MATERNAL AND CHILD HEALTH EPIDEMIOLOGY

2022/2023 HEALTHY TEXAS MOTHERS AND BABIES DATA BOOK

TEXAS Health and Human Services

Texas Department of State Health Services

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Executive Summary

Texas Health and Safety Code, Section 161.0211, authorizes the Department of State Health Services (DSHS) to conduct surveillance and investigate factors that increase risk for negative birth outcomes. Each year, DSHS summarizes this research in the Healthy Texas Mothers and Babies Data Book (Data Book) to give an overview of Texas infant and maternal health. The Data Book highlights trends and disparities in infant and maternal health outcomes to help Texas programs and policymakers make data-driven decisions on how to improve statewide outcomes.

Key 2022/2023 Data Book findings include:

- The birth rate in Texas increased slightly from 2020 to 2021 which is the first increase in seven years. While the teen birth rate in Texas is declining, it remains higher than the national teen birth rate.
- Since 2012, the Texas preterm birth rate remains higher than the national preterm birth rate. In 2021, the percent of preterm births in Texas increased to the highest rate in over ten years.
- In 2021, the percentage of babies born with a low birth weight (LBW) in Texas increased.
- The Texas infant mortality rate declined over the past decade reaching an all-time low in 2021.
- The percentage of Texas women who smoke during pregnancy declined. In 2021, all racial and ethnic groups exceeded Healthy People 2030 (HP 2030) goals for smoking during pregnancy. Texas has one of the lowest rates of maternal smoking during pregnancy compared to other states.
- Over the past decade, pre-pregnancy obesity, maternal diabetes, and maternal hypertension increased in Texas.
- The Texas neonatal abstinence syndrome rate remained stable.
- Geographic and regional differences were observed throughout Texas, especially for teen birth rates, infant mortality rates, the prevalence of smoking during pregnancy, and neonatal abstinence syndrome rates.
- Substantial disparities exist for Texas infant and maternal health indicators. For example, non-Hispanic Black mothers and infants have significantly higher rates of infant mortality, preterm birth, LBW, maternal mortality, and severe maternal morbidity than other racial or ethnic groups. These populations are also less likely to receive first trimester prenatal care, use safe sleep practices, and experience recommended infant feeding practices.

Purpose

The 2022/2023 Data Book provides an overview of Texas infant and maternal health. Texas trends and disparities in infant and maternal health outcomes highlighted in this report help programs and policymakers make data-driven decisions on how to improve these outcomes. The Data Book brings different data sources together for analysis and reporting to create a cohesive view of the status of both Texas infant and maternal health.

The U.S. Department of Health and Human Services (HHS), Health Resources and Services Administration (HRSA) funds this Data Book under Grant Number B04MC45246, Maternal and Child Health (MCH) Services. The information or content and conclusions in this report are those of the author and should not be construed as the official position or policy of, nor should any endorsements be inferred by HRSA, HHS, or the U.S. Government.

Texas Pregnancy Risk Assessment Monitoring System (PRAMS) is supported, in part, through funding from the Centers for Disease Control and Prevention (CDC) (Grant Number U01DP006595), the State Systems Development Initiative Grant Program (Grant Number H18MC00048), and the Texas MCH Title V Block Grant Program.

Data Sources and Terms

Data Sources

DSHS compiled and analyzed the following 2022/2023 Data Book data sources:

- Vital records data (information from Texas birth, death, fetal death, and linked birth-death files);
- Texas Health Care Information Collection (THCIC) inpatient data;
- Texas PRAMS survey;
- DSHS/Texas Health and Human Services Commission Texas Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) Infant Feeding Practices Survey (IFPS); and
- National Immunization Survey (NIS).

DSHS collects demographic data on all Texas births and deaths and information on fetal deaths weighing 350 grams or more or (if weight is unknown) occurring at 20 weeks of gestation or more. Vital records files are a comprehensive source of data; however, birth certificate data quality depends on how accurately hospital staff or providers complete birth records. The birth file likely underreports the prevalence of several maternal health indicators such as diabetes and preeclampsia.[1,2] In addition, the 2021 Texas birth file data, the 2021 death file data, and the 2020 Texas linked birth-death data are provisional data, meaning these datasets have not been thoroughly 'cleaned' and finalized.

Outcomes and maps are presented using provisional 2021 data since final 2021 data were not available for this report. Data between one and four cases in the numerator were suppressed in maps to prevent identification of affected individuals, which could be possible with small numbers. Data suppression protects the confidentiality and privacy of individuals and their families.

THCIC inpatient data files contain data on Texas hospital discharges. Inpatient data are available by quarter beginning with data for 1999 through the fourth quarter of 2021.[3] The Data Book uses International Classification of Diseases, tenth revision (ICD-10) diagnosis and procedure codes in the inpatient data files to identify indicators for neonatal abstinence syndrome (NAS).

The Texas PRAMS survey provides the most comprehensive population-based data on maternal health before, during and after pregnancy. Starting in 2002, DSHS in partnership with the CDC implemented the PRAMS annual survey. The PRAMS survey asks

[1] Haghighat, N., Hu, M., Laurent, O., Chung, J., Nguyen, P., & Wu, J. (2016). Comparison of birth certificates and hospital-based birth data on pregnancy complications in Los Angeles and Orange County, California. BMC pregnancy and childbirth, 16(1), 93.

[2] Vinikoor, L. C., Messer, L. C., Laraia, B. A., & Kaufman, J. S. (2010). Reliability of variables on the North Carolina birth certificate: a comparison with directly queried values from a cohort study. Pediatric and perinatal epidemiology, 24(1), 102-112.

[3] Texas Inpatient Public Use Data File (PUDF) (released October 20, 2021). Retrieved from **dshs.texas.gov/thcic/hospitals/Inpatientpudf.shtm** [Accessed March 28, 2022].

questions (via mail or telephone) of mothers who have recently given birth on topics such as prenatal care, pregnancy intention, alcohol use, smoking, intimate partner violence, postpartum depression, breastfeeding, infant sleep position, and infant secondhand smoke exposure. PRAMS data is obtained from a sample of Texas women residents who gave birth to a live infant. The CDC provides Texas with a PRAMS survey data file with survey weights allowing representative analyses of Texas women who gave birth to a live infant. In this book, the most recent PRAMS data year is 2020. Note the overall 2020 Texas state response rate was less than the CDC threshold. Therefore, Texas PRAMS 2020 data should be interpreted with caution, and when possible, should be considered alongside previous Texas year data trends.

For the above reasons, along with potential sampling and reporting differences, PRAMS findings may differ from results obtained from vital statistics data. PRAMS results are reported along with confidence intervals (CIs). The width of the CI – the distance between its upper and lower limits – is an indicator of the variability, or the reliability, of the results. The larger the CI the more variability in the estimate. Texas PRAMS data are presented as estimated percentages or prevalence estimates to account for complex sampling and weighting. As with any self-reported survey, the possibility of recall bias exists. Women may not answer the question correctly or leave it blank because they may not remember the event. However, to minimize recall bias, the PRAMS survey is mailed to potential respondents approximately 60 to 180 days after the birth of the infant.

To promote breastfeeding, DSHS MCH and Texas WIC programs regularly collaborate to conduct the Texas WIC IFPS survey of breastfeeding beliefs, attitudes, and practices among Texas women receiving WIC services. The most recent IFPS survey occurred in 2018. The bilingual survey questionnaire allowed multiple choice (close-ended) responses. Each clinic who served eight or more infants from May through July 2017 was assigned a specified number of surveys proportionate to the number of clinic participants served. The eligible women population were biological mothers 18 years of age or older who had a baby aged one month through 30 months at the time of the survey. Eligible participants who agreed to participate during the survey period (October 15 through December 21, 2018) completed the survey booklet. Completed IFPS surveys were returned by all 65 local WIC agencies operating during the survey period. The final sample included 10,076 completed surveys after excluding ineligible survey respondents. Sampling methods did not include random sampling and survey responses were not weighted or adjusted. Therefore, IFPS survey findings may not be generalizable to the broader population of women participating in Texas WIC services. A geographic one-stage cluster probability sampling design was used to increase the chance that the respondent sample was representative of the eligible study population. The age of respondents' children ranged wasn't even distributed. For this reason, breastfeeding duration and exclusivity rates for children ages six months and older should be interpreted with caution.

Despite the few limitations described above, these data sources combine to provide invaluable information on the status of Texas infant and maternal health. Texas vital records are the most comprehensive available resource. PRAMS data provide much-needed information about Texas maternal risk and health pre-pregnancy, during

pregnancy, and post-pregnancy that is not available elsewhere. The Texas WIC IFPS provides essential data about infant feeding for the population that accesses Texas WIC services. DSHS, other state agencies, and stakeholders use these data sources to inform, develop, and drive policies and programs to improve the health of Texas mothers and babies and understand their emerging health needs. These sources provide an understanding of both Texas infant and maternal health and serve as an important resource for risk factor analysis and for identification of possible avenues for prevention.

The NIS, conducted by the CDC, collects nationwide data related to vaccination coverage among children and teens across the country. This survey also includes breastfeeding practices data with current state and national data available through 2019.

Some values in figures, graphs, or written results may not sum to the total amount due to rounding or other estimates. Data and results are based on the most recent data available.

Data Terms

Baby-Friendly Hospital: Birthing facilities that meet internationally recognized maternal and infant feeding care best practice standards for designation as Baby-Friendly Hospitals. To achieve designation as a Baby-Friendly Hospital, which is accredited nationally through the organization Baby-Friendly USA, a facility must:

- Demonstrate that at least 80 percent of mothers are exclusively breastfeeding at the time of discharge or that there was a medical indication or parental request for formula;
- Adhere to the International Code of Marketing Breastmilk Substitutes; and
- Successfully implement the Ten Steps to Successful Breastfeeding, jointly developed by the World Health Organization (WHO) and United Nations International Children's Emergency Fund.[4,5]

Body Mass Index (BMI): A measure of weight-for-height that is often used to classify adults as being underweight, of normal weight, overweight, or obese.[6] In this report, maternal BMI is calculated using the mother's pre-pregnancy weight and height. Consistent with National Center for Health Statistics (NCHS) standards, BMI categories are defined using the standard cutoffs for adults, even if the mother is younger than 22 years of age.[7]

Causes of Infant Death: NCHS Instruction Manual causes of infant death categories used to calculate information regarding the leading causes of Texas infant death in the Data Book.[8] Not all infant deaths in Texas are due to the leading causes shown in the report. Causes of infant death are reported as the number of deaths per 10,000 live births.

Gestational Age: A calculation to determine a preterm birth and when in pregnancy the mother first received prenatal care. However, exact gestational age is often unknown and must be estimated. Beginning with final 2014 data, NCHS changed the variable used to

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[4] Baby-Friendly USA, Inc. (2020). Baby-Friendly Hospital Initiative: Guidelines and Evaluation Criteria for Facilities Seeking and Sustaining Baby-Friendly Designation. Retrieved from **babyfriendlyusa.org/wp-content/uploads/2019/12/US-Interim-GEC_191107_CLEAN.pdf** [Accessed March 28, 2022].

[5] Baby-Friendly USA, Inc (2012). Baby-Friendly Hospital Initiative. Retrieved from **babyfriendlyusa.org** [Accessed March 28, 2022].

[6] World Health Organization (2017, August 29). About Adult BMI. Retrieved from **cdc.gov/healthyweight/assessing/bmi/adult_bmi/index.html** [Accessed March 28, 2022].

[7] Branum, A. M., Kirmeyer, S. E., & Gregory, E. C. (2016). Prepregnancy body mass index by maternal characteristics and state: data from the birth certificate, 2014. *National vital statistics reports: from the Centers for Disease Control and Prevention, National Center for Health Statistics, National Vital Statistics System*, *65*(6), 1-11. Retrieved from **cdc.gov/nchs/data/nvsr/nvsr65/nvsr65_06.pdf** [Accessed March 28, 2022].

[8] National Center for Health Statistics (2011). ICD–10 cause-of-death lists for tabulating mortality statistics (updated March 2011 to include WHO updates to ICD–10 for data year 2011). Retrieved from **cdc.gov/nchs/data/dvs/Part9InstructionManual2011.pdf** [Accessed March 28, 2022].

estimate gestation.[9] The current standard from 2014 uses the obstetric estimate of gestation on the birth certificate and not a combination of last menstrual period and the obstetric estimate. This current standard for calculating gestational age is used throughout the Data Book.

Healthy People 2030 Target (HP 2030): A 10-year target released by HHS designed to guide national health promotion and disease prevention efforts to improve nationwide health. Targets are released each decade and undergo a midcourse review where targets may be adjusted due to new data.[10,11,12]

Infant Mortality Rate (IMR): The number of infants who died in a given year divided by the number of live births in that same year, multiplied by 1,000. The births that comprise this rate are restricted to those women with Texas listed as their state of residence.

Perinatal Periods of Risk (PPOR): A comprehensive approach to help communities use data to improve infant and maternal health outcomes. In addition to infant deaths, fetal deaths are also included in the PPOR analysis. The PPOR analysis divides fetal and infant deaths into four Risk Periods (maternal health/prematurity, maternal care, newborn care, and infant health) based on birth weight and age of death. An excess feto-infant mortality rate (F-IMR) is then calculated for each of these four periods (both statewide and for specific demographic study populations). The reference group for each of these calculations is a state-level population of mothers with near-optimal birth outcomes.[13] Due to the complexity of this analysis and estimate rounding, values in figures and graphs may not sum to the true amount described in the written analysis.

Race and Ethnicity: For information obtained from birth records, fetal death records, or PRAMS, race or ethnicity information shown throughout the Data Book refer to the mother, not the infant. However, infant death data were classified according to infant's race or ethnicity. Women who identified themselves as Hispanic were classified as Hispanic regardless of their race designation. Women who identified themselves as only White or only Black and who did not indicate that they were Hispanic were classified as non-Hispanic White or non-Hispanic Black, respectively. Women of all other races,

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[9] Martin, J. A., Osterman, M. J., Kirmeyer, S. E., & Gregory, E. C. (2015). Measuring gestational age in vital statistics data: transitioning to the obstetric estimate. National Vital Statistics Reports: From the Centers for Disease Control and Prevention, National Center for Health Statistics, National Vital Statistics System, 64(5), 1-20.

[10] United States Department of Health and Human Services, Office of Disease Prevention and Health Promotion (2010, November). Healthy People 2030 Framework. Retrieved from **health.gov/healthypeople/about/healthy-people-2030-framework** [Accessed March 28, 2022].

[11] Centers for Disease Control and Prevention, National Center for Health Statistics (2018, June). Healthy People 2020 Midcourse Review. Retrieved from **cdc.gov/nchs/healthy_people/hp2020/hp2020_midcourse_review.htm** [Accessed March 28, 2022].

[12] Centers for Disease Control and Prevention, National Center for Health Statistics (2020, August). Healthy People 2030: NCSH Fact Sheet, August 2020. Retrieved from **cdc.gov/nchs/about/factsheets/factsheet-hp2030.htm#:~:text=HP2030%20is%20the%20fifth%20iteration,and%20research%20and%20developmental%20objectives** [Accessed March 28, 2022].

[13] Peck, M. G., Sappenfield, W. M., & Skala, J. (2010). Perinatal periods of risk: A community approach for using data to improve women and infants' health. *Maternal and Child Health Journal*, *14*(6), 864-874.

including multiracial women, were classified as Other if the woman did not self-identify as Hispanic. The Other category encompasses a variety of racial and ethnic groups, including Native American, Asian, and multiracial. There have been shifts in the demographics of women within the other category. For example, since 2004, there has been an increase in the number of women identifying themselves as multiracial. While this allows for a large enough group for analysis, it limits data interpretability. Starting in 2016, due to the nationwide implementation of the 2003 revision of the U.S. Standard Certificate of Live Birth, national vital statistics data can also be classified using the above race or ethnicity group definitions.

Maternal Mortality: The Data Book presents findings on maternal mortality from DSHS analyses of statewide trends, rates, and disparities. In calculating the maternal mortality ratio, DSHS used an enhanced four step approach and identified maternal deaths that occur during pregnancy or within 42 days postpartum.[14] Terminology used in this Data Book related to maternal mortality includes:

> *Pregnancy-Associated Death*: The death of a woman while pregnant or within one year of the end of pregnancy regardless of the cause. Pregnancy-associated deaths include maternal mortality cases that are pregnancy-related, not pregnancy-related, and when pregnancy-relatedness is undetermined.
>
> *Pregnancy-Related Death*: The death of a woman during pregnancy or within one year of the end of pregnancy from a pregnancy complication, a chain of events initiated by pregnancy, or the aggravation of an unrelated condition by the physiologic effects of pregnancy.
>
> *Pregnancy-Associated, but Not Related Death*: The death of a woman during pregnancy or within one year of the end of pregnancy from a cause that was not related to the pregnancy.
>
> *Pregnancy-Associated, but Unable to Determine Pregnancy-Relatedness Death*: 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.
>
> *Maternal Death*: A vital registration term used for the death of a woman while pregnant or within 42 days after 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-10 coding.[15]

[14] Texas Department of State Health Services (2020). Texas Maternal Mortality and Morbidity Review Committee and Department of State Health Services Joint Biennial Report, 2020, revised February 2022.
[15] 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. Retrieved from **apps.who.int/iris/bitstream/10665/70929/1/9789241548458_eng.pdf** [Accessed March 28, 2022].

