statistics System (NVSS); National Center for Health Statistics (NCHS)	N/A
	Distribution of Race/Ethnicity	Census tract	ACS	N/A
	Percent Non-English Speaking	Census tract	ACS	N/A
Socioeconomic Factors	Percent in Poverty	Census tract	ACS	Percentile Rank
	Percent No HS Diploma	Census tract	ACS	Percentile Rank
	Percent Without a Car	Census tract	ACS	Percentile Rank in concert with Urbanicity
	Percent Bad Air Quality Days	County	Human Resources & Services Administration's (HRSA) Area Health Resource File	Percentile Rank
	Violent Crime Rate	County	Texas Department of Public Safety; Federal Bureau of Investigation Uniform Crime Reporting	Percentile Rank
Behavioral Health Factors	Mental Health Provider Shortage Area	County	HRSA's Area Health Resource File	Score of 0, 50, or 100
	Drug Overdose Death Rate	County	Texas CHS; NCHS	Percentile Rank
	Suicide Rate	County	Texas CHS; NCHS	Percentile Rank
	Percent With Unmet Substance Abuse Need	Texas Region	National Survey on Drug Use and Health (NSDUH)	Percentile Rank
	Percent Nonmedical Drug Use	Texas Region	NSDUH	Percentile Rank

Category	Title	Level	Source	Gauge Equation
	Teen Pregnancy Rate	County	Texas CHS; NCHS; NVSS	Percentile Rank
Reproductive Health Factors	Severe Maternal Morbidity Rate	County	Texas Health Care Information Collection Hospital Inpatient Public Use Data File (PUDF); HRSA's Federally Available Data (FAD) Resource Document	Percentile Rank
	Percent Late to PNC	County	Texas CHS; HRSA's FAD Resource Document	Percentile Rank
	Pre-Pregnancy Obesity	County	Texas CHS; NVSS	Percentile Rank
Healthcare Access	Percent Uninsured	Census tract	ACS	Percentile Rank
	Percent Uninsured with Family Planning Needs	County	Guttmacher Institute	Percentile Rank
	Percent Covered by Medicaid	Census tract	ACS	Percentile Rank in concert with Percent in Poverty
	Percent No Annual Checkup	Region	Behavioral Risk Factor Surveillance System (BRFSS)	Percentile Rank
Healthcare Availability	Primary Care Provider Shortage Area	County	HRSA's Area Health Resource File	Score of 0, 50, or 100.
	OBGYNs per 10,000 Women	County	HRSA's Area Health Resource File	Percentile Rank, stratified by Birth Rate
	Midwives per 10,000 Women	County	HRSA's Area Health Resource File	Percentile Rank, stratified by Birth Rate

Indicator Descriptions

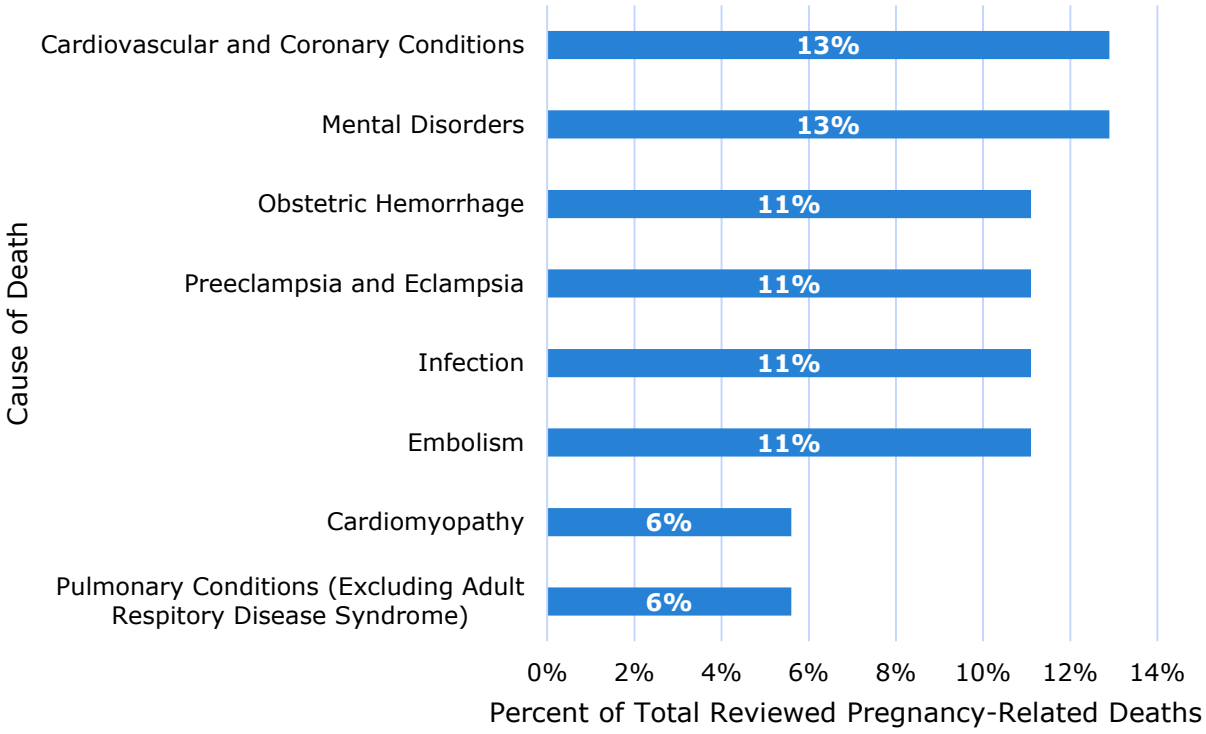
Title	Description
Rural-Urban Gauge	The rural-urban commuting area (RUCA) codes classify U.S. census tracts using measures of population density, urbanization, and daily commuting. The most recent RUCA codes are based on data from the 2010 decennial census and the 2006-10 American Community Survey.
Birth Rate	Birth rate is the number of births divided by the total population and multiplied by 1,000. Census Tract estimates used 2013 birth counts from CHS and 2011 to 2015 5-year period estimates for population counts from ACS. State estimates used 2013 birth counts from NVSS and 2013 population estimates from NCHS.
Distribution of Race/Ethnicity	Population estimates by race/ethnicity were from ACS 5-year period estimates for 2009-2013.
Percent Non-English Speaking	Percent of population who did not speak English "very well" is from ACS 5-year period estimates for 2009-2013.
Percent in Poverty	Percent of population living below the Federal Poverty Line is from ACS 5-year period estimates for 2009-2013.
Percent No HS Diploma	Percent of population 18 and over without a high school diploma is from ACS 5-year period estimates for 2009-2013.
Percent Without a Car	Percent of workers 16 and over living in households with no vehicle available is from ACS 5-year period estimates for 2009-2013.
Percent Bad Air Quality Days	Air Quality data are from the 2013 Environmental Protection Agency (EPA), Air Data Air Quality Index Report. Air Quality Index (AQI) is an indicator of overall air quality, because it takes into account all of the criteria air pollutants measured within a geographic area. "Bad" air quality is considered to be an AQI above 50.
Mental Health Provider Shortage Area	Refer to HRSA's website for a complete description of criteria used to designate Health Professional Shortage Areas (HPSA). This estimate was from 2015 Mental Health HPSA designations. Mental health professionals include psychiatrists, clinical psychologists, clinical social workers, psychiatric nurse specialists, and marriage and family therapists.
Drug Overdose Death Rate	Drug overdose death rate is the rate of drug overdose deaths per 100,000 population for 2009 to 2013 (i.e., the 5-year count of drug overdose deaths divided by 5-year population count and multiplied by 100,000). Drug overdose deaths are identified by underlying cause of death codes from death certificate data using methods that can be found on NCHS' website.
Suicide Rate	Suicide rate is the rate of suicides per 100,000 population for 2009 to 2013 (i.e., the 5-year count of suicides divided by 5-year population count and multiplied by 100,000). Suicides are identified by underlying cause of death codes from death certificate data using methods that can be found on NCHS' website.
Percent With Unmet Substance Abuse Need	The percent of survey participants needing but not receiving treatment at a specialty facility for illicit drug use in the past year is shown for years 2012-2014. NSDUH provides estimates for 15 regions in Texas (see survey documentation for more details).