Statistical Significance: Tests of statistical significance provide measures of the likelihood that differences among outcomes are actual and not just due to chance. Statistically significant differences are noted throughout the Data Book. The term "significant" is also used to identify a statistically significant change.[16]

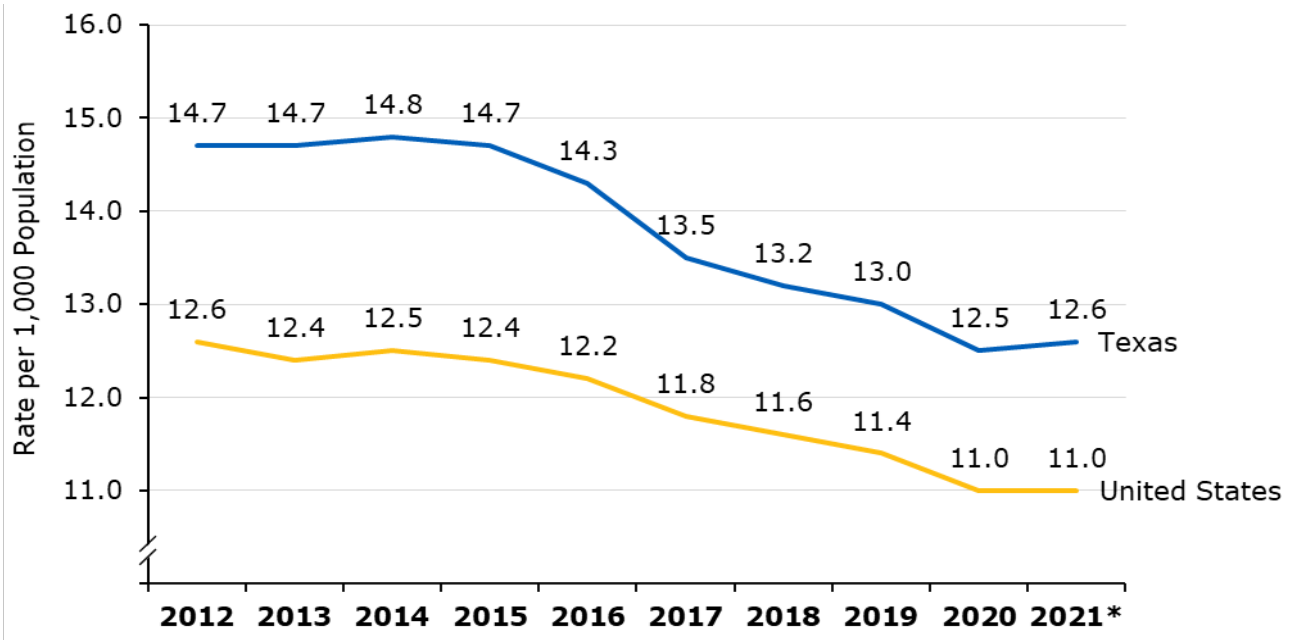
[16] Priest, Ronda. Statistical/Substantive, Interpretations, and Data Limitations. Encyclopedia of Social Measurement (671-674). 2005. **https://doi.org/10.1016/B0-12-369398-5/00180-8**.

Birth Demographics

Birth Rate

In 2021, 373,340 babies were born to mothers who were Texas residents. Since 2014, the birth rate in Texas (defined as number of live births per 1,000 people in the population) has decreased (**Figure 1**). However, in 2020, the Texas birth rate significantly increased from 12.5 births per 1,000 to 12.6 births per 1,000 in 2021. Texas had the fourth highest birth rate in the U.S. in 2021.[17]

Figure 1: Birth Rate in Texas and the United States, 2012-2021



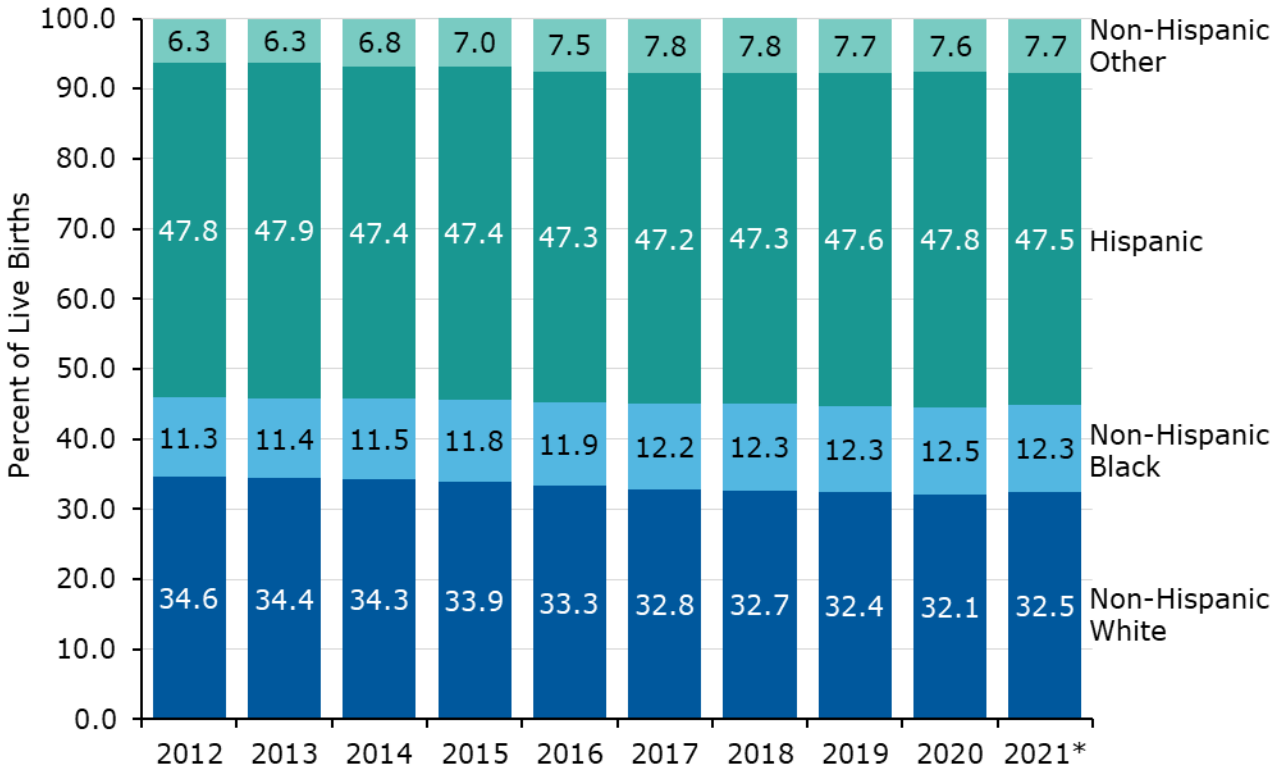
*2021 data are provisional
Source: 2012-2021 Birth Files, National Center for Health Statistics; 2012-2021 Population Estimates, U.S. Census Bureau
Prepared by: Maternal & Child Health Epidemiology Unit
Jan 2023

[17] Hamilton BE, Martin JA, Osterman MJK. Births: Provisional data for 2021. Vital Statistics Rapid Release; no 20. Hyattsville, MD: National Center for Health Statistics. May 2022. DOI: https://dx.doi.org/10.15620/cdc:116027.

Maternal Race and Ethnicity

In 2021, births to Hispanic women made up the largest percentage of all Texas births (47.5 percent), followed by births to non-Hispanic White women (32.5 percent), non-Hispanic Black women (12.3 percent), and women classified as Other races or ethnicities (7.7 percent) (**Figure 2**). The Other category encompasses a variety of racial and ethnic groups, including Native American, Asian, multiracial, or other racial or ethnic designations. From 2012 to 2021, the percentage of births to non-Hispanic Black women increased by about one percentage point over the last ten years, with a significant increase from 2016 to 2017 and decrease from 2020 to 2021. From 2012 to 2020, the percentage of infants born to non-Hispanic White women decreased with a statistically significant increase in 2021.

Figure 2: Distribution of Racial and Ethnic Groups Among All Live Births, 2012-2021



*2021 Texas data are provisional
Source: 2012-2021 Live Birth Files, Texas Center for Health Statistics
Prepared by: Maternal & Child Health Epidemiology Unit
Jan 2023

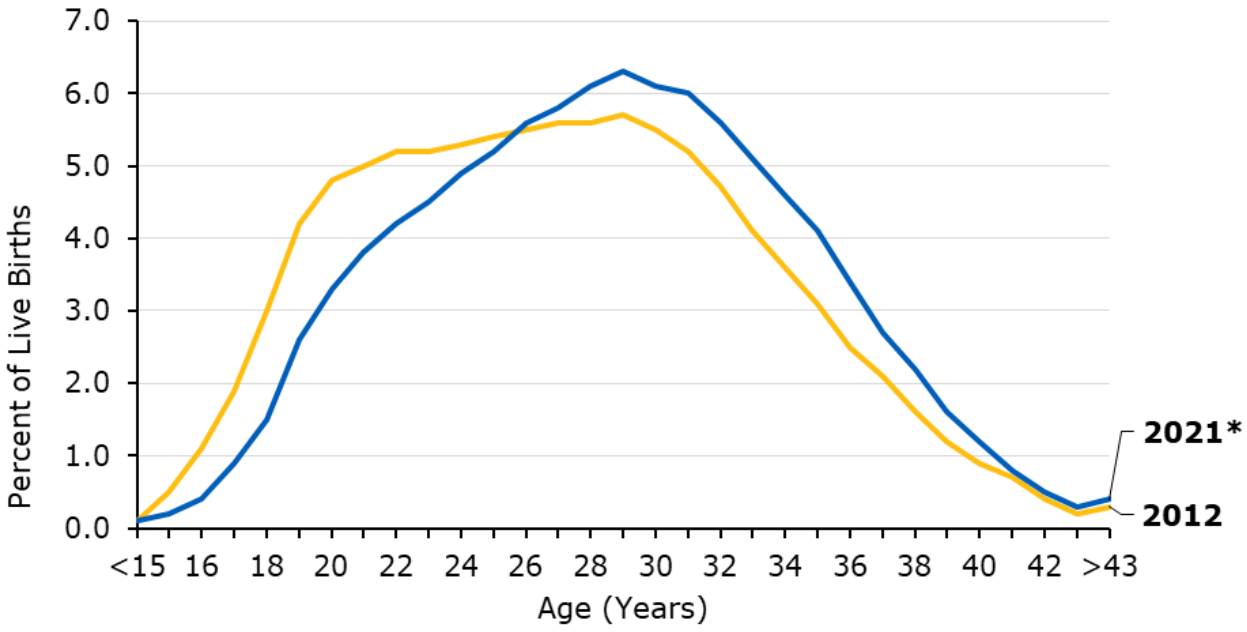
Although the smallest proportion of Texas births were to women who were classified as being of Other races or ethnicities, this group had the largest increase in the percent of total live births over the past decade. However, this group encompasses many different

races and ethnicities, which often limits the interpretability of results for this racial and ethnic category.

Maternal Age

Texas, as in the U.S., has seen a shift over time in the maternal age of women giving birth.[18] The Texas average maternal age at birth in 2021 was 28.6 years — a significant increase from an average age of 27.2 years in 2012 (**Figure 3**).

Figure 3: Maternal Age Distribution in Texas, 2012 and 2021

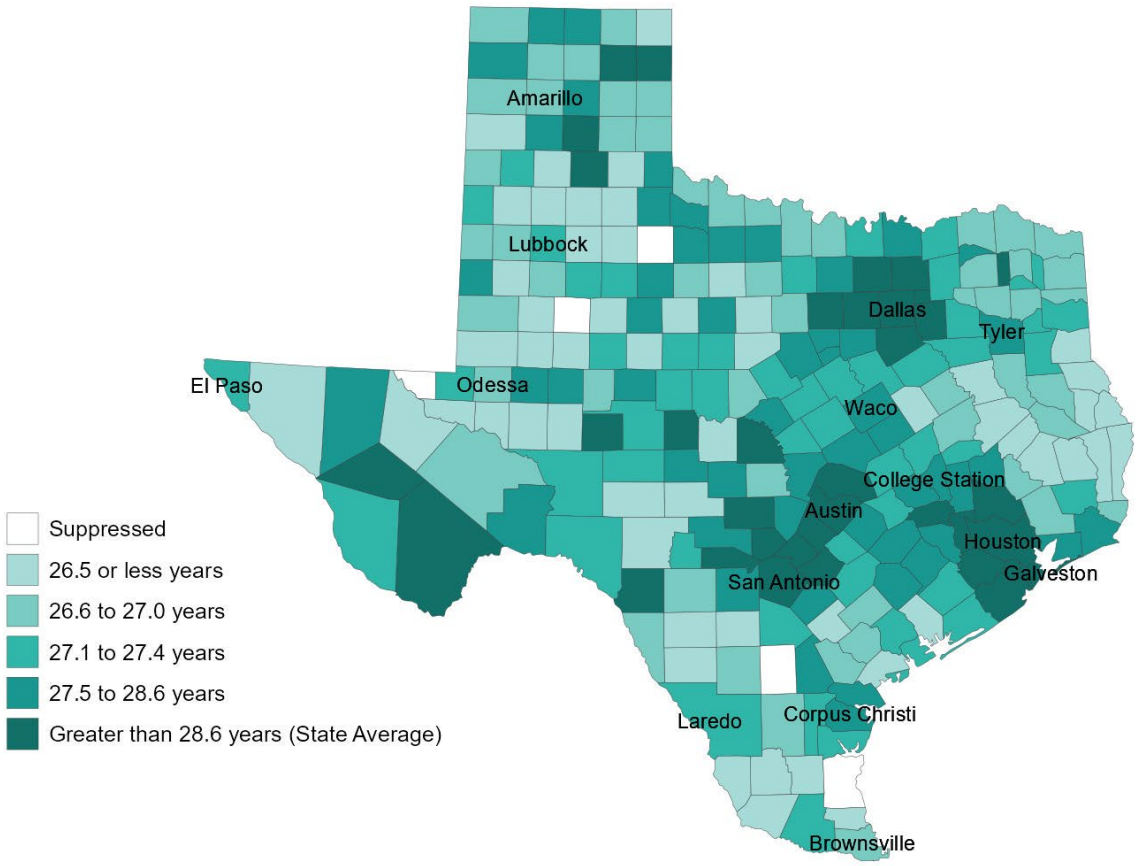


*2021 Texas data are provisional
Source: 2012 and 2021 Live Birth Files, Texas Center for Health Statistics
Prepared by: Maternal & Child Health Epidemiology Unit
Jan 2023

[18] Mathews, T. J., & Hamilton, B. E. (2016). Mean age of mothers is on the rise: United States, 2000-2014. NCHS data brief, (232), 1-8.

The average age for women with a live birth in 2021 differed by region (**Figure 4**). Counties with densely populated areas, such as Harris, Dallas, Bexar, and Travis counties, tended to have older average maternal ages (greater than the state average of 28.6 years of age) compared to counties with rural areas.

Figure 4: Average Age of a Woman with a Live Birth by County of Residence, 2021

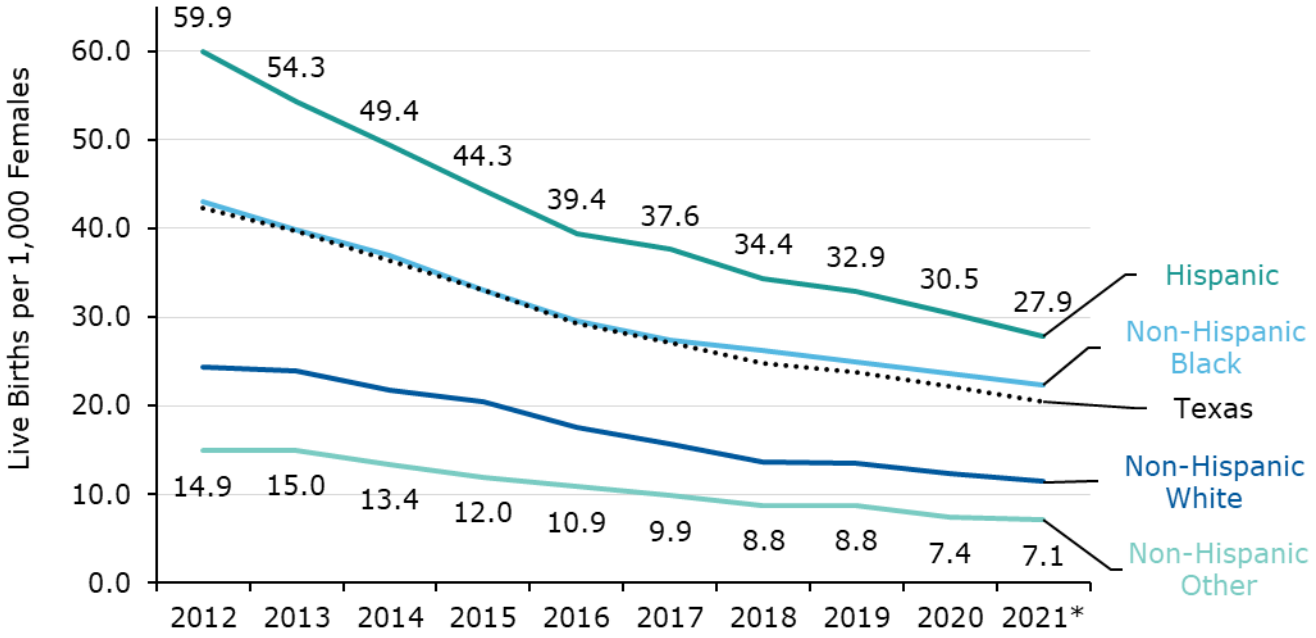


2021 Texas data are provisional
Source: 2021 Live Birth Files, Texas Center for Health Statistics
Prepared by: Maternal & Child Health Epidemiology Unit
Jan 2023

The increase in average maternal age observed over the past decade is likely due in part to a marked decrease in the teen birth rate in Texas and the U.S. The CDC defines the teen birth rate as the number of live births per 1,000 females aged 15-19 years.[19]

Since 2012, Texas, like the rest of the country, reported large decreases in the teen birth rate. This decrease was greatest among Hispanic and non-Hispanic Black teens, with rates declining by 53.4 percent and 52.9 percent, respectively (**Figure 5**).

Figure 5: Teen (15-19 Years of Age) Birth Rate per 1,000 Females by Race and Ethnicity, 2012-2021



*2021 Texas data are provisional
Source: 2012-2021 Live Birth Files, Texas Center for Health Statistics; 2012-2020 Population Estimates, Texas Demographic Center; 2021 Population Projections, Texas Demographic Center
Prepared by: Maternal & Child Health Epidemiology Unit
Jan 2023

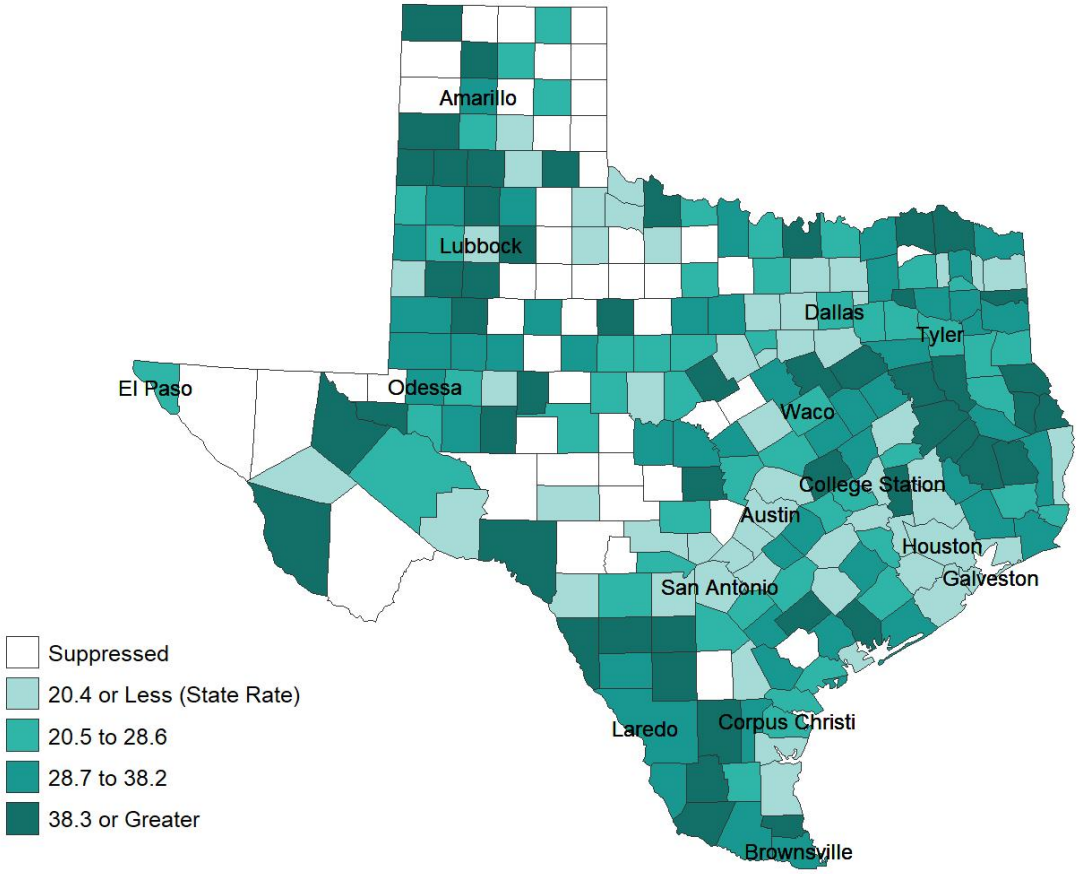
In 2020, Texas had the second highest percent of repeat births among teen mothers ages 15-19 years (17.2 percent) compared to other states. Nationally, the percent of teen mothers with repeat births in 2020 was 14.8 percent.[20]

Additionally, several Texas areas had high teen birth rates when compared to the rest of the state (**Figure 6**). Many counties in the border regions, rural areas, and in the Texas

[19] Martin JA, Hamilton BE, Osterman MJK, and Driscoll AK, Division of Vital Statistics, Centers for Disease Control and Prevention (CDC, 2021). Births: Final Data for 2019. National Vital Statistics Report 70(2). Retrieved from **cdc.gov/nchs/data/nvsr/nvsr70/nvsr70-02-508.pdf** [Accessed March 28, 2022].
[20] United States Department of Health and Human Services (US DHHS), Centers for Disease Control and Prevention (CDC), National Center for Health Statistics (NCHS), Division of Vital Statistics. Natality public-use data 2016-2020, on CDC WONDER Online Database. Retrieved from **wonder.cdc.gov/natality-expanded-current.html** [Accessed November 4, 2021].

Panhandle had teen birth rates over 38.3 births per 1,000 females aged 15-19 years in 2021.

Figure 6: Teen Birth Rate per 1,000 Females Aged 15-19 Years by County of Residence, 2021



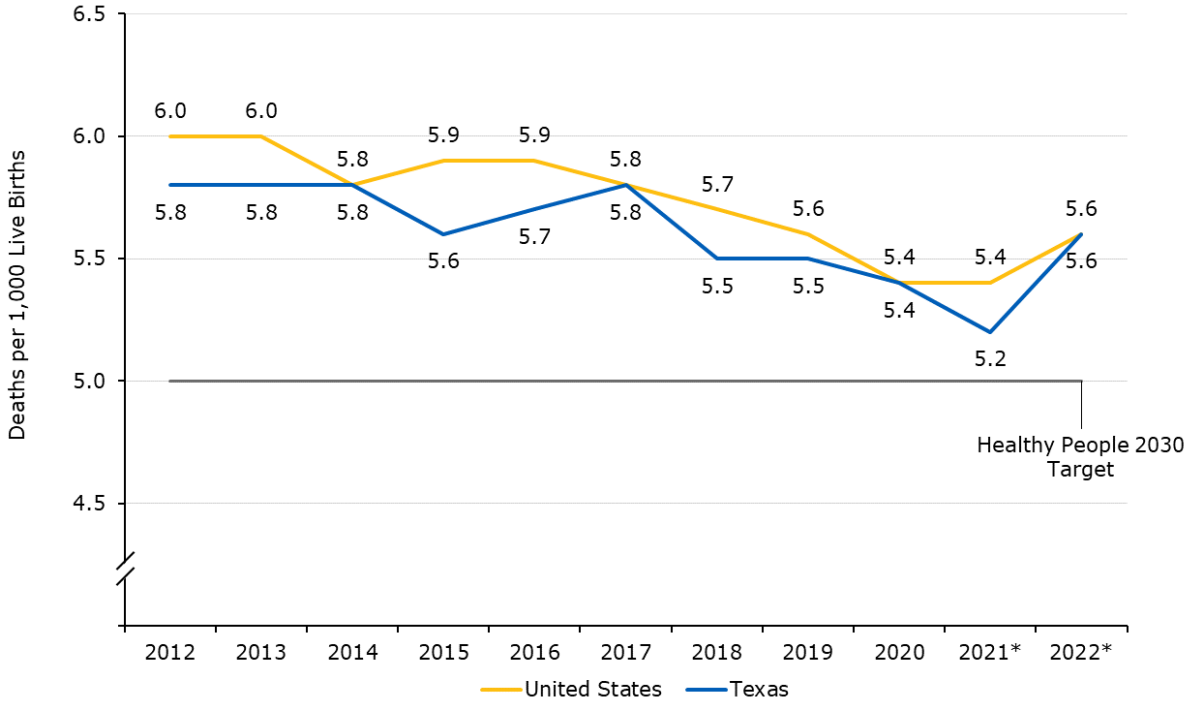
2021 Texas data are provisional
Source: 2021 Live Birth Files, Texas Center for Health Statistics; 2021 Population Projections, Texas Demographic Center
Prepared by: Maternal & Child Health Epidemiology Unit
Jan 2023

Infant Mortality and Morbidity

Infant Mortality Rate

In 2021, the IMR in Texas reached a historic low of 5.2 deaths per 1,000 live births. However, initial analysis of the provisional 2022 data shows an IMR of 5.6 deaths per 1,000 live births; this rate was the same as the national level. Current analyses of the 2022 data by race and ethnicity, geographic distribution, mother's age, and causes of infant death are underway. The IMR in Texas has been at or below the national rate over the past ten years (**Figure 7**), but is still above the HP 2030 target of 5.0 deaths per 1,000 live births.[21]

Figure 7: Infant Mortality Rate in Texas and the United States, 2012-2022

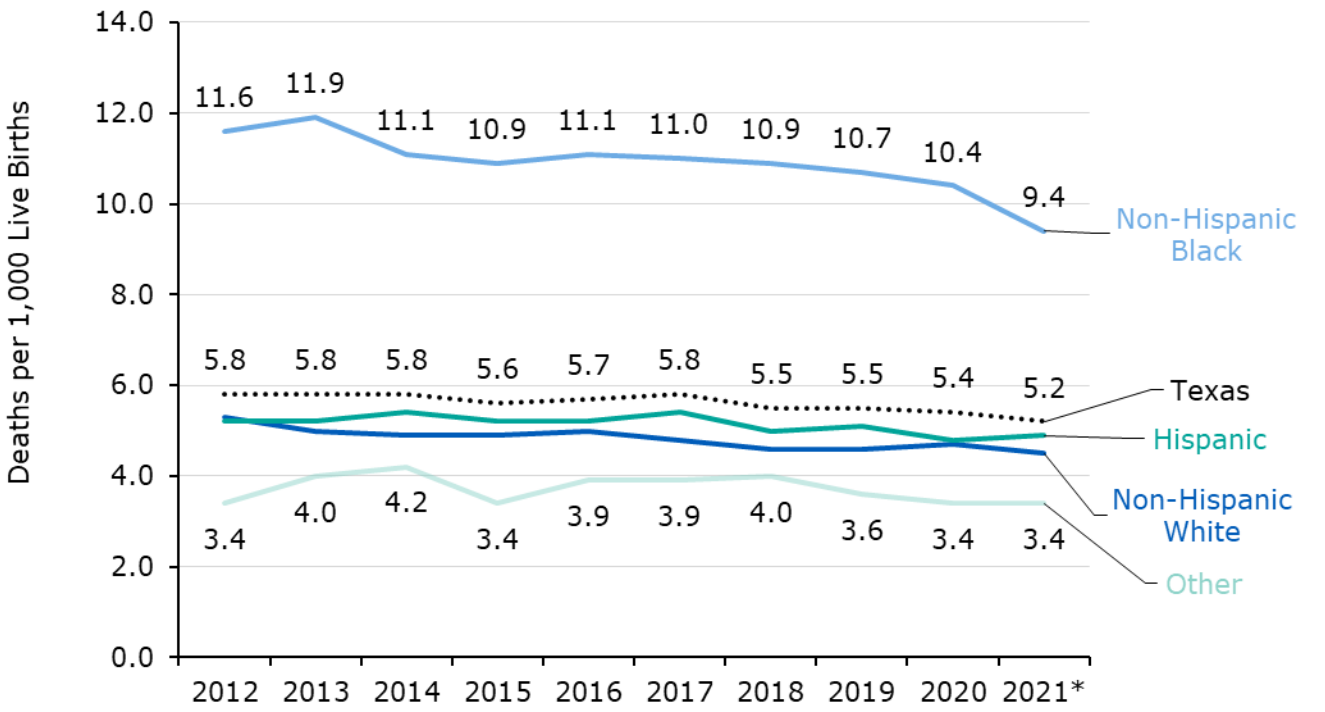


*2021 and 2022 Texas rates are provisional
Source: 2012-2022 Live Birth & Death Files, Texas Center for Health Statistics; 2012-2022 Death Files, National Center for Health Statistics; Healthy People 2030
Prepared by: Maternal & Child Health Epidemiology Unit

[21] Healthy People 2030, Office of Disease Prevention and Health Promotion, United States Department of Health and Human Services Reduce the rate of infant deaths — MICH-02. Retrieved from **health.gov/healthypeople/objectives-and-data/browse-objectives/infants/reduce-rate-infant-deaths-mich-02** [Accessed March 28, 2022].

However, IMR disparities persist in Texas and the overall decrease in IMR observed over the past decade was not equally distributed across all racial or ethnic groups (**Figure 8**). IMRs for non-Hispanic Black infants have been twice as high as IMRs for non-Hispanic White and Hispanic infants throughout the decade.

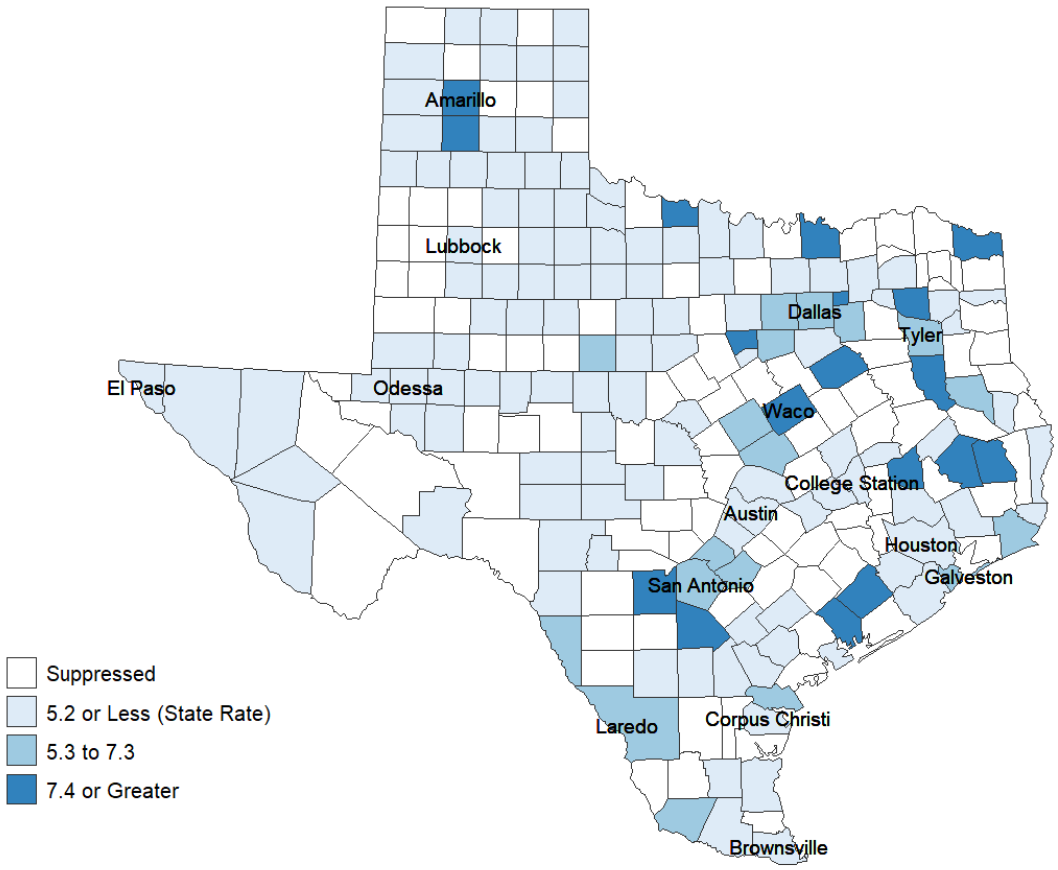
Figure 8: Infant Mortality Rate in Texas by Race and Ethnicity, 2012-2021



*2021 Texas rates are provisional
Source: 2012-2021 Live Birth & Death Files, Texas Center for Health Statistics
Prepared by: Maternal & Child Health Epidemiology Unit
Jan 2023

In addition, substantial IMR regional differences persist within the state. In 2021, many Texas counties met the HP 2030 target of 5.0 or fewer infant deaths per 1,000 live births. These same counties were below the state IMR of 5.2 (data not shown).[21] In contrast, Tyler, Jackson, Wood, Polk, Navarro, Medina, and Atascosa counties had the highest Texas IMRs. In 2021, at least ten deaths per 1,000 live births were reported in these counties (**Figure 9**).

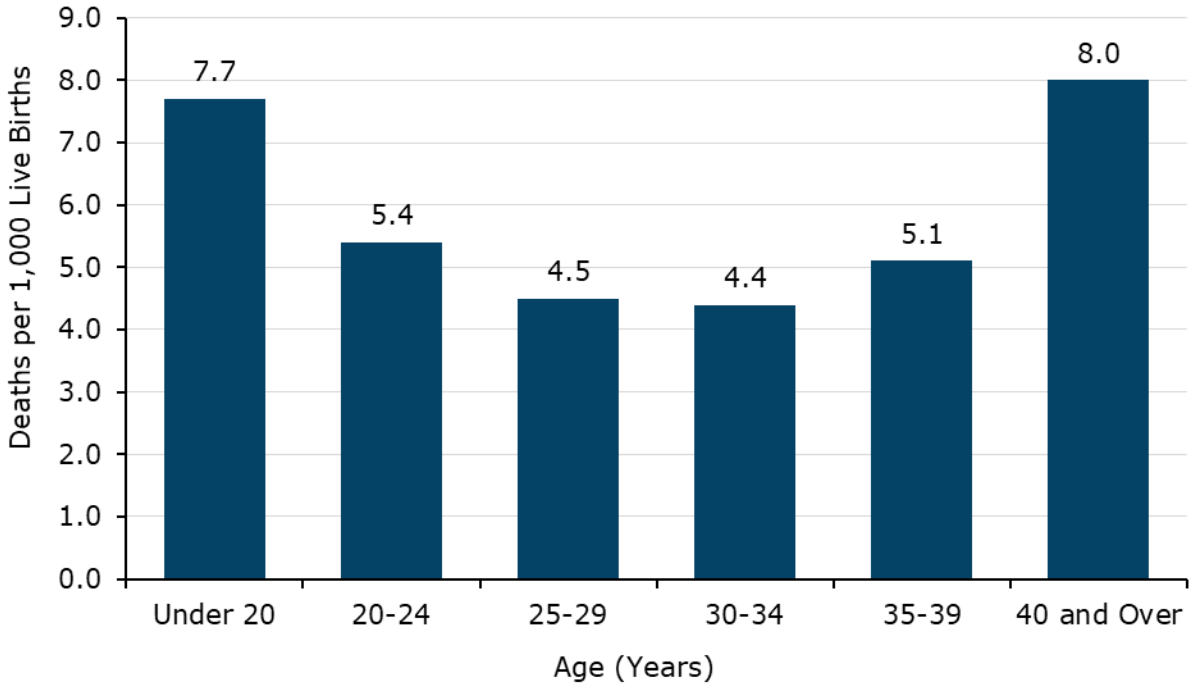
Figure 9: Infant Mortality Rate per 1,000 Live Births by County of Residence, 2021



2021 Texas data are provisional
Source: 2021 Live Birth & Death Files, Texas Center for Health Statistics
Prepared by: Maternal & Child Health Epidemiology Unit
Jan 2023

Differences in IMR also exist by maternal age. In 2020, a higher IMR was observed among young mothers aged less than 20 years and mothers aged 40 years or older than among mothers of other age groups. (**Figure 10**). Mothers in these two age groups comprised 9.2 percent of all Texas resident births in 2020.