Title	Description
Percent Nonmedical Drug Use	The percent of survey participants reporting nonmedical use of prescription pain relievers in the past year is shown for years 2012-2014. Prescription pain relievers include many medications that are or have been available by prescription. NSDUH provides estimates for 15 regions in Texas (see survey documentation for more details).
Teen Pregnancy Rate	Teen pregnancy rate is the number of births to females aged 15-19 divided by the female population aged 15-19 and multiplied by 1,000. County estimates used 2013 birth counts from CHS and 2013 population counts from TDC, and state estimates used 2013 counts from NVSS.
Severe Maternal Morbidity Rate	Severe maternal morbidity (SMM) rate is the number of cases having at least one condition classified as SMM per 10,000 delivery hospitalizations for 2013. County data is calculated from Texas 2013 Inpatient PUDF. Methods for calculating SMM and state data can be found in HRSA's FAD Resource Document.
Percent Late to PNC	The percent of women with late entry to prenatal care (PNC) is calculated as the number of births to women not entering PNC in the first trimester divided by all births. These estimates are from 2013 birth certificate data.
Percent Pre-Pregnancy Obesity	The percent of women with pre-pregnancy obesity is calculated as the number of births to women with a pre-pregnancy BMI of 30 or higher divided by all births. These estimates are from 2013 birth certificate data.
Percent Uninsured	Percent of population without health insurance is from ACS 5-year period estimates for 2009-2013.
Percent Uninsured with Family Planning Need	This estimate shows the number of women in need of publicly funded contraceptive services who are uninsured divided by all women in need of publicly funded contraceptive services. Women in need of publicly funded contraceptive services include women aged 13-44 who are sexually active, are able to conceive, are not currently pregnant or trying to become pregnant, and are either under 20 years old or have an income below 250% of the federal poverty line.
Percent Covered by Medicaid	Percent of population reporting health insurance coverage by Medicaid is from ACS 5-year period estimates for 2009-2013.
Percent No Annual Checkup	Percent of women aged 18-44 reporting not having a preventative medical visit in the past year is from the 2013 BRFSS.
Primary Care Provider Shortage Area	Refer to HRSA's website for a complete description of criteria used to designate Health Professional Shortage Areas (HPSA). This estimate was from 2015 Primary Care HPSA designations. Primary care professionals include those who practice in general or family practice, general internal medicine, pediatrics, and obstetrics and gynecology.
OBGYNs per 10,000 Women	This estimate was calculated by averaging 2010 counts and 2015 counts of providers in general obstetrics and gynecology (OBGYN) and other OBGYN subspecialties per 10,000 women aged 15-44 from 2013 TDC population estimates.
Midwives per 10,000 Women	This estimate was calculated by taking the maximum of the 2013 count of Advanced Practice Midwives who are registered with a National Provider Identification (NPI) and the 2013 count of Certified Nurse Midwives per 10,000 women aged 15-44 from 2013 TDC population estimates.

Title	Description
FP Centers per 10,000 Women	This estimate shows the number of publicly funded family planning centers per 10,000 women aged 13-44 in need of publicly funded contraceptive services. Women in need of publicly funded contraceptive services include women who are sexually active, are able to conceive, are not currently pregnant or trying to become pregnant, and are either under 20 years old or have an income below 250% of the federal poverty line.

Appendix F. Texas MMMRC Findings

Chart F-1: Leading Underlying Causes of Reviewed Pregnancy-Related Deaths, Texas, 2013 (N=44 of 54 Reviewed Pregnancy-Related Deaths)

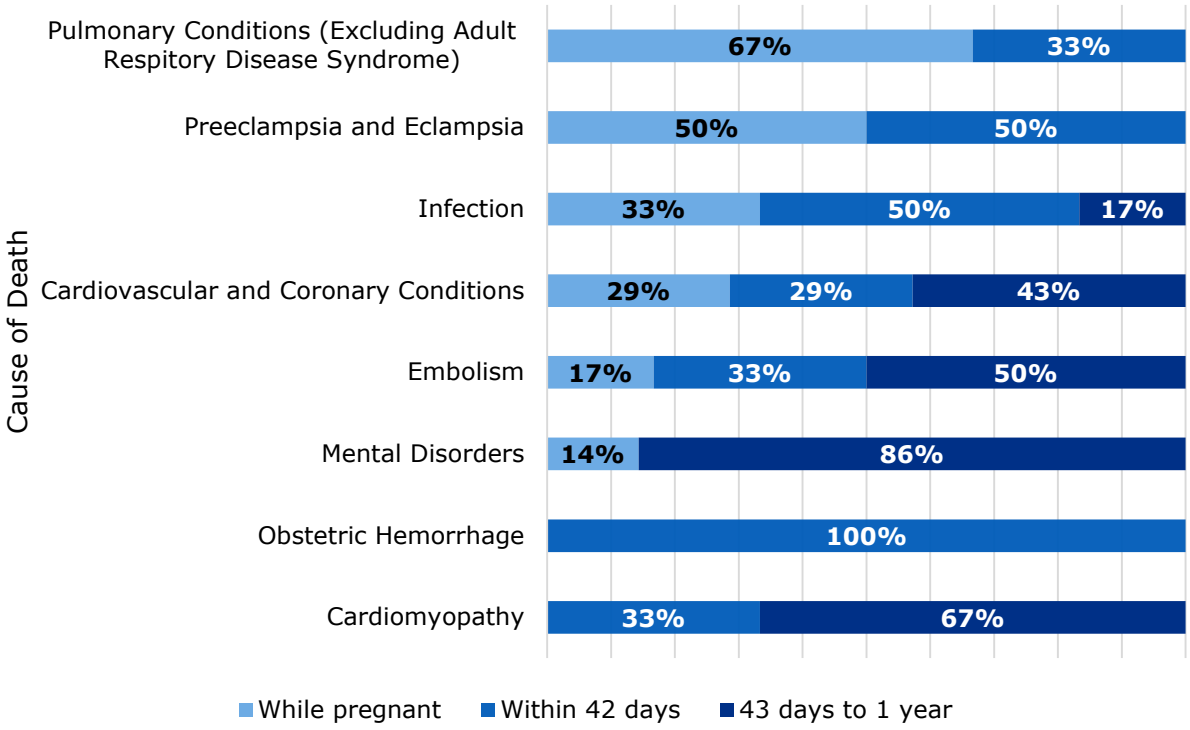


PREPARED BY: Healthy Texas Mothers and Babies Branch, Maternal & Child Health Unit, Division for Community Health Improvement, the Department of State Health Services (DSHS).

DATA SOURCE: 2013 Death Files, DSHS

NOTES: Amniotic fluid embolism is not included in the embolism grouping due to differences in etiology and opportunities for prevention. Mental disorders include deaths to suicide, overdose, poisoning, and unintentional injuries determined by the MMMRC to be related to a mental disorder.

Chart F-2: Top Underlying Causes of Reviewed Pregnancy-Related Deaths by Timing of Death in Relation to Pregnancy, Texas 2013 (N=44 of 54 Reviewed Pregnancy-Related Deaths)

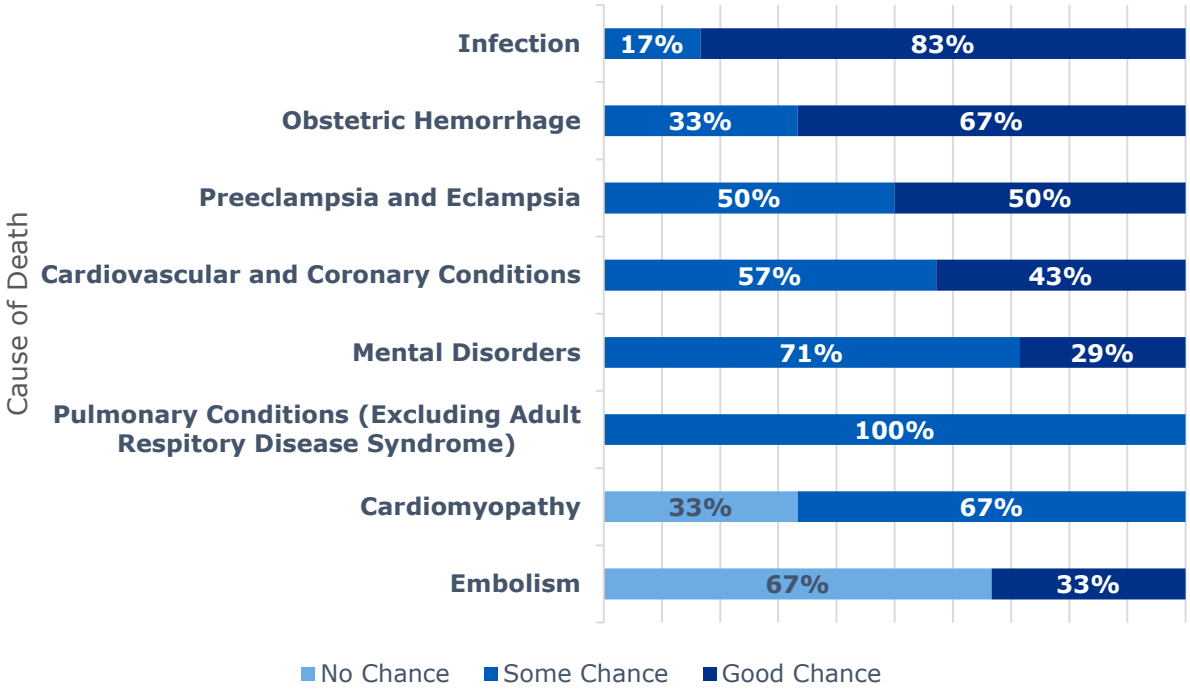


PREPARED BY: Healthy Texas Mothers and Babies Branch, Maternal & Child Health Unit, Division for Community Health Improvement, the Department of State Health Services (DSHS).

DATA SOURCE: 2013 Death Files, DSHS

NOTES: Amniotic fluid embolism is not included in the embolism grouping due to differences in etiology and opportunities for prevention.

Chart F-3: Degree of Preventability for Top Underlying Causes of Reviewed Pregnancy-Related Deaths by Rating of Chance to Alter Outcome, Texas, 2013 (N=44 of 54 Reviewed Pregnancy-Related Deaths)



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

DATA SOURCE: 2013 Death Files, DSHS

NOTES: Amniotic fluid embolism is not included in the embolism grouping due to differences in etiology and opportunities for prevention.

Table F-1: Top Contributing Factors to Pregnancy-Related Deaths Identified by the Texas Maternal Mortality and Morbidity Review Committee by Factor Domain, 2013