Figure 10: Infant Mortality Rate by Mother's Age Group, 2020

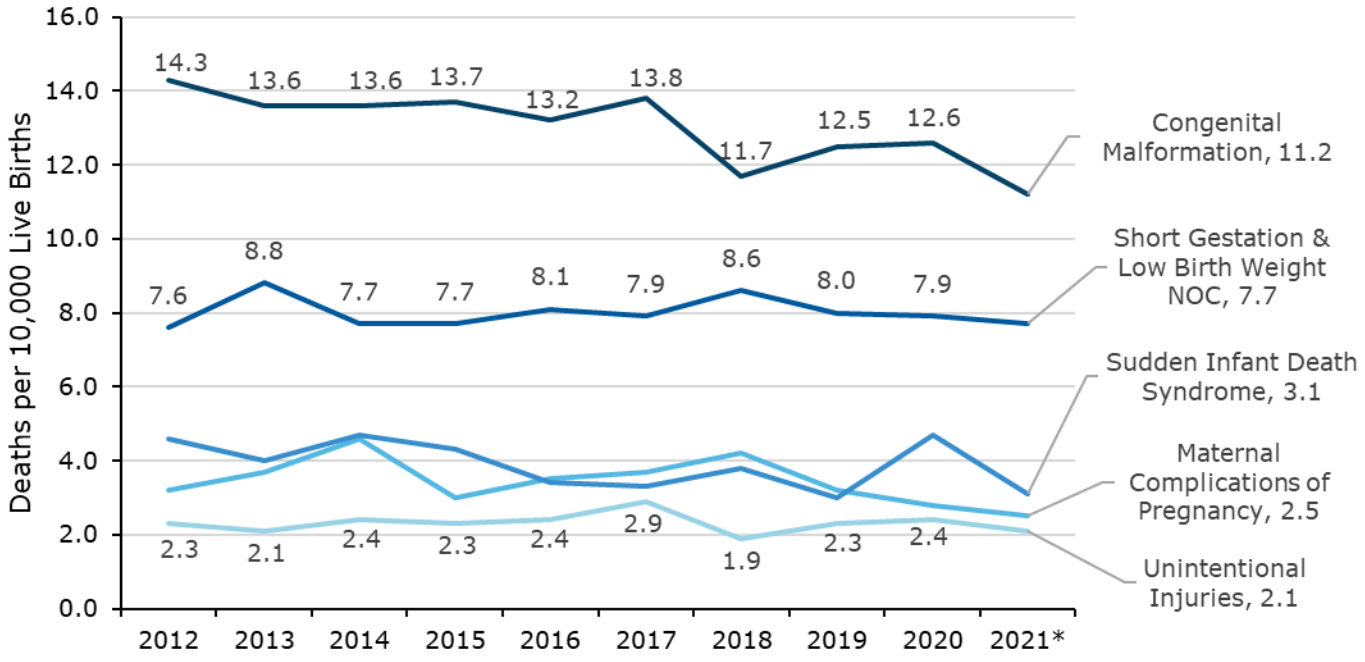


2020 data are provisional
Source: 2020 Linked Birth-Death Files, Texas Center for Heath Statistics
Prepared by: Maternal & Child Health Epidemiology Unit
Jan 2023

Causes of Infant Death

In 2021, the leading cause of death for infants younger than one year in Texas was congenital malformation, followed by short gestation and LBW, not otherwise classified (NOC), and sudden infant death syndrome (SIDS) (**Figure 11**). LBW is defined as weighing less than 2,500 grams at birth. For infants between 28 days and one year, the leading cause of death was listed as unknown, followed by congenital malformation, and SIDS (data not shown).

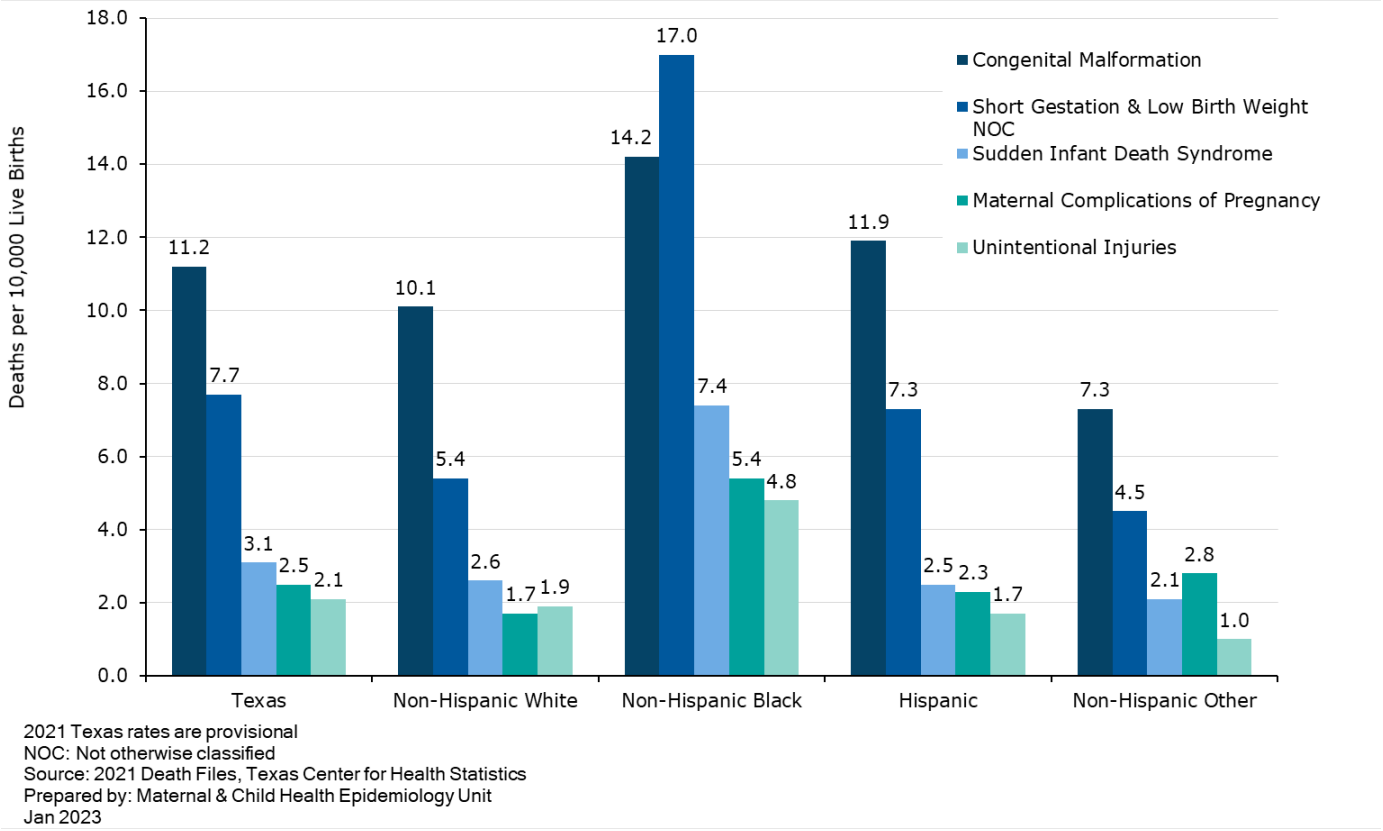
Figure 11: Leading Causes of Infant Death, 2012-2021



*2021 rates are provisional
NOC: Not otherwise classified
Source: 2012-2021 Death & Birth Files, Texas Center for Health Statistics
Prepared by: Maternal & Child Health Epidemiology Unit
Jan 2023

Leading causes of infant death differ by race and ethnicity (**Figure 12**). In 2021, the leading cause of death among non-Hispanic Black infants was short gestation and LBW. LBW accounted for 17.0 deaths per 10,000 live births for non-Hispanic Black infants. However, congenital malformation was the leading cause of death for the state overall and for all other racial or ethnic groups. Non-Hispanic Black infants were over two times more likely to die of short gestation and LBW, SIDS, maternal complications of pregnancy, and unintentional injuries than non-Hispanic White infants.

Figure 12: Leading Causes of Infant Death by Race and Ethnicity, 2021

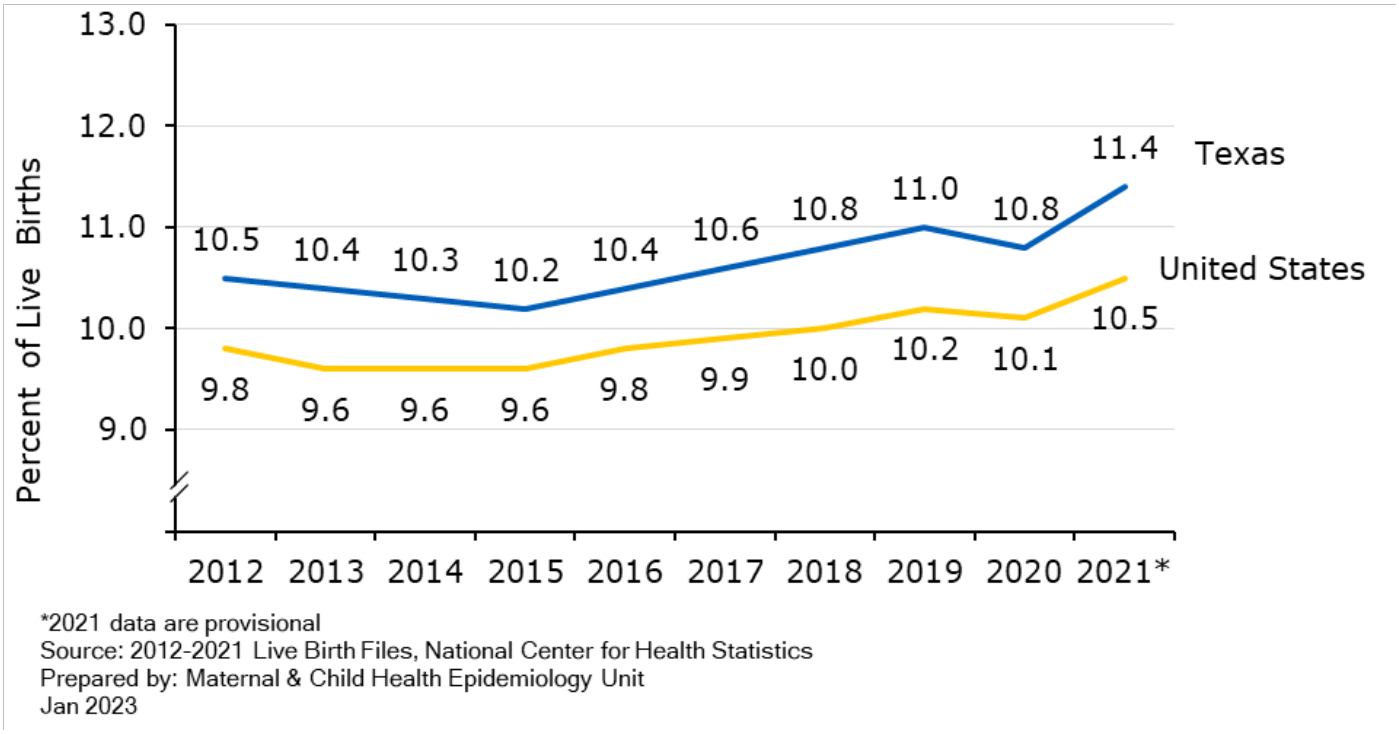


2021 Texas rates are provisional
NOC: Not otherwise classified
Source: 2021 Death Files, Texas Center for Health Statistics
Prepared by: Maternal & Child Health Epidemiology Unit
Jan 2023

Preterm Birth

Preterm births occur prior to 37 weeks of gestation. In 2021, the preterm birth rate in the U.S. rose to 10.5 percent, the highest rate reported since 2007.[17] The preterm birth rate in Texas also significantly increased from 10.8 percent in 2020 to 11.4 percent in 2021, the highest rate since 2012. The Texas preterm birth rate has consistently been higher than the national average over the past ten years (**Figure 13**).

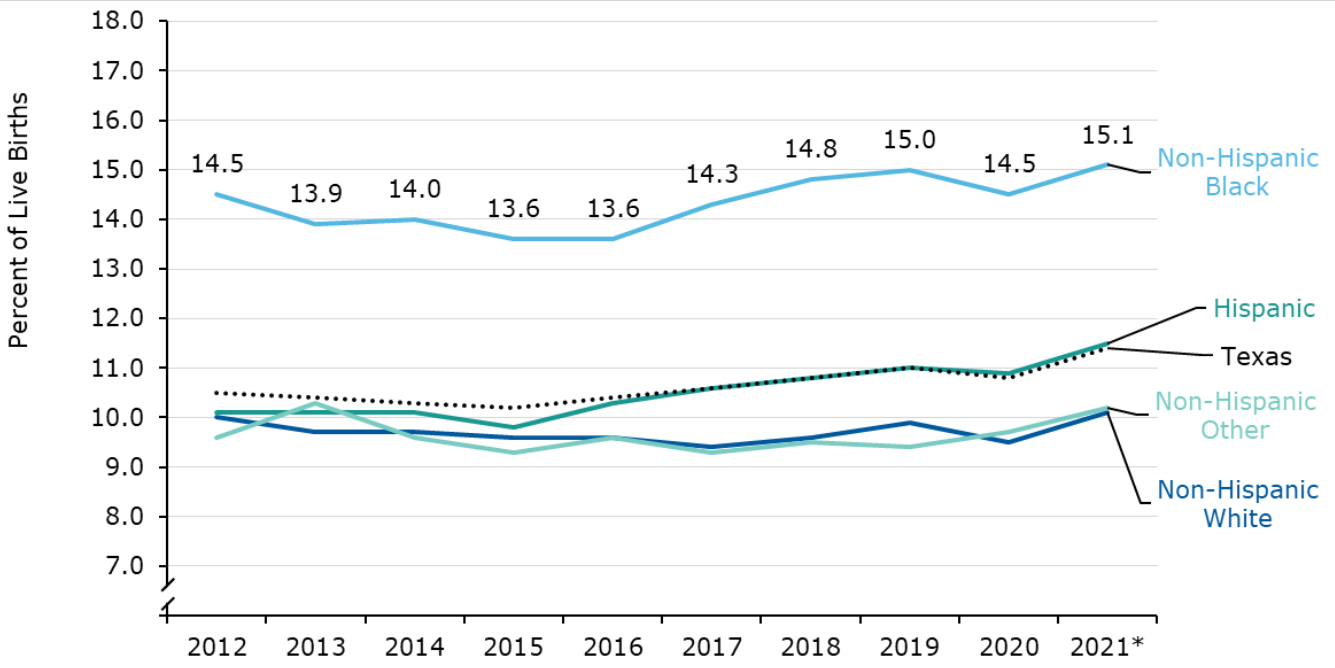
Figure 13: Percent of Live Births Born Preterm (less than 37 weeks) in Texas and the United States Using Obstetric Estimate of Gestation, 2012-2021



*2021 data are provisional
Source: 2012-2021 Live Birth Files, National Center for Health Statistics
Prepared by: Maternal & Child Health Epidemiology Unit
Jan 2023

Disparities in the preterm birth rate were observed over the previous decade (**Figure 14**). Non-Hispanic Black infants had a higher preterm birth rate than infants of any other racial or ethnic group. Hispanic infants had the second highest preterm birth rate since 2014.

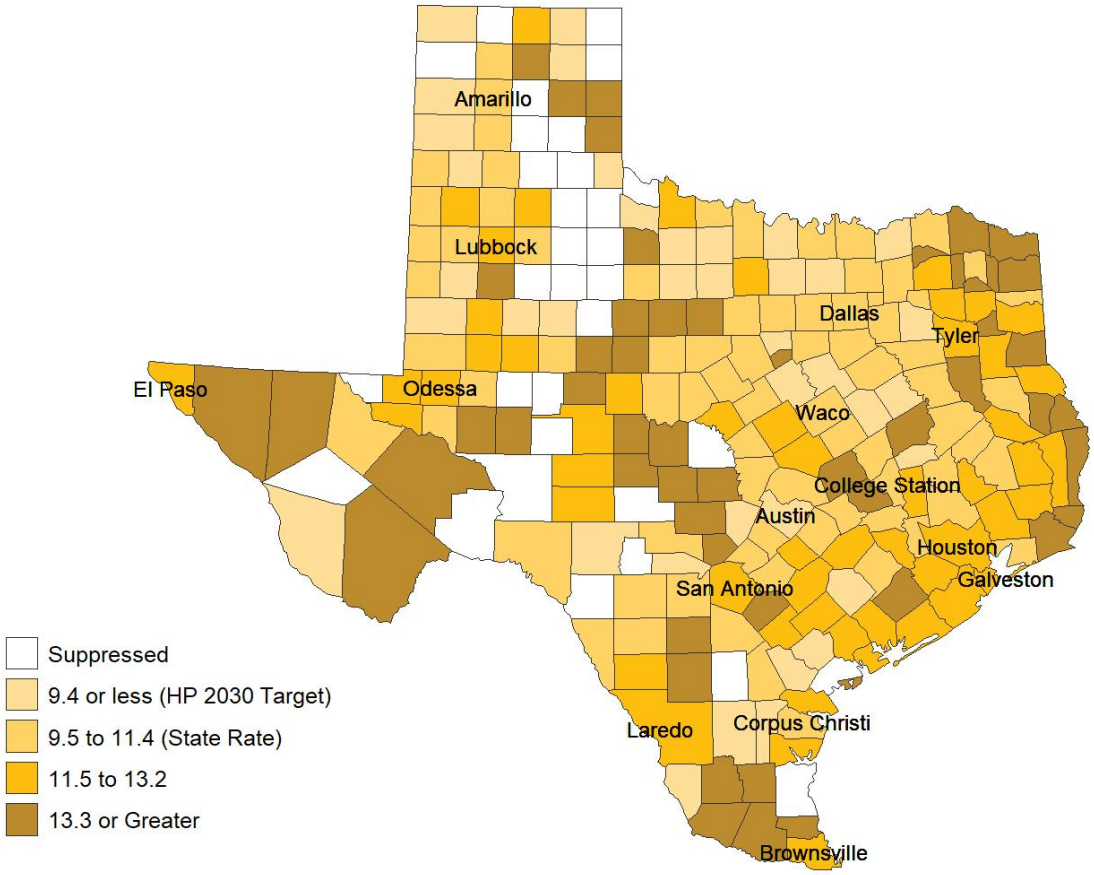
Figure 14: Percent of Live Births Born Preterm (less than 37 weeks) in Texas by Race and Ethnicity Using Obstetric Estimate of Gestation, 2012-2021



*2021 Texas data are provisional
Source: 2012-2021 Live Birth Files, Texas Center for Health Statistics
Prepared by: Maternal & Child Health Epidemiology Unit
Jan 2023

Figure 15 shows the percentage of preterm births by Texas county. In 2021, only 38 counties met the HP 2030 target of 9.4. Clusters of preterm birth rates above the state rate were observed in the eastern, western, and southern borders of the state and several central Texas counties.

Figure 15: Percent of Live Births Born Preterm (less than 37 weeks) in Texas Using Obstetric Estimate of Gestation by County of Residence, 2021

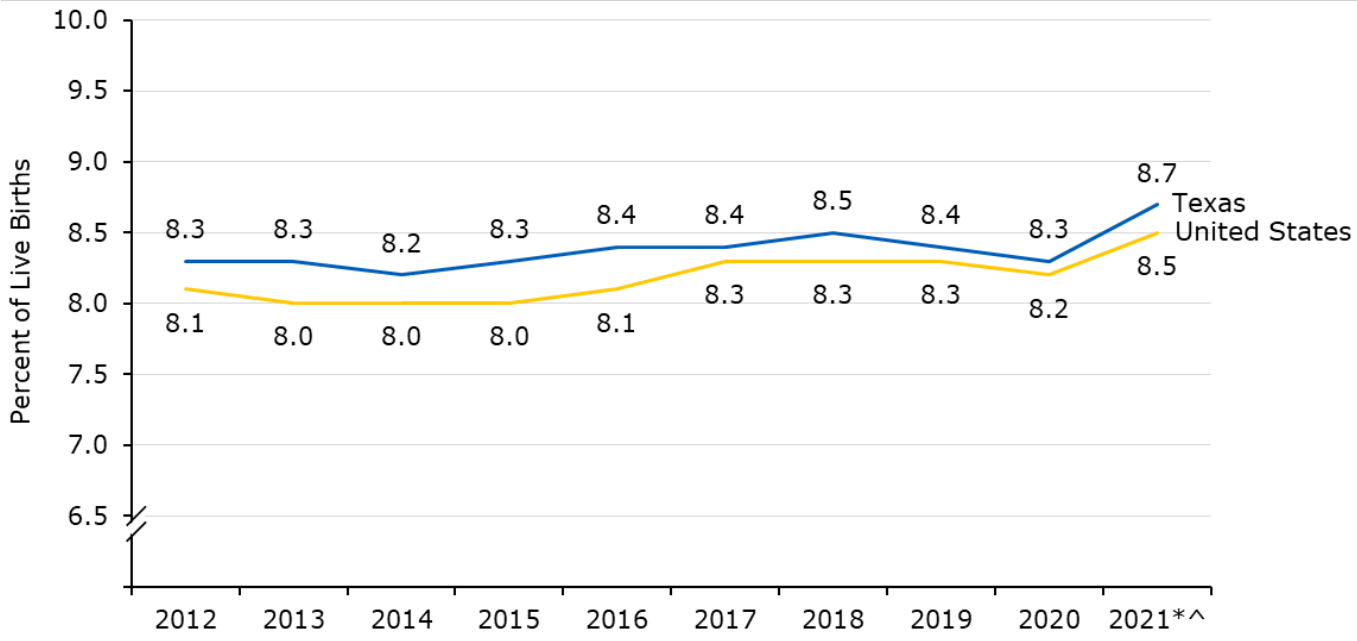


2021 Texas data are provisional
Source: 2021 Live Birth Files, Texas Center for Health Statistics
Prepared by: Maternal & Child Health Epidemiology Unit
Jan 2023

Low Birth Weight

The percentage of babies born with a LBW (weighing less than 2,500 grams) in Texas significantly increased from 8.3 in 2020 to 8.7 in 2021, reaching the highest rate observed since 2012. The rate of LBW infants in Texas has been slightly higher than the national rate since 2012 (**Figure 16**).

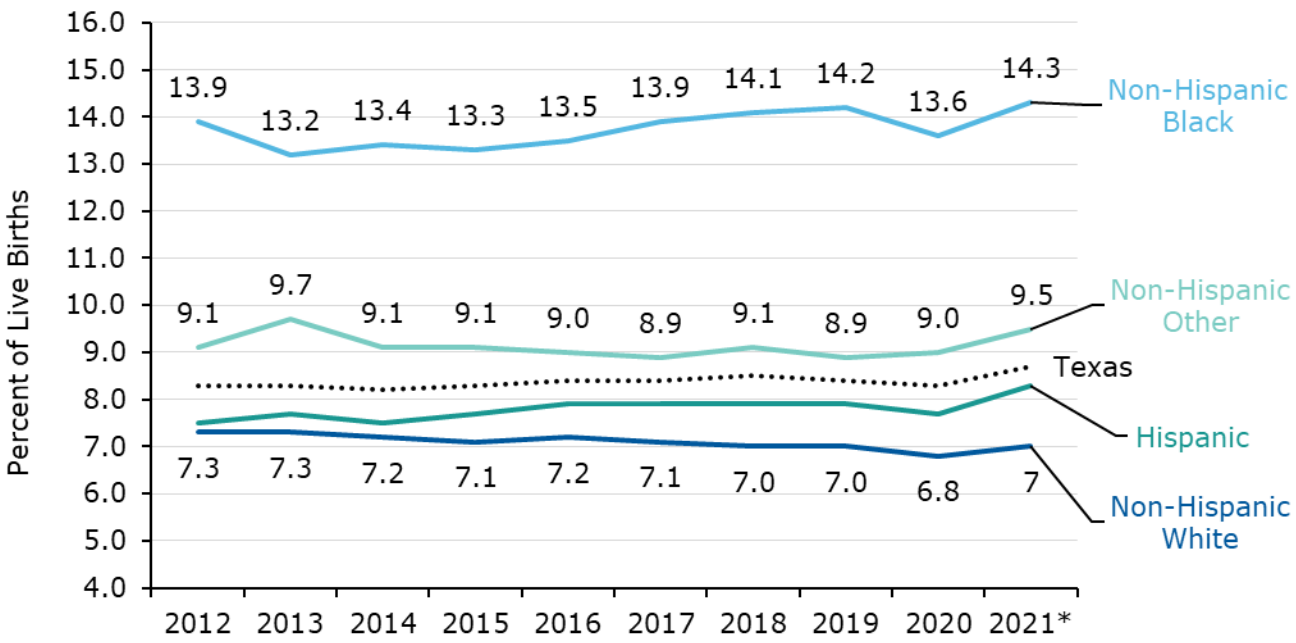
Figure 16: Percent of Births That Are LBW (less than 2,500 grams) in Texas and the United States, 2012-2021



*2021 Texas data are provisional
^2021 National data are not yet available
Source: 2012-2012 Live Birth Files, Texas Center for Health Statistics; 2012-2020 Live Birth Files, National Center for Health Statistics
Prepared by: Maternal & Child Health Epidemiology
Jan 2023

As with IMR and preterm births, non-Hispanic Black mothers had a disproportionately high percentage of LBW infants (**Figure 17**) and the gap between non-Hispanic Black mothers and non-Hispanic White mothers has been slowly widening since 2013. The rate of LBW infants is also higher among mothers in the Other racial or ethnic category than among non-Hispanic White or Hispanic mothers.

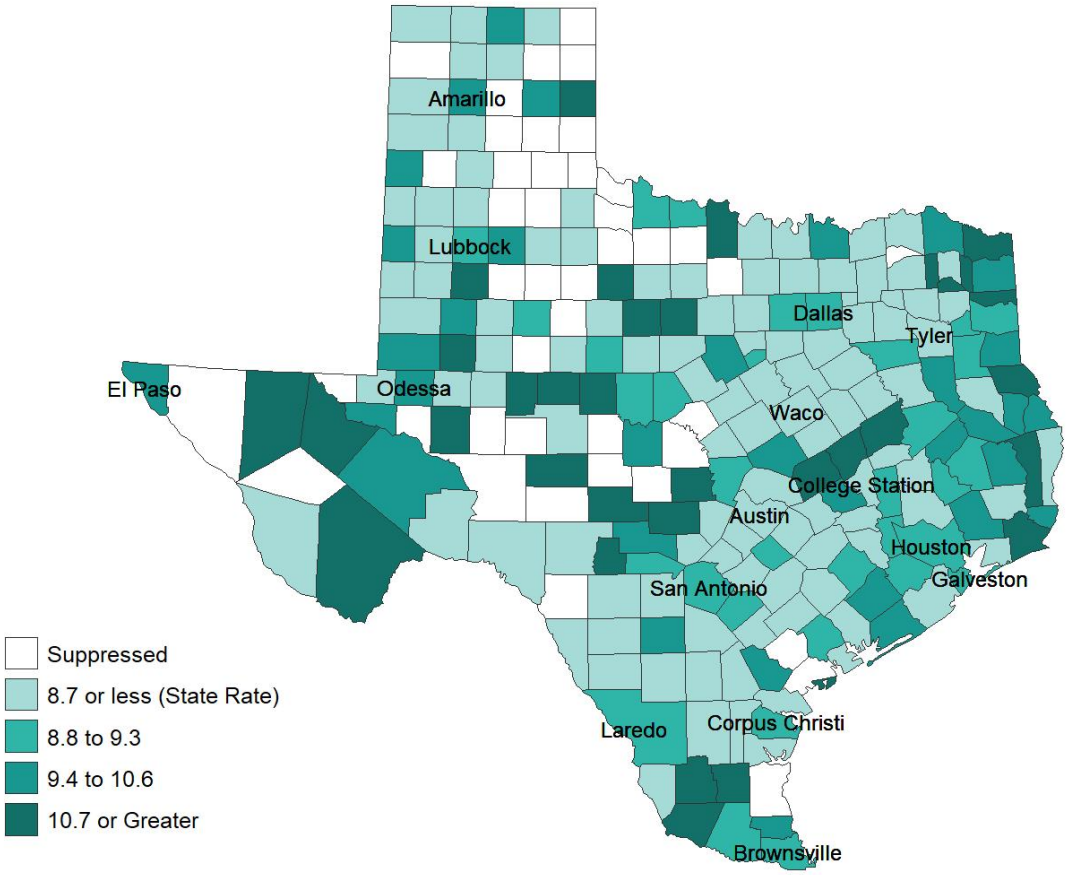
Figure 17: Percent of Births That Are LBW (less than 2,500 grams) in Texas by Race and Ethnicity, 2012-2021



*2021 Texas data are provisional
Source: 2012-2021 Live Birth Files, Texas Center for Health Statistics
Prepared by: Maternal & Child Health Epidemiology Unit
Jan 2023

The percentage of infants born with LBW varied across Texas in 2021 (**Figure 18**). Culberson County, located in West Texas, had the highest percentage of LBW infants at 22.6 percent. In contrast, 21 counties reported low birth weight infants in 6.0 percent or less of births.

Figure 18: Percent of Infants Born Low Birth Weight (less than 2,500 grams) by County of Residence, 2021



2021 Texas data are provisional
Source: 2021 Live Birth Files, Texas Center for Health Statistics
Prepared by: Maternal & Child Health Epidemiology Unit
Jan 2023

Infant Mortality: Analyzing Perinatal Periods of Risk

Although Texas has made progress in reducing infant mortality, data continues to show disparities in infant mortality and feto-infant mortality among different racial and ethnic groups especially between non-Hispanic Black and non-Hispanic White women. To better understand these disparities, DSHS conducted a PPOR analysis. PPOR analyses have been used in other states, urban areas, and counties to examine the risk of feto-infant mortality during four perinatal periods among different populations. PPOR analysis findings are intended to help policymakers create specific, impactful interventions that reduce infant mortality.

Fetal and infant deaths are categorized into four risk groups based on birth weight and when the death occurred (**Figure 19**):[13,22,23]

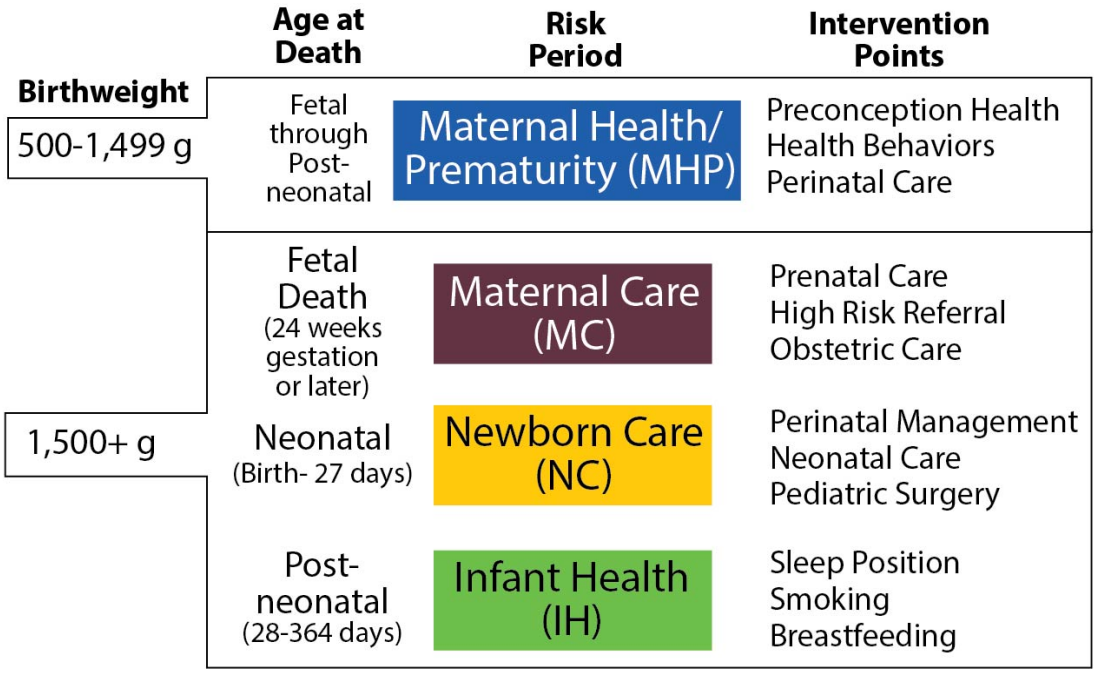
1. The Maternal Health/Prematurity (MHP) Risk Period: deaths occurring during pregnancy at 24 weeks gestational age or later with a fetus weighing 500-1,499 grams or death occurring after birth through 364 days with the infant birth weight between 500-1,499 grams.
2. The Maternal Care (MC) Risk Period: deaths occurring during pregnancy at 24 weeks gestational age or later with the fetus weighing over 1,500 grams.
3. The Neonatal Care (NC) Risk Period: deaths occurring between birth and 27 days postpartum with a birth weight over 1,500 grams.
4. The Infant Health (IH) Risk Period: deaths occurring 28-364 days postpartum with a birth weight over 1,500 grams.

[22] Sappenfield, W. M., Peck, M. G., Gilbert, C. S., Haynatzka, V. R., & Bryant, T. (2010). Perinatal periods of risk: Analytic preparation and phase 1 analytic methods for investigating feto-infant mortality. Maternal and child health journal, 14(6), 838-850.

[23] Sappenfield, W. M., Peck, M. G., Gilbert, C. S., Haynatzka, V. R., & Bryant, T. (2010). Perinatal periods of risk: phase 2 analytic methods for further investigating feto-infant mortality. Maternal and child health journal, 14(6), 851-863.

Each of these periods has different risk factors and causes of death, and thus, different prevention opportunities. Therefore, the four Risk Periods represent distinct intervention points in the health care continuum.[13] Figure 19 shows each of the four criteria categories and intervention examples that might be appropriate for each period.