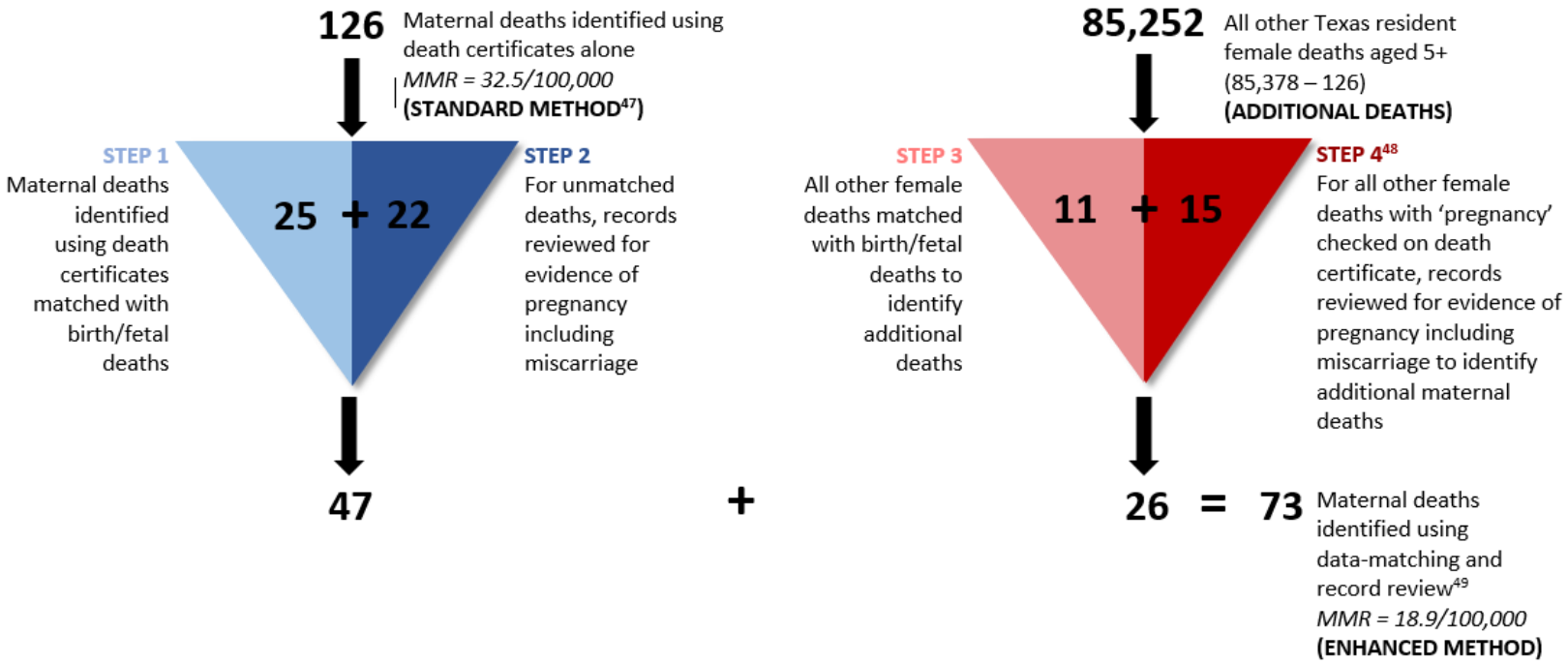
Contributing Factor Domain Total Contributing Factors, n= 367	Most Common Contributing Factors	% of Total Contributing Factors in each Contributing Factor Domain
Patient/Family (n=125)	Chronic Disease	18% (n=23)
	Knowledge- Lack of knowledge regarding importance of event or of treatment or follow up	12% (n=16)
	Delay or failure to seek care	10% (n=13)
	Lack of access/financial resources	9% (n=12)
	Adherence to medical recommendations	9% (n=12)
Provider (n=87)	Clinical Skill/Quality of Care (Provider Perspective)	25% (n=22)
	Delay- Provider was delayed in referring for care, treatment, or follow up care/action	13% (n=11)
	Lack of continuity of care/care Coordination	14% (12)
	Knowledge- Provider did not receive adequate education or lacked knowledge or understanding regarding the significance of a health event or lacked understanding about need for treatment/ follow up after evaluation for a health event	14% (n=12)
	Failure to screen/inadequate assessment of risk	13% (n=11)
Facility (n=63)	Lack of Continuity of Care (Facility Perspective Delay	17% (n=11)
	Clinical Skill/ Quality of Care (Facility Perspective)	14% (n=9)
	Delay	13% (n=8)
	Lack of Standardized Policies and Procedures	11% (n=7)
	Lack of knowledge regarding the importance of the event or of treatment or follow-up	10% (n=6)

Contributing Factor Domain Total Contributing Factors, n= 367	Most Common Contributing Factors	% of Total Contributing Factors in each Contributing Factor Domain
Systems of Care (n=65)	Poor communication/ lack of case coordination or management/ lack of continuity of care (System Perspective)	25% (n=16)
	Clinical skill/quality of care	11% (n=7)
	Lack of access/financial resources	9% (n=6)
	Lack of Referral or Consultation	9% (n=6)
Community (n=27)	Lack of knowledge regarding importance of event or of treatment or follow up	30% (n=8)
	Inadequate community outreach/resources	11% (n=3)
	Lack of access/financial resources- system issues	11% (n=3)
	Chronic Disease	7% (n=2)
	Violence and Intimate Partner Violence	7% (n=2)
	Environmental Factors (Air Quality)	7% (n=2)
	Referral (community perspective)	7% (n=2)

A list of contributing factors and their descriptions can be found on the Maternal Mortality Review Information Application's Maternal Mortality Review Committee Decisions Form.

Appendix G. Enhanced Maternal Mortality Ratios, 2013-2015

Figure G-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, 2013[46,47,48,49]



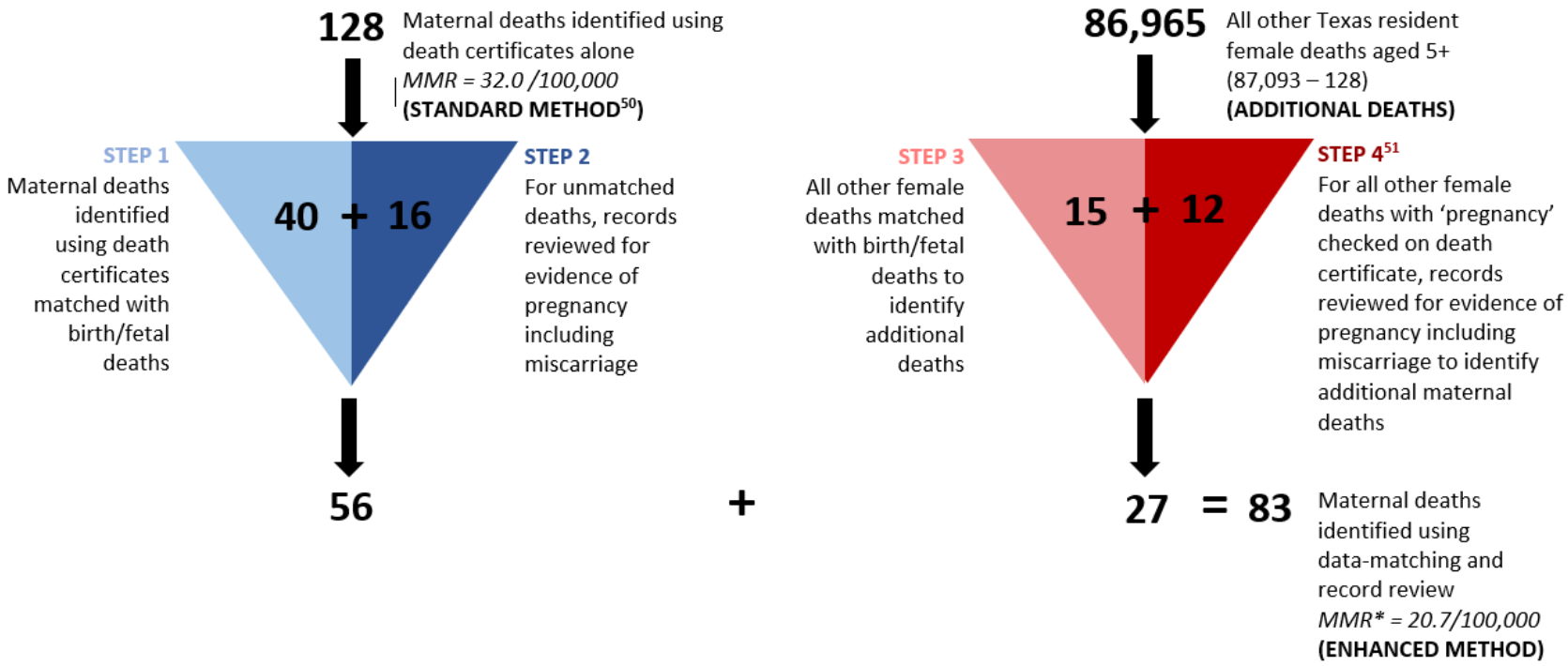
[46]These numbers are from probabilistic linkage

[47]The Standard Method uses 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". There is 1 "Undetermined" cases (unable to determine if pregnancy associated even after record review).

[48]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."

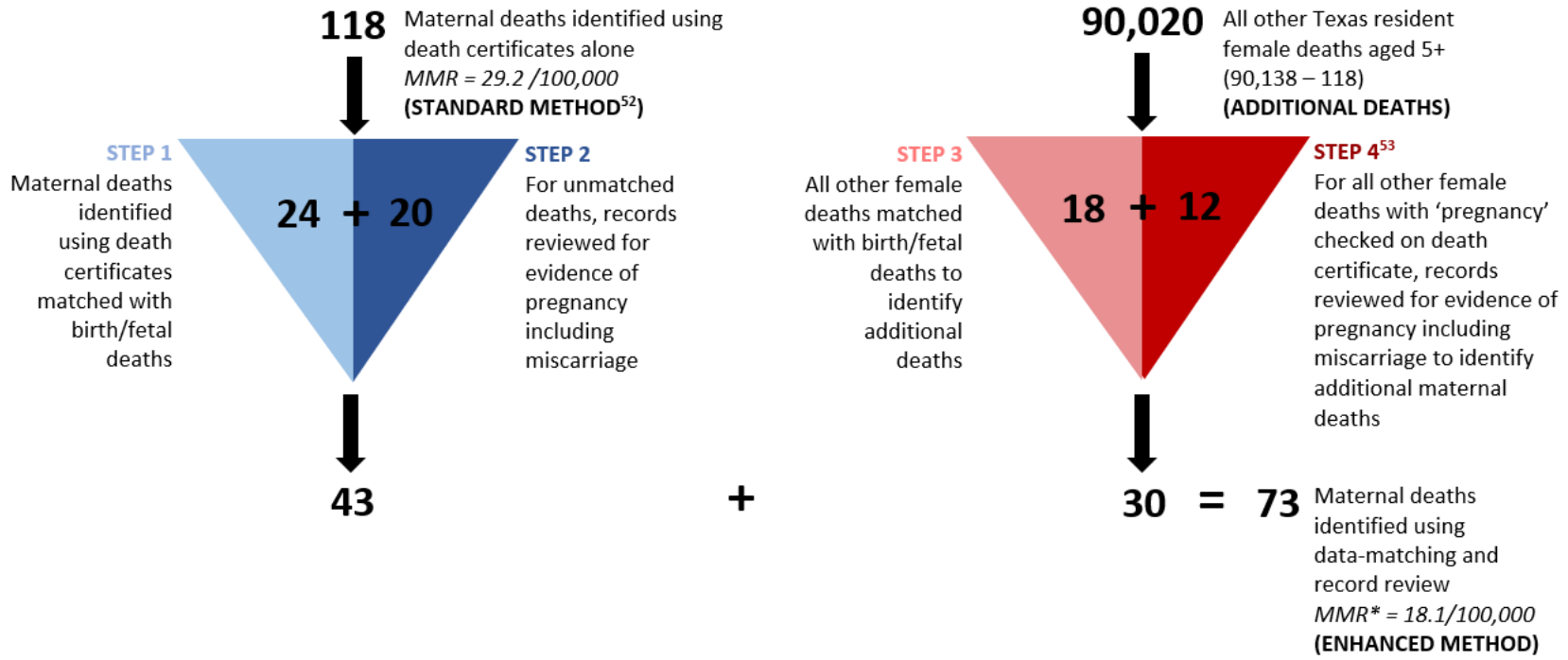
[49]Two vehicular homicides were removed.

Figure G-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, 2014[48,50,51]



[50]The Standard Method uses 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".
* There are 7 "Undetermined" cases (unable to determine if pregnancy associated even after record review).
*Cases not confirmed through linkage are still undergoing review and therefore numbers and MMR will not be reported until review is complete.
[51]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."

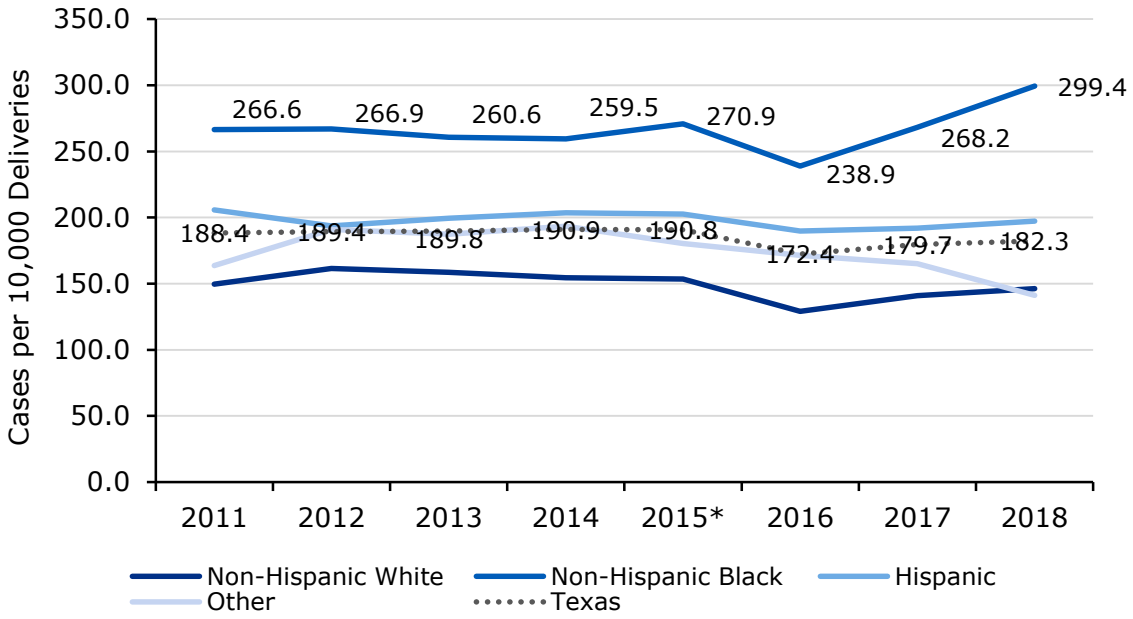
Figure G-3: Four-Step Enhanced Method — Number of Maternal Deaths within 42 Days Following End of Pregnancy and Enhanced Maternal Mortality Ratio (MMR) per 100,000 live births, Texas, 2015[48,52,53]



[52]The Standard Method uses 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".
*There are 7 "Undetermined" cases (unable to determine if pregnancy related even after record review).
*Cases not confirmed through linkage are still undergoing review and therefore numbers and MMR will not be reported until review is complete.
[53]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."