Figure 19: PPOR Risk Periods: Classification of Infant Deaths and Potential Interventions by Period of Risk



PPOR analysis is divided into two phases. Phase I Analysis is used to identify whether excessive feto-infant mortality occurs for each of the four Risk Periods. This analysis compared the Texas F-IMR and chosen study populations (non-Hispanic Black, non-Hispanic White, Hispanic, and teens) to a state-level reference group generally known to have better feto-infant mortality outcomes. The reference group included non-Hispanic White women who were at least 20 years of age and had a minimum of 13 years of education. The reference group allows an estimation of preventable (excess) deaths for each period of risk and provided a realistic benchmark for reducing infant mortality in a community.

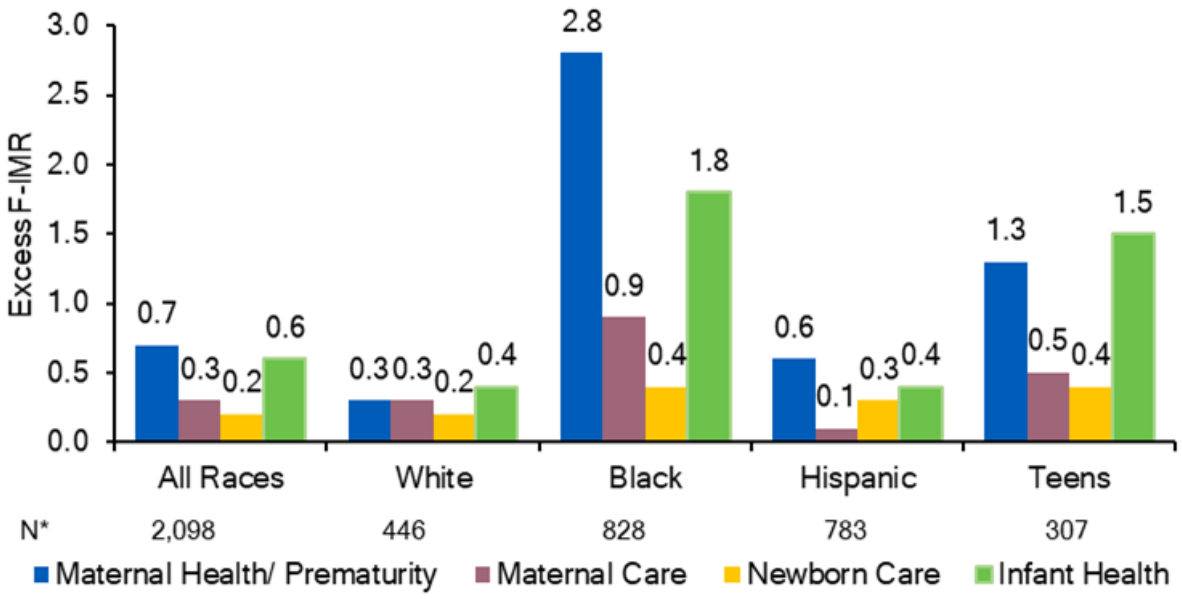
Phase II Analysis further investigated the Risk Periods with the highest excess feto-infant mortality to identify contributing risk factors and causes of death. Results of the Phase II Analysis intend to help identify programmatic and policy initiatives expected to have the most impact at reducing infant mortality.

Phase I Analysis

In the following analysis racial or ethnic categories are mutually exclusive. The category of teens includes all races and ethnicities and teens are not excluded from the racial and ethnic categories. Additionally, the 'All Races' category shown in Figure 20 includes all race, ethnicities, and ages not included in the reference population. The overall F-IMR was calculated as the number of fetal and infant deaths per 1,000 live births and fetal deaths and is the total of the rates across all Risk Periods for each study population. The 2016 - 2018 F-IMRs were 5.3 for non-Hispanic White mothers, 10.0 for non-Hispanic Black mothers, 5.5 for Hispanic mothers, and 7.8 for teen mothers (data not shown).

The overall F-IMR for the reference group was 4.1 per 1,000 live births and fetal deaths (data not shown). The excess F-IMR shown in Figure 20 indicates how much higher the F-IMR was for the study population compared to the reference group. Calculated as the sum of the excess rate for each period of risk shown in Figure 20, non-Hispanic Black mothers experienced a total of 5.9 excess fetal and infant deaths per 1,000 live births and fetal deaths in 2016-2018. Total excess F-IMRs for non-Hispanic White mothers, Hispanic mothers, and teen mothers were 1.2, 1.4, and 3.7 excess fetal and infant deaths per 1,000 live births and fetal deaths, respectively (**Figure 20**).

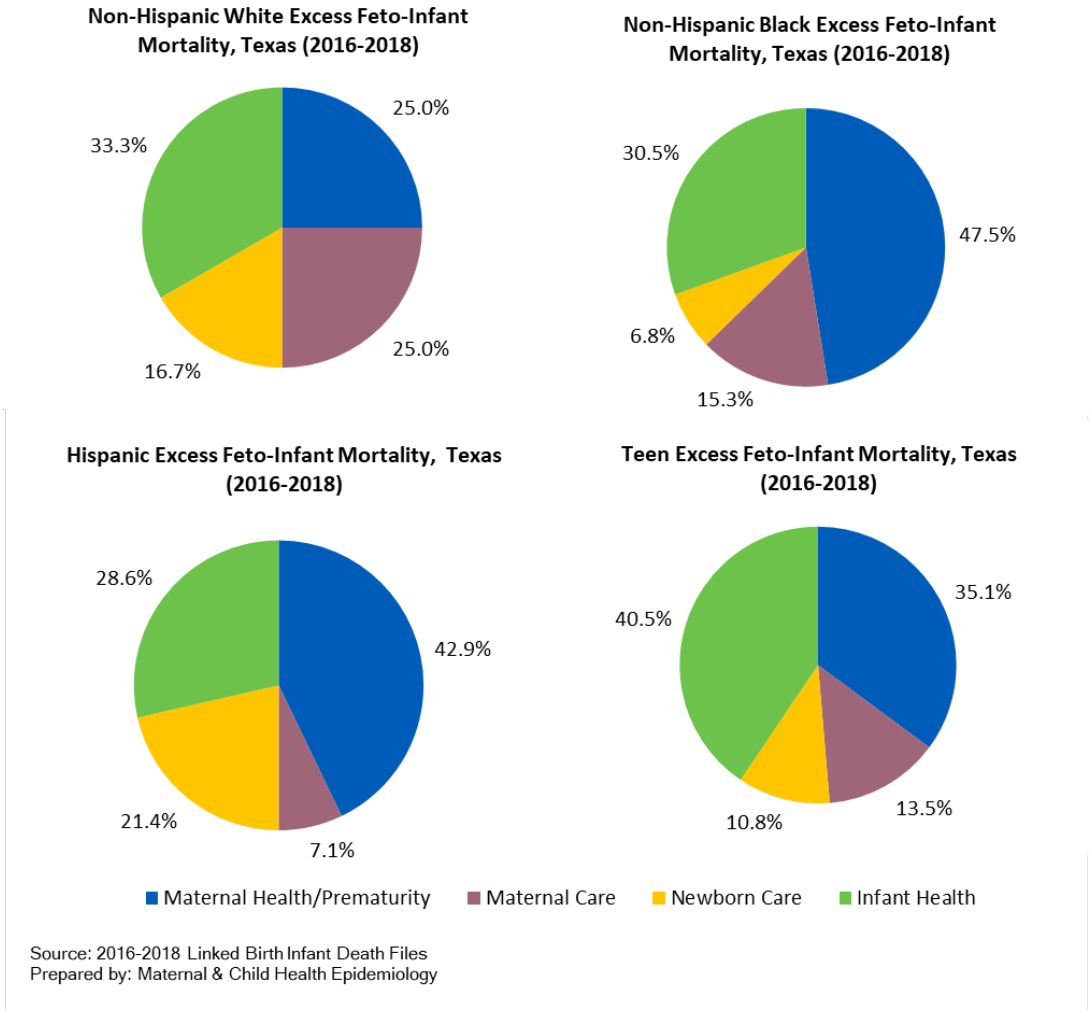
Figure 20: Excess F-IMR by Risk Period and Study Population, 2016-2018



*N is the number of excess fetal and infant deaths for each of the groups shown.
Source: 2016-2018 Linked Birth Infant Death Files
Prepared by: Maternal & Child Health Epidemiology

Non-Hispanic Black mothers had the highest excess F-IMR for all four Risk Periods when compared to other racial/ethnic groups (**Figure 20**), with 57.2 percent of all non-Hispanic Black fetal and infant deaths being potentially preventable (i.e., excess fetal and infant deaths). The percentage of potentially preventable deaths was 46.6 percent for teen mothers, 25.1 percent for Hispanic mothers, 21.7 percent for non-Hispanic White mothers, and 29.9 percent for the state (data not shown). Most of the excess deaths were in the MHP Risk Period (any deaths occurring with a birth weight below 1,500 grams) for Hispanic and non-Hispanic Black mothers, while the MHP Risk Period and IH Risk Period were highest for teens and non-Hispanic White mothers. For non-Hispanic Black mothers, 47.5 percent of the overall excess fetal and infant deaths occurred in the MHP Risk Period. For teen mothers, 75.6 percent of excess feto-infant deaths occurred in the Maternal Health (35.1 percent) and IH (40.5 percent) Risk Periods combined (**Figure 21**).

Figure 21: Percent of Excess F-IMR per Risk Period within Study Populations, 2016-2018



Phase II Analysis

Phase I Analysis found the MHP and the IH Risk Periods as the periods with the highest excess mortality for the overall population, with the highest rates among non-Hispanic Black and teen mothers. These two Risk Periods were explored further during the Phase II Analysis to identify contributing factors to excess mortality to guide intervention strategies.

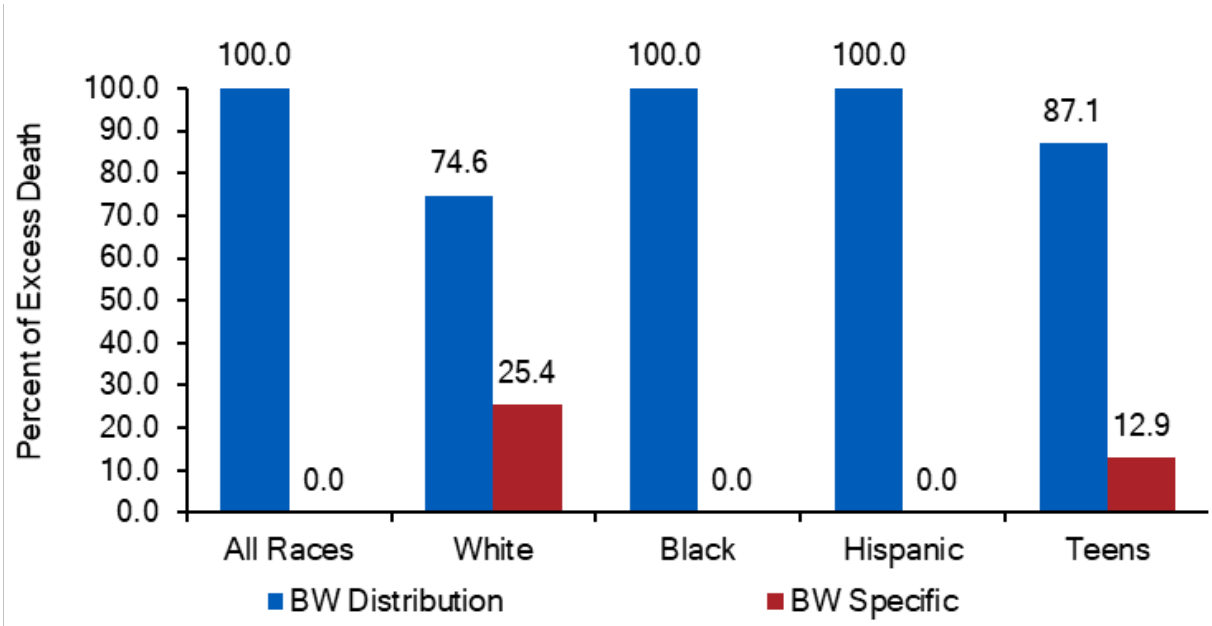
Analysis of Maternal Health / Prematurity Risk Period

For fetal and infant deaths during the MHP Risk Period, a Kitagawa analysis was conducted for each study population. Kitagawa analysis indicates whether excess mortality in this Risk Period was primarily due to a greater number of very low birth weight (VLBW) (defined as infants weighing less than 1,500 grams at birth) in the study population compared to the reference group (a difference in birth weight distribution) or to a higher mortality rate of VLBW infants in the study population compared to the VLBW infants in the reference group (a difference in birth weight specific mortality). These analyses are used to determine if excess feto-infant mortality occurred because of the greater number of VLBW infants in the study population compared to the reference group or because VLBW infants died at higher rates compared to the reference group.

This distinction is important because each situation requires different preventative measures. If there are excess deaths due to a higher number of VLBW infants being born, intervention methods should focus on preventing VLBW. If excess deaths occur for VLBW infants in a study population compared to the reference population, interventions should focus on improving care for VLBW infants in the study population. The percentage of excess deaths attributable to a difference in birth weight distribution (higher number of VLBW infants born) compared with the percentage attributable to a difference in birth weight specific mortality rates are shown in **Figure 22** for each study population.

For all populations examined, the majority of excess MHP Risk Period deaths were attributed to a greater number of VLBW births (birth weight distribution) in these groups when compared to the reference population. Notably, for the total, non-Hispanic Black, and Hispanic populations, mortality rates among VLBW births were not higher compared to the reference population. For these subgroups, all excess deaths (100 percent) were potentially attributable to a greater number of VLBW births (Figure 22). For all study populations, but especially for infants born to non-Hispanic Black and teen mothers (who had the highest excess infant mortality rates in this Risk Period), interventions focused on reducing the number of VLBW births are likely to be most effective at closing the gap in feto-infant mortality. For infants born to non-Hispanic White mothers and teens, a small proportion of excess feto-infant death was attributed to a higher mortality rate among VLBW births than the reference population.

Figure 22: Percent of Excess Death Attributable to Birth Weight (BW) Distribution vs. BW Specific Mortality, 2016-2018



Source: 2016-2018 Linked Birth Infant Death Files
Prepared by: Maternal & Child Health Epidemiology

Birth Weight Distribution

To examine differences in birth weight distribution during the MHP Risk Period, 1) a multivariable logistic regression analysis was conducted to identify factors associated with risk of delivering a VLBW baby, 2) the population attributable risk (PAR) percentages were calculated to determine attributable risk, and 3) adjusted risk ratios (ARR) were calculated with 95 percent CIs to determine the risk of VLBW associated with each risk factor.

Factors examined in the regression models included maternal demographic factors (race, ethnicity, age, and education), smoking during pregnancy, high parity (a high number of births for a mother's age), previous preterm birth, infections, maternal weight gain during pregnancy, adequacy of prenatal care, trimester when prenatal care began, multiple gestations, and expected delivery payment source as indicated by the birth certificate. Although multiple gestation and payment source for delivery were included in the model and were often significantly correlated with VLBW they were not discussed in the results. Multiple gestation was included as a control variable rather than a point of intervention and payment source was not included due to limitations of the birth certificate data. Some of the variables included in this analysis are modifiable and/or known to have direct influences on birth outcomes, such as smoking during pregnancy. Other variables, such as race and ethnicity, are not modifiable or do not directly impact birth outcomes due to biological factors, but serve as a proxy for other risk factors. Other variables, such as lack of first trimester prenatal care access, may have both direct effects on birth outcomes and serve as a proxy for other risks.

For the whole population (and controlling for multiple gestation), VLBW was associated with gestational weight gain under 15 pounds (ARR 2.66, CI: 2.51-2.82), non-Hispanic Black race/ethnicity (ARR: 2.04, CI: 1.88-2.20), inadequate prenatal care (ARR: 2.28, CI: 2.10-2.46), and previous preterm birth (ARR:2.58, CI: 2.31-2.84). VLBW deliveries were mostly attributed to gestational weight gain under 15 pounds (PAR: 19.3 percent) and inadequate prenatal care (PAR: 19.1 percent), followed by non-Hispanic Black race/ethnicity (PAR 11.2 percent), and previous preterm birth (PAR: 4.6 percent).

Excess deaths associated with birth weight distribution were seen for all study populations, but the non-Hispanic Black population and teens experienced the most excess mortality during this period of risk. For all study populations, factors associated with increased prevalence of VLBW births compared to the reference population included maternal weight gain less than 15 pounds, high parity, and inadequate prenatal care and lack of first trimester prenatal care. Increased VLBW prevalence was associated with having a previous preterm birth among non-Hispanic Black, Hispanic, and non-Hispanic White mothers. VLBW prevalence was associated with smoking and maternal weight gain over 40 pounds among non-Hispanic White mothers.

Infant Health Risk Period Analysis

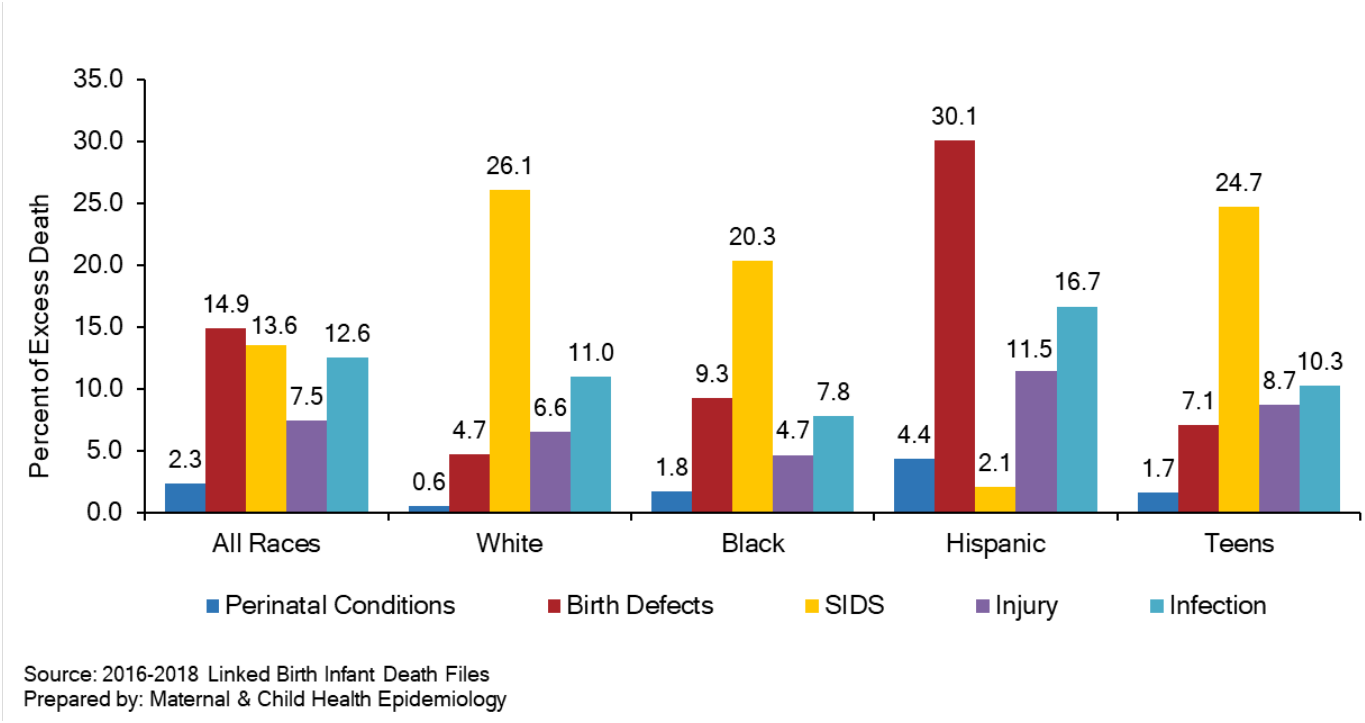
The Phase II Analysis of the IH Risk Period identified risk factors associated with infant death among infants 28-364 days and the PAR percentages were calculated to determine attributable risk. Maternal demographic factors, smoking during pregnancy, adequacy of prenatal care, breastfeeding status at hospital discharge, and which trimester prenatal care began were all examined. Some variables analyzed directly impact infant health outcomes, such as smoking, while other variables, such as race and ethnicity, are proxies for other risk factors.

Maternal risk factors for infant mortality in this period increased by having less than 12 years of education (ARR: 1.29, CI: 1.06-1.52), non-Hispanic Black race and ethnicity (ARR: 1.86, CI: 1.45-2.28), inadequate prenatal care (ARR: 1.53, CI: 1.21-1.86), not breastfeeding by the time of hospital discharge (ARR: 1.68, CI: 1.35-2.00), and smoking (ARR: 1.75, CI: 1.21-2.28). Risk of infant death in this period was mostly attributed to having less than 12 years of education (PAR: 11.5 percent), non-Hispanic Black race or ethnicity of the mother (PAR 9.4 percent), not breastfeeding (PAR: 7.4 percent), and inadequate prenatal care (PAR: 8.8 percent) (data not shown).

Primary causes of death were analyzed for this Risk Period. **Figure 23** shows the percent of excess deaths (i.e., deaths occurring at higher rates compared to the reference population) by cause for the populations analyzed. Among all infant deaths in the IH Risk Period, congenital anomalies and birth defects were the primary causes of death, accounting for 14.9 percent of excess deaths (**Figure 23**). Birth defects contributed to 30.1 percent of excess mortality among Hispanic infants, driving the leading cause for the state because nearly half of births in Texas are within the Hispanic population (**Figure**

23). However, SIDS was the leading cause of death for infants of non-Hispanic Black (20.3 percent), non-Hispanic White (26.1 percent), and teen mothers (24.7 percent).

Figure 23: Excess Infant Health-Related Death by Race and Ethnicity and Cause, 2016-2018



Source: 2016-2018 Linked Birth Infant Death Files
Prepared by: Maternal & Child Health Epidemiology

Summary of Phase II Analysis

Phase II of this analysis investigated two periods of risk identified in Phase I as having the most excess deaths: MHP Risk Period and the IH Risk Period. The highest percentage of excess infant mortality in both Risk Periods were seen among the non-Hispanic Black population followed by teens.

In the MHP Risk Period, birth weight distribution (i.e., a greater number of births to VLBW infants) was the primary risk across all populations studied. Therefore, programming aimed at reducing VLBW births is expected to have the greatest impact in preventing infant mortality for this Risk Period. For all study populations (non-Hispanic White, non-Hispanic Black, Hispanic, and teen), excess mortality due to higher numbers of VLBW infant factors included weight gain less than 15 pounds, inadequate prenatal care, and high parity. Previous preterm birth was a relevant risk factor for all study populations except for teens. Non-Hispanic White mothers had additional risks associated with smoking during pregnancy and gestational weight gain over 40 pounds.

In the IH Risk Period, most excess infant deaths were seen among non-Hispanic Black mothers and teen mothers and SIDS was identified as the leading contributor to excess mortality for these populations. Among the whole population, birth defects were a primary contributor to excess mortality in this Risk Period (related to the high prevalence of this cause of death among the Hispanic population).

PPOR Analysis Regional Summaries

PPOR analysis was also conducted for border and non-border counties, urban and rural areas, and for the eight Texas public health regions (PHRs) for 2016-2018. Below is a summary for each analysis. All CIs are calculated at 95 percent and all F-IMR rates are given as the number of fetal and infant deaths per 1,000 live births and fetal deaths.

Border and Non-Border Counties: The Texas-Mexico border area contains 32 Texas counties that fall within 100 kilometers of the U.S.-Mexico border line. Phase I analysis for the border counties showed the F-IMR was 5.2 and the excess feto-infant mortality rates were highest for the IH Risk Period (0.5), followed by the MHP Risk Period (0.4). In the IH Risk Period, birth defects were the leading cause of excess death (25.8 percent) followed by infection (18.7 percent). Risk of infant death in this period increased with mothers not breastfeeding (ARR: 1.85, CI: 0.81-2.89, $p<0.03$), and 9.9 percent of deaths were attributable to this risk factor.

The PPOR non-border area analysis includes the remaining 222 Texas counties that do not fall within 100 kilometers of the U.S.-Mexico border line, were similar to the whole state. The overall non-border F-IMR was 6.0 fetal and infant deaths per 1,000 live births. The MHP Risk Period had the highest overall excess mortality rate overall (0.8) and among the non-Hispanic Black population (2.7). Birth weight distribution was the primary contributor of excess death in this Risk Period. Controlling for multiple gestations, risk factors associated with VLBW births included gestational weight gain under 15 pounds (ARR:

2.68, CI: 2.51-2.85), inadequate prenatal care (ARR: 2.29, CI: 2.11, 2.48), non-Hispanic Black race/ethnicity (ARR: 2.02, CI: 1.86-2.18), and previous preterm birth (ARR: 2.48, CI: 2.20, 2.75). VLBW births were mostly attributed to inadequate prenatal care (PAR: 19.32 percent) and gestational weight gain under 15 pounds (PAR: 18.65 percent), followed by non-Hispanic Black race/ethnicity (PAR: 12.10 percent) and previous preterm birth (PAR: 4.29 percent) when compared to the reference group.

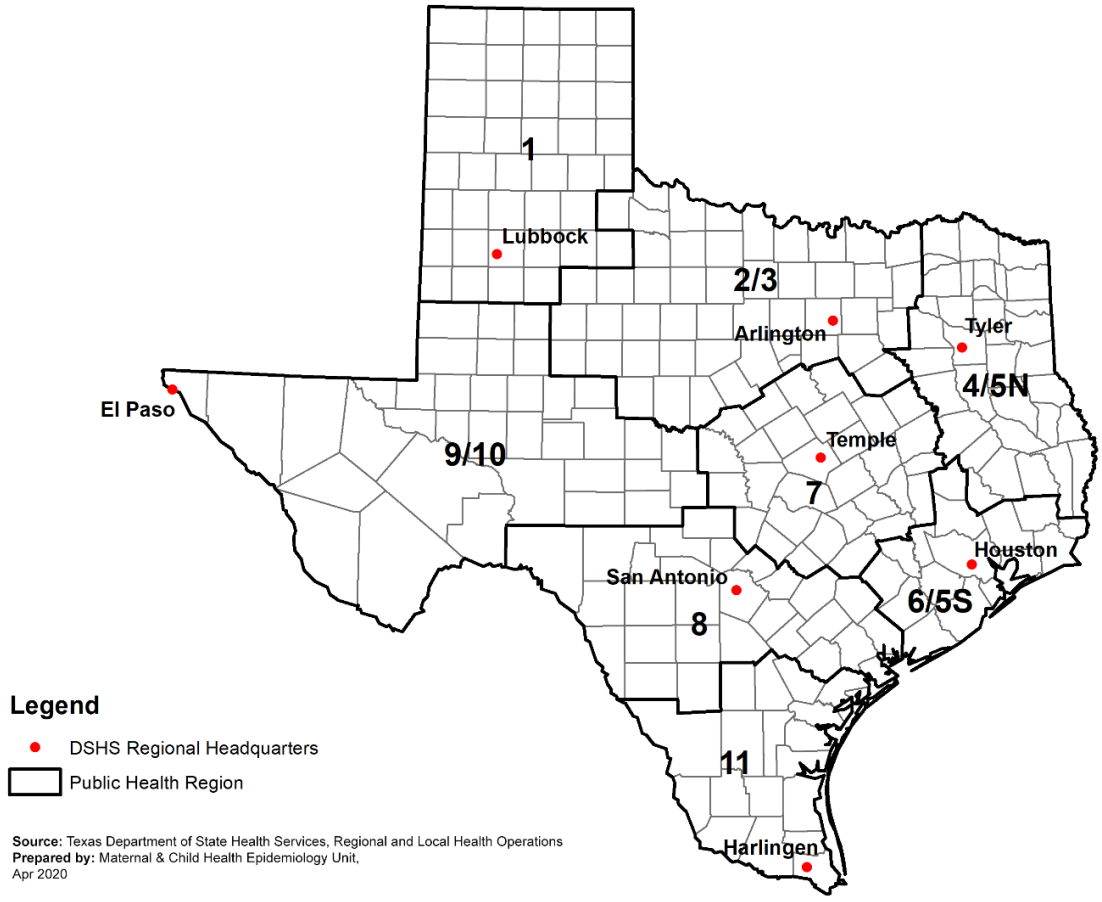
Urban and Rural Counties: In urban Texas counties, the F-IMR was 5.9 and the non-Hispanic Black population had the highest excess mortality rate at 6.0 and the highest rates of excess deaths occurred in the MHP Risk Period. During this period, the rate of excess death was 0.8 for the total population and 2.8 for the non-Hispanic Black population. For both the total population and the non-Hispanic Black population, all excess deaths during the MHP Risk Period were attributable to birth weight distribution (i.e., a high prevalence of VLBW deliveries rather than high mortality rates among VLBW deliveries).

For urban counties (and controlling for multiple gestations), the following factors are associated with increased risk of delivering a VLBW baby: gestational weight gain under 15 pounds (ARR: 2.67, CI: 2.50-2.84), non-Hispanic Black race/ethnicity (ARR: 2.02, CI: 1.85-2.19), having a previous preterm birth (ARR:2.65, CI: 2.36-2.93), and inadequate prenatal care (ARR: 2.28, CI: 2.10-2.47). Weight gain under 15 pounds (PAR: 19.2 percent) and inadequate prenatal care (PAR: 19.5 percent) were the risk factors most attributed to VLBW.

In rural Texas counties, the F-IMR was 6.0 and the IH Risk Period had the highest excess mortality at 0.8. In these counties, birth defects were the leading cause of infant death (20 percent). Of the factors studied, maternal education of less than 12 years attributed most to the risk of infant death in this period (PAR 34.7 percent), almost doubling the risk (ARR:1.99, CI: 0.95-3.02, $p<0.01$).

Public Health Regions: A PPOR analysis was conducted for the eight Texas PHRs, shown in **Figure 24**. Main findings are summarized for each region.

Figure 24: Texas Public Health Regions



Public Health Region 1 (Texas Panhandle): For PHR 1, the non-Hispanic White, non-Hispanic Black, Hispanic, and teen populations were not analyzed individually because of small sample size (fewer than 60 deaths), but were included in the total population. The F-IMR was 6.9 and the excess F-IMR was 2.8. The MHP Risk Period had the highest excess death rates for the total population (1.0). For the IH Risk Period, birth defects were the leading cause of excess death (17.0 percent). The risk of infant death in the IH Risk Period was most attributable to no breastfeeding in hospital (PAR: 15.8 percent).

Public Health Region 2/3 (North Texas): For PHR 2/3, the F-IMR was 6.1 and the non-Hispanic Black population had the highest excess mortality rate at 5.4, followed by teens at 4.0. For both the total population and non-Hispanic Black subgroup, the MHP Risk Period had the highest excess death rate. In the teen population, the IH Risk Period had the highest excess mortality rate of 2.0. Birth weight distribution (i.e., a high prevalence of VLBW deliveries rather than high mortality rates among VLBW deliveries) was the primary driver of deaths for this Risk Period for the total population and all subgroups

other than non-Hispanic White. For the MHP Risk Period, 59.3 percent of deaths were attributed to birth weight specific mortality.

In this region, non-Hispanic Black mothers had over twice the risk of VLBW deliveries compared to non-Hispanic White mothers (ARR: 2.10, CI: 1.97-2.43) and 15.5 percent of the VLBW births were attributable to this risk factor. Other factors associated with an increased risk of VLBW deliveries included inadequate prenatal care (PAR: 10.3 percent) (ARR: 1.84, CI: 1.62-2.05), gaining less than 15 pounds during pregnancy (PAR: 17.3 percent) (ARR: 2.85, CI: 2.60-3.10), and having a previous pre-term birth (PAR: 4.2 percent) (ARR: 2.81, CI: 2.38-3.24).

Public Health Region 4/5N (Northeast Texas): For PHR 4/5N, the total and non-Hispanic White populations met the criteria to be included in the PPOR analysis. The F-IMR was 6.6 and the excess F-IMR was 2.5. For the total population, the IH Risk Period had the highest excess death rate. In the IH Risk Period, SIDS was the leading cause of excess deaths (19.0 percent). Inadequate prenatal care increased the risk of infant death for this period (ARR: 1.81, CI: 0.26-3.36) and was the highest attributable factor (PAR: 9.8 percent).

Public Health Region 6/5S (Southeast Texas): For PHR 6/5S, the F-IMR was 6.1 and the non-Hispanic Black population had the highest excess mortality rate at 6.7. For this subgroup and for the total population, the Maternal Health/Prematurity Risk Period had the highest excess death rate at 1.0 and 3.1, respectively, and birth weight distribution (i.e., a high prevalence of VLBW deliveries rather than high mortality rates among VLBW deliveries) was the primary driver of deaths for the whole population and all study populations. Controlling for multiple births, risk factors associated with having a VLBW delivery were gestational weight gain under 15 pounds (ARR: 2.88, CI:2.55-3.20), non-Hispanic Black race/ethnicity (ARR: 1.74, CI 1.49-1.99), having a previous preterm birth (ARR: 2.78, CI:2.24-3.33), and inadequate prenatal care (ARR: 2.42, CI: 2.07-2.76). Gestational weight gain under 15 pounds (PAR: 22.6 percent) and inadequate prenatal care (PAR: 25.6 percent) were the risk factors most attributed to VLBW.

Public Health Region 7 (Central Texas): For PHR 7, the total population F-IMR was 5.1 and the excess F-IMR was 1.0. The non-Hispanic Black population had the highest excess mortality rate at 4.6. For the total population and the non-Hispanic Black population, the MHP Risk Period had the highest excess death rate at 0.4 and 2.0, respectively. Birth weight distribution (i.e., a high prevalence of VLBW deliveries rather than high mortality rates among VLBW deliveries) was the primary driver of deaths for all populations. Controlling for multiple births, gestational weight gain under 15 pounds tripled the risk of having a VLBW delivery (ARR: 3.04, CI: 2.44-3.64), and non-Hispanic Black race/ethnicity doubled the risk (ARR: 2.30, CI: 1.71-2.90). VLBW deliveries were mostly attributable to gestational weight gain under 15 pounds (PAR: 19.6 percent), followed by non-Hispanic Black race/ethnicity (PAR: 12.0 percent).

Public Health Region 8 (South Central Texas): For PHR 8, the total and Hispanic population met the criteria to be included in the PPOR analysis. The overall F-IMR was 6.1 and the excess F-IMR was 2.0. Although the excess mortality rate was lower for the

Hispanic population (1.9), 58.8 percent of the excess deaths were within this population. For the overall population, the MHP Risk Period had the highest excess death rate at 0.7. Birth weight distribution (i.e., a high prevalence of VLBW deliveries rather than high mortality rates among VLBW deliveries) was the primary driver of deaths for all populations. Controlling for multiple births, gestation weight gain under 15 pounds doubled the risk of having a VLBW delivery (ARR:2.38, CI: 1.92-2.84) and had the highest PAR (18.0 percent). Other risk factors associated with VLBW deliveries in this period included Hispanic race/ethnicity (ARR: 1.41, CI: 1.06-1.75), inadequate prenatal care (ARR: 1.94, CI:1.43-2.44), and having a previous preterm birth (ARR: 1.75. CL:1.08-2.43).

Public Health Region 9/10 (West Texas): For PHR 9/10, the non-Hispanic White, non-Hispanic Black, Hispanic, and teen populations were not analyzed individually because of small sample size (fewer than 60 deaths), but were included in the total. The F-IMR was 5.0 and the excess F-IMR was 0.9. The IH Risk Period had the highest excess death rates for the total population (0.5). In the IH Risk Period, birth defects were the leading cause of excess death (26 percent). Deaths in the MHP Risk Period were primarily driven by high prevalence of VLBW deliveries.