Appendix H. Severe Maternal Morbidity and Statewide Trends for the Most At-Risk Populations

Figure H-1: Rate of Delivery Hospitalizations Involving Any Severe Maternal Morbidity in Texas per 10,000 Delivery Hospitalizations by Race and Ethnicity, 2011-2018

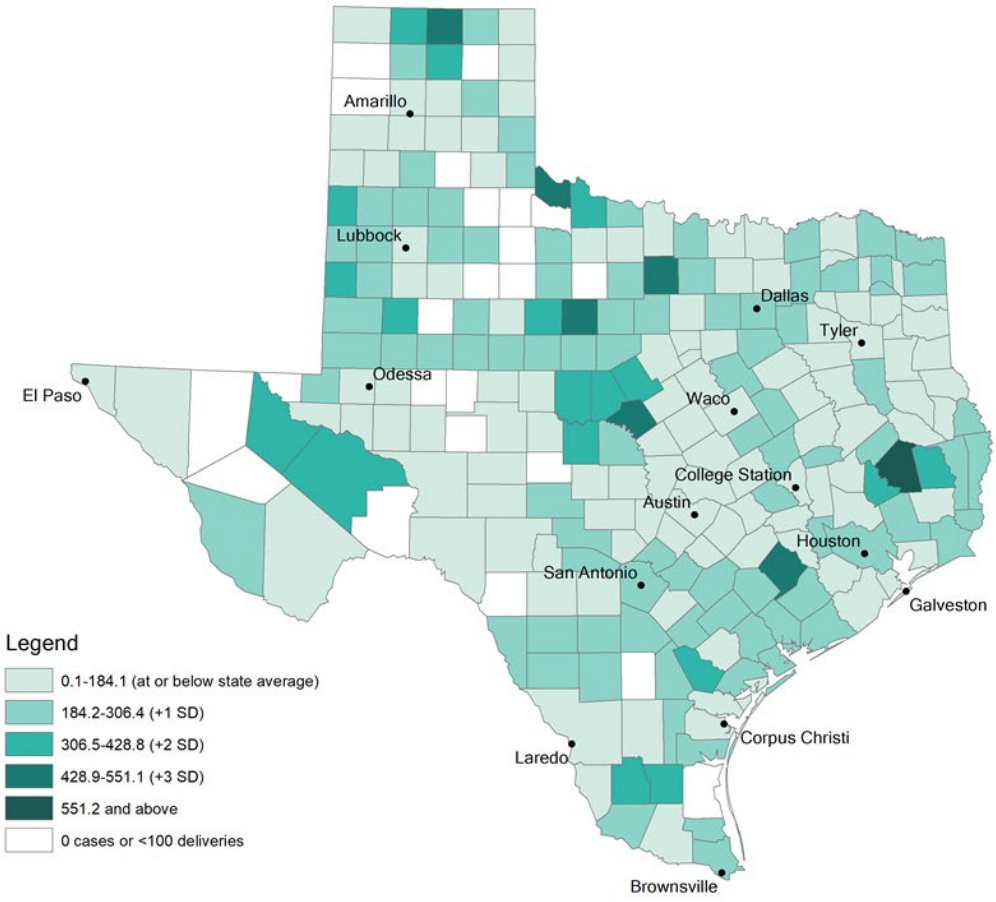


PREPARED BY: Maternal & Child Health Epidemiology, Division for Community Health Improvement, the Department of State Health Services (DSHS).

DATA SOURCE: Hospital Inpatient Discharge Public Use Data File (PUDF), 2011-2018. Center for Health Statistics, DSHS.

NOTES: Hospital discharge data transitioned from ICD-9 to ICD-10 codes in the last quarter of 2015. Based on CDC guidance, delivery hospitalizations with the 21 indicators of severe maternal morbidity (SMM), including blood transfusion, are identified by the corresponding ICD-9, ICD-10 codes and procedure codes. In 2019, DSHS enhanced analysis for SMM by utilizing methods identified by CDC and New York City Department of Health and adapted for Texas.

Figure H-2: Rates of Delivery Hospitalizations Involving Any Severe Maternal Morbidity per 10,000 Delivery Hospitalizations by County, 2013-2018

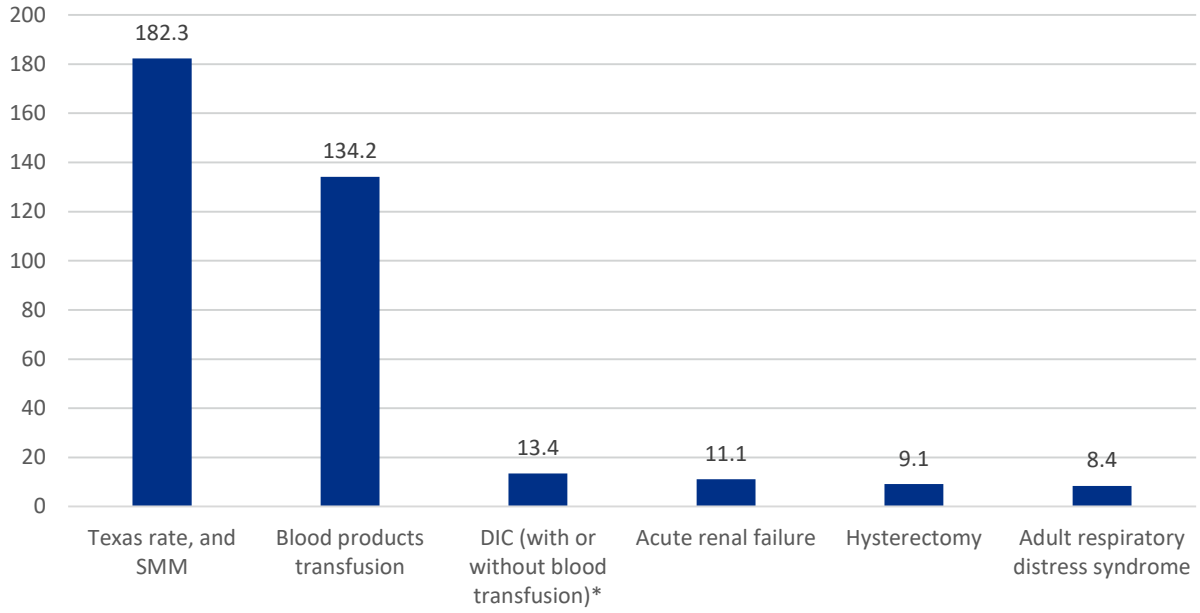


PREPARED BY: Maternal & Child Health Epidemiology, Division for Community Health Improvement, the Department of State Health Services (DSHS).

DATA SOURCE: Hospital Inpatient Discharge Public Use Data File (PUDF), 2013-2018. Center for Health Statistics, DSHS.

NOTES: Hospital discharge data transitioned from ICD-9 to ICD-10 codes in the last quarter of 2015. Based on CDC guidance, delivery hospitalizations with the 21 indicators of severe maternal morbidity (SMM), including blood transfusion, are identified by the corresponding ICD-9, ICD-10 codes and procedure codes. In 2019, DSHS enhanced analysis for SMM by utilizing methods identified by CDC and New York City Department of Health and adapted for Texas.

Figure H-3: Rates in Severe Maternal Morbidity Indicators per 10,000 Delivery Hospitalizations, Texas, Any Severe Maternal Morbidity Rate and Leading Indicators, 2018



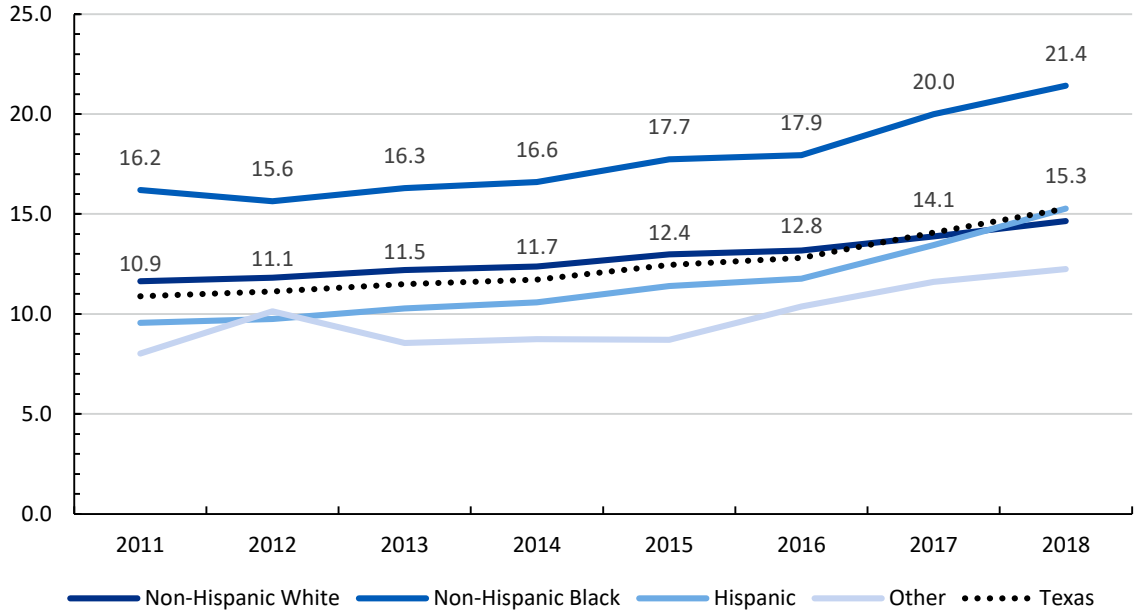
PREPARED BY: Maternal & Child Health Epidemiology, Division for Community Health Improvement, the Department of State Health Services (DSHS).

DATA SOURCE: Hospital Inpatient Discharge Public Use Data File (PUDF), 2018. Center for Health Statistics, DSHS.

NOTES: Hospital discharge data transitioned from ICD-9 to ICD-10 codes in the last quarter of 2015. Based on CDC guidance, delivery hospitalizations with the 21 indicators of severe maternal morbidity (SMM), including blood transfusion, are identified by the corresponding ICD-9, ICD-10 codes and procedure codes. In 2019, DSHS enhanced analysis for SMM by utilizing methods identified by CDC and New York City Department of Health and adapted for Texas.

* DIC is Disseminated Intravascular Coagulation.

Figure H-4: Delivery Hospitalization Involving Hypertensive Disorder Rates by Race/Ethnicity, Texas, 2011-2018

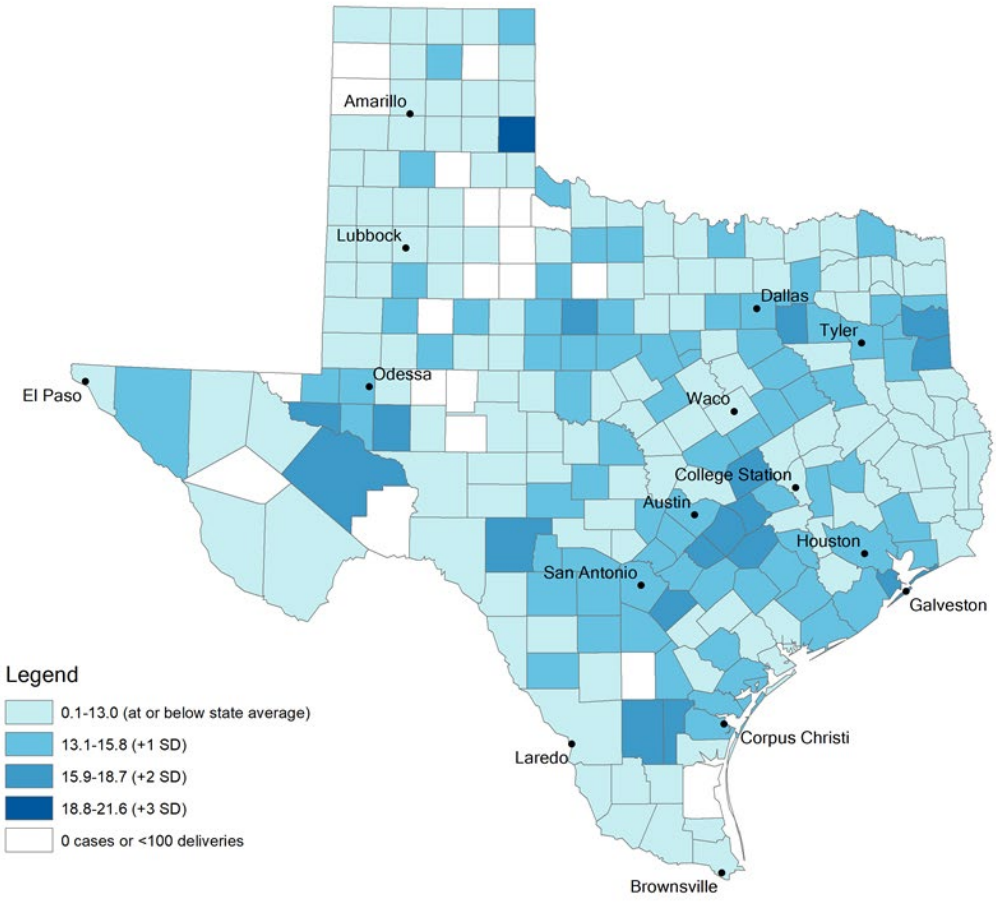


PREPARED BY: Maternal & Child Health Epidemiology, Division for Community Health Improvement, the Department of State Health Services (DSHS).