Public Health Region 11 (South Texas): For PHR 11, the total and Hispanic population met the criteria for PPOR analysis. The F-IMR was 5.4 and the excess F-IMR was 1.3. The IH Risk Period had the highest rate of excess deaths at 0.7. Infections (32.2 percent) were the leading cause of excess deaths for the IH Risk Period, followed by birth defects (23.7 percent). Not breastfeeding (ARR: 2.83, CI: 1.27-4.39) doubled the risk of infant death in this period and had a PAR of 19.6 percent.

Infant Health Practices

Breastfeeding

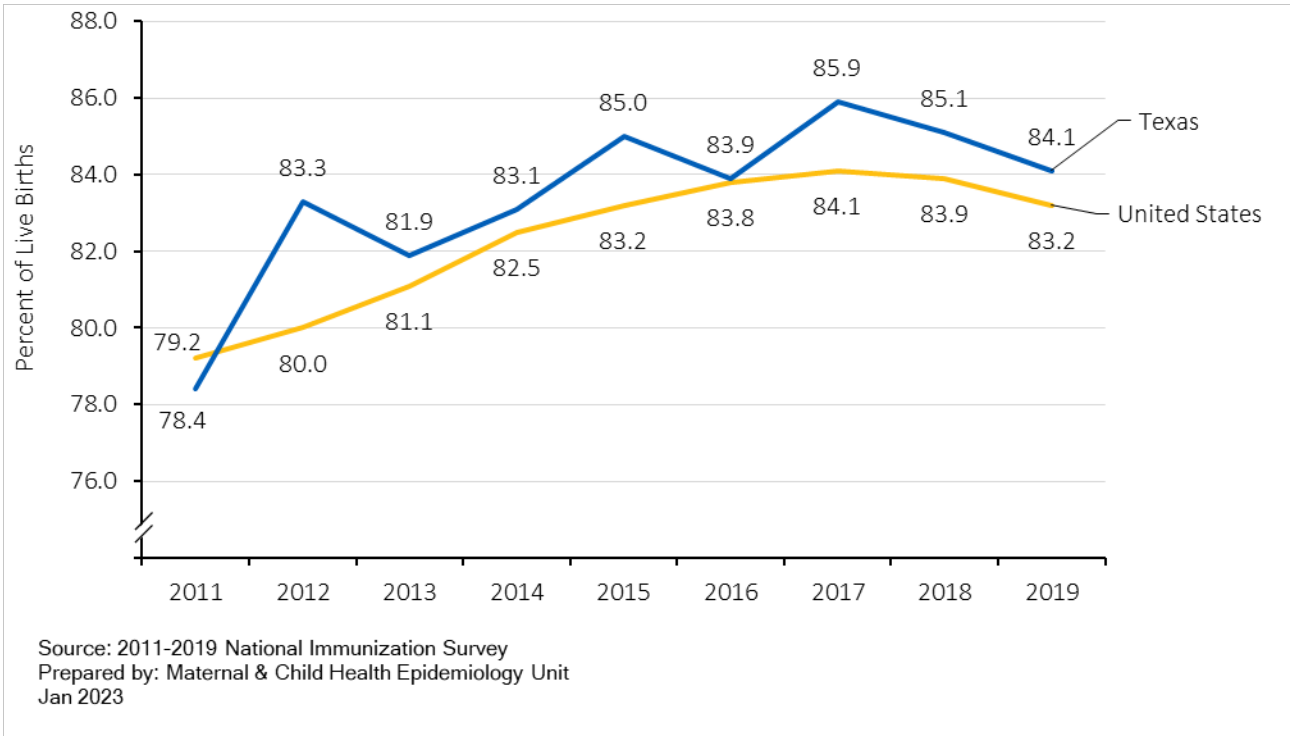
Breastmilk contains essential nutrients, antibodies, and other properties that support infant growth, development, and protection from disease. For the child, suboptimal breastfeeding is associated with a higher risk of SIDS, necrotizing enterocolitis, lower respiratory infections, chronic diseases (such as asthma, obesity, and type 2 diabetes), and other poor health outcomes.[24,25] For the mother, reduced exclusive breastfeeding time and shorter breastfeeding duration are associated with increased population risk for maternal breast and ovarian cancers, diabetes, hypertension, cardiovascular disease, and other poor maternal health outcomes.[26,27,28,29]

Breastfeeding Initiation

According to the NIS, in 2019, 84.1 percent (95 percent CI: 80.5-87.7) of infants born in Texas were ever breastfed (**Figure 25**).[30] The 2019 national rate was 83.2 percent (95 percent CI: 82.2-84.2) (**Figure 25**).

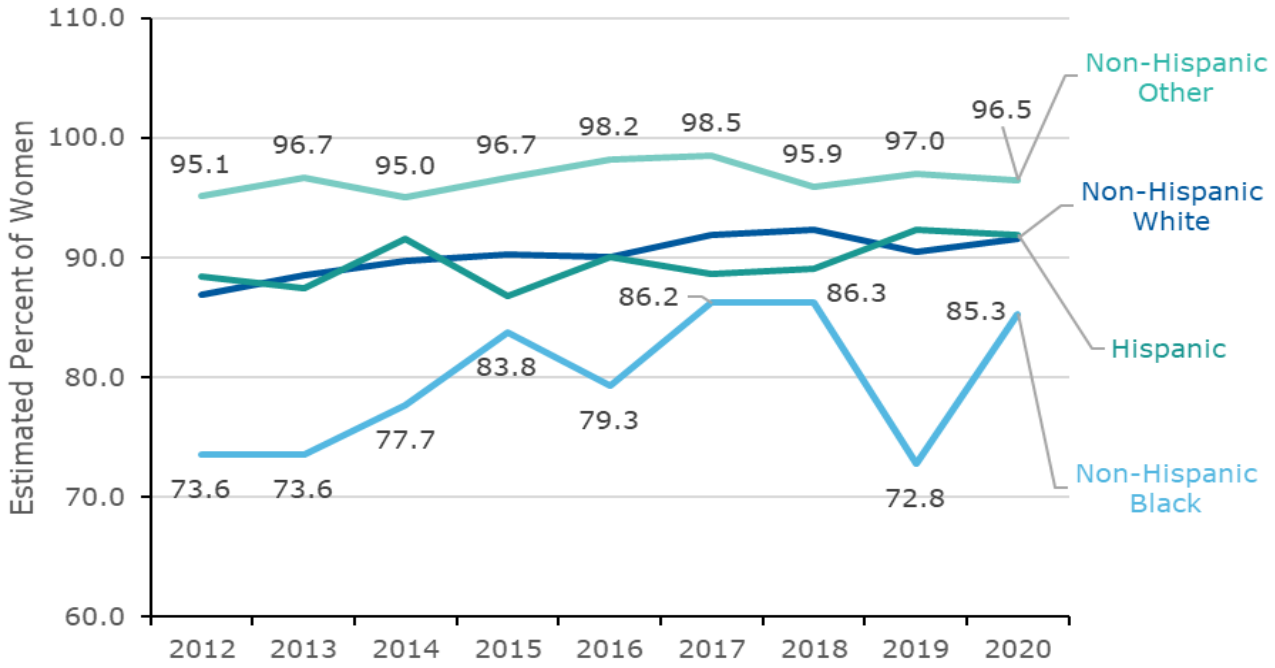
[24] Bartick, M., & Reinhold, A. (2010). The burden of suboptimal breastfeeding in the United States: a pediatric cost analysis. *Pediatrics*, *125*(5), e1048-e1056.
[25] Section on Breastfeeding. Breastfeeding and the use of human milk. (2012) *Pediatrics.;129(3*), e827-41.
[26] World Health Organization. Breastfeeding. Retrieved from **who.int/health-topics/breastfeeding#tab=tab_1** [Accessed March 28,2022].
[27] Crowe, S. D., & Hanley, L. E. (2018). Optimizing Support for Breastfeeding as Part of Obstetric Practice. *Obstetrics and Gynecology*, *132*(4), E187-E196.
[28] Johnston M, Landers S, Noble L, Szucs K, Viehmann L (2012). Breastfeeding and the Use of Human Milk. Section on Breastfeeding. *Pediatrics Mar* 2012, 129(3) DOI: 10.15422/peds.2011-3552.
[29] Breastfeeding Challenges: ACOG Committee Opinion Summary, Number 820. (2021) *Obstet Gynecol.137(2)*, 394-395.
[30] Centers for Disease Control and Prevention (CDC, 2020). Rates of Any and Exclusive Breastfeeding by State among Children Born in 2018. Retrieved from **cdc.gov/breastfeeding/data/nis_data/rates-any-exclusive-bf-by-state-2018.htm** [Accessed March 28, 2022].

Figure 25: Percent of Infants Ever Breastfed in Texas and the United States, NIS 2011-2019



According to the Texas PRAMS survey, significant racial or ethnic disparities exist in the rate of women who have ever breastfed their infant. 2020 PRAMS survey data found non-Hispanic Black mothers reported lower rates of ever breastfeeding than mothers of other races or ethnicities (**Figure 26**). The most common reason women gave for not ever breastfeeding was not wanting to breastfeed (36.9 percent), followed by not liking breastfeeding (21.3 percent), breastfeeding being too difficult (18.0 percent), and going back to work (12.7 percent) (data not shown).

Figure 26: Women Who Ever Breastfed Their Baby by Race and Ethnicity, Texas PRAMS 2012-2020



Note: Error bars not shown to improve readability. See Appendix B, Table B-4 for point estimates and confidence intervals.
Source: 2012-2020 Texas PRAMS
Prepared by: Maternal & Child Health Epidemiology Unit
Jan 2023

The Texas WIC IFPS showed similar results for breastfeeding initiation by race and ethnicity. According to the most recent data (2018), non-Hispanic Black infants were least likely to receive only breastmilk and most likely to receive only formula while at the hospital or birthing center. Of women who reported they had ever breastfed their infant, non-Hispanic Black women were the least likely (36.6 percent) and non-Hispanic White women were most likely (47.2 percent) to report breastfeeding or trying to breastfeed in the first hour after delivery. For infants of non-Hispanic Black mothers, their first feeding was less likely to be breastmilk (58.2 percent) compared to infants of non-Hispanic White women (68.8 percent), Hispanic women (69.3 percent), or non-Hispanic Other women (67.3 percent). Of mothers who never initiated breastfeeding, one-third believed formula was as good or better than breastfeeding.[31]

Initiating hospital breastfeeding is an important first step towards exclusive breastfeeding. A Baby-Friendly Hospital, a designation given to birthing facilities that meet international and national recognized maternal and infant care standards for infant feeding care best

[31] Texas Department of State Health Services, Community Health Improvement Division, Maternal and Child Health Section (2019). 2018 Texas WIC Infant Feeding Practices Survey State Report.

practices, provides increased support for initiating hospital breastfeeding. According to 2021 Baby-Friendly USA and CDC data, only 16.9 percent of births in this year occurred in a Texas Baby-Friendly Hospital.[32]

Exclusive and Continued Breastfeeding

Research shows maternal and infant health outcomes are optimized when the baby is exclusively breastfed during the first six months of life and is continued to be breastfed (in combination with the introduction of complementary foods) for at least one to two years after birth.[32,33] While most (84.1 percent) Texas mothers reported ever breastfeeding, fewer mothers reported exclusive breastfeeding.

According to the 2019 NIS, 42.4 percent (95 percent CI: 38.0-46.8) of Texas mothers reported exclusively breastfeeding at three months (**Figure 27**) and 24.0 percent (95 percent CI: 20.3-37.7) reported breastfeeding exclusively at six months (**Figure 28**). In addition, 34.8 percent (95 percent CI: 30.7-38.9) reported any breastfeeding at 12 months (**Figure 29**). The HP 2030 targets aim to increase exclusive breastfeeding at six months to 42.4 percent and any breastfeeding at one year to 54.1 percent.[34,35] The discrepancies between breastfeeding initiation and the percentage of women who continue any and exclusive breastfeeding underscore barriers to maintaining breastfeeding for the recommended duration.

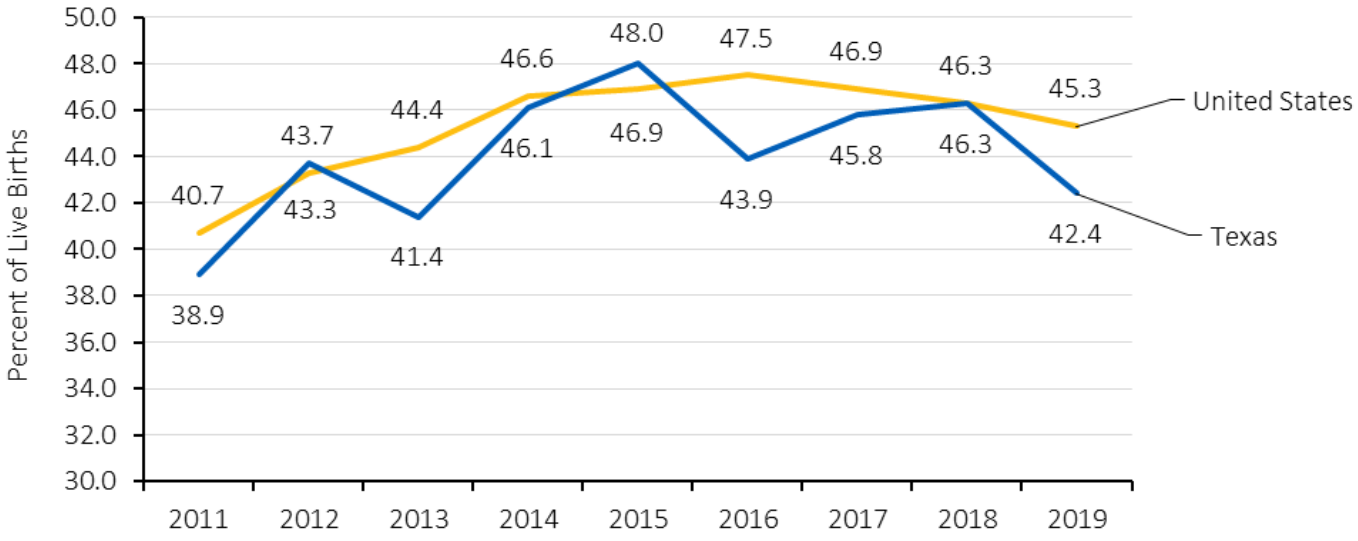
[32] Centers for Disease Control and Prevention. National Center for Chronic Disease Prevention and Health Promotion, Division of Nutrition, Physical Activity, and Obesity. Data, Trend and Maps. Retrieved from **www.cdc.gov/nccdphp/dnpao/data-trends-maps/index.html** [Accessed October 21, 2022].

[33] American College of Obstetricians and Gynecologists. (2016). Optimizing support for breastfeeding as part of obstetric practice. Committee Opinion No. 658. *Obstet Gynecol*, 127(2), e86-e92.

[34] Healthy People 2030, Office of Disease Prevention and Health Promotion, United States Department of Health and Human Services. Increase the proportion of infants who are breastfed exclusively through age 6 months — MICH-15. Retrieved from **health.gov/healthypeople/objectives-and-data/browse-objectives/infants/increase-proportion-infants-who-are-breastfed-exclusively-through-age-6-months-mich-15** [Accessed March 29, 2022].

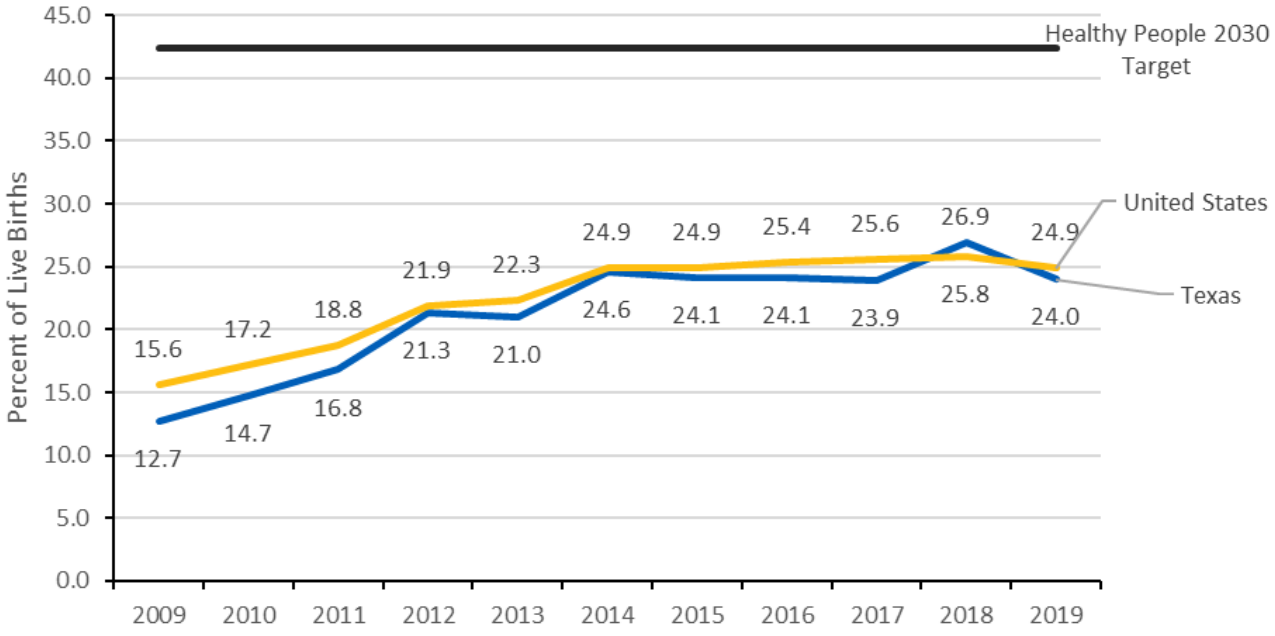
[35] Healthy People 2030, Office