DATA SOURCE: Hospital Inpatient Discharge Public Use Data File (PUDF), 2011-2018. Center for Health Statistics, DSHS.

NOTES: Hospital discharge data transitioned from ICD-9 to ICD-10 in the last quarter of 2015. ICD-9 diagnosis code 642.xx (Hypertension Complicating Pregnancy, Childbirth, and the Puerperium) and ICD-10 diagnosis codes O10-O16 (Edema, proteinuria and hypertensive disorders in pregnancy, childbirth, and the puerperium) were used to calculate proportions of delivery hospitalizations involving hypertensive disorder. In 2019, DSHS enhanced analysis for SMM by utilizing methods identified by New York City Department of Health and adapted for Texas.

Figure H-5: Rate of Delivery Hospitalization Involving Hypertensive Disorder per 10,000 Delivery Hospitalizations by County of Residence, Texas, 2013-2018



PREPARED BY: Maternal & Child Health Epidemiology, Division for Community Health Improvement, the Department of State Health Services (DSHS).

DATA SOURCE: Hospital Inpatient Discharge Public Use Data File (PUDF), 2013-2018. Center for Health Statistics, DSHS.

NOTES: Hospital discharge data transitioned from ICD-9 to ICD-10 in the last quarter of 2015. ICD-9 diagnosis code 642.xx (Hypertension Complicating Pregnancy, Childbirth, and the Puerperium) and ICD-10 diagnosis codes O10-O16 (Edema, proteinuria and hypertensive disorders in pregnancy, childbirth, and the puerperium) were used to calculate proportions of delivery hospitalizations involving hypertensive disorder. In 2019, DSHS enhanced analysis for SMM by utilizing methods identified by CDC and New York City Department of Health and adapted for Texas.

Appendix I. Potential Stakeholder Organizations

The Maternal Mortality and Morbidity Review Committee (MMMRC) builds an understanding on the causes and contributors to pregnancy-related death and identifies and recommends prevention and quality improvement opportunities. The collective and coordinated efforts of diverse groups of stakeholders with a shared interest in improving population health for women of reproductive age and maternal health and safety is essential to drive effective implementation, adoption, and diffusion of MMMRC recommendations.

Figure I-1: Examples of Maternal/Perinatal Quality Improvement Stakeholders
(See List of Acronyms)

Appendix J. Texas MMMRC Health Equity Lens Recommendations

To apply a health equity lens and foster patient-centered and culturally competent and humble care, the MMMRC recommends the following.[54,55]

- Stakeholder organizations to fully engage members of the populations most impacted by maternal mortality and morbidity—specifically, Non-Hispanic Black mothers and their support networks—in planning, development, and evaluation of programs and services related to protection, promotion, or support of maternal health and safety.
- Graduate Medical Education (GME) curricula to integrate and promote Unintended (Implicit) Bias training.
- The state's perinatal quality collaborative - Texas Collaborative for Healthy Mothers and Babies (TCHMB) - to increase relationships with established organizations that represent Non-Hispanic Black communities.
- Health care institutions and professionals to follow the National Standards for Culturally and Linguistically Appropriate Services in Health and Health Care.
- Programs to assess health and psychosocial risks and determinants, provide coordinated care, and direct populations to relevant community resources.
- Professional and stakeholder organizations to promote and disseminate models of patient-centered care and shared decision making (SDM).[56] This involves recognizing women as experts in their values and preferences and supporting an informed, collaborative approach for making health care decisions.
- Professional organizations to develop and promote multimedia SDM educational materials for maternity service providers.
- Providers to use SDM for induced and cesarean deliveries.
- Community advocates and birth support workers to promote and use the Council on Patient Safety in Women's Health Care's (CPSWHC) Urgent

[54] Douglas MD, Josiah Willock R, Respress E, et al. Applying a Health Equity Lens to Evaluate and Inform Policy. *Ethn Dis*. 2019;29(Suppl 2):329-342. Published 2019 Jun 13.
[55] Becoming a culturally competent health care organization. Chicago, IL: Illinois. Health Research & Educational Trust. Available: https://www.aha.org/ahahret-guides/2013-06-18-becoming-culturally-competent-health-care-organization.
[56] The SHARE Approach. Agency for Healthcare Research and Quality, Rockville, MD. Available: https://www.ahrq.gov/health-literacy/curriculum-tools/shareddecisionmaking/index.html.

Maternal Warning Signs (UMWS) and providers and facilities work across service lines to develop systems to standardize escalation of concerns.

- Professional and stakeholder organizations to promote awareness on the prevalence and impact of cumulative trauma across the life course and provide education on trauma-informed care for maternal populations.
- Relevant professional and stakeholder organizations to support policies to increase diversity in the women's health workforce.
- Hospitals, birthing centers, and clinics to develop policies that reflect respectful maternity care and a human-rights based approach to improving quality of care and reducing maternal mortality and morbidity.[57]

[57] WHO Reproductive Health Library. WHO recommendation on respectful maternity care. (2018). The WHO Reproductive Health Library; Geneva: World Health Organization.

Appendix K. Texas MMMRC Integrated Behavioral Health Recommendations

To support integrated behavioral health care, the Maternal Mortality and Morbidity Review Committee (MMMRC) recommends that providers and relevant stakeholder organizations take the following actions.

- Use validated screening tools to screen all pregnant and postpartum women for perinatal mood and anxiety disorders and for substance use disorder (SUD).
- Partner with the American Psychiatric Association to develop perinatal mental health care guidelines.
- Incorporate basic psychiatry and behavioral health training into medical providers' education to improve opportunities for intervention and treatment management.
- Promote use of validated postpartum depression screening tools such as in the Texas Health and Human Services Commission's (HHSC) Texas Clinician's Postpartum Depression Toolkit.
- Assess and implement perinatal mental health services models in clinics.
- Implement TexasAIM programs to support uptake of the CPSWHC's Alliance for Innovation on Maternal Health's (AIM) Obstetric Care for Women with Opioid Use Disorder (OB-OUD) bundle.
- Increase provider education and technical assistance in national standards and best practices for care of women with SUD, including for
  - Screening, risk assessment, brief intervention, and referral;
  - Pain management and guidelines for prescribing opioids;
  - Medication-Assisted Treatment (MAT); and
  - Prevention of bias, stigma and discrimination.
- Promote awareness that SUDs are treatable chronic medical conditions.
- Promote and use dyadic-centered treatment and recovery services where maternal and infant care is considered interdependently.
- Increase availability and access to MAT and other supportive services.
- Explore strategies to increase access to behavioral health care in critical shortage areas, including telehealth services.
- Support implementation of the Statewide Behavioral Health Coordinating Council's strategic plan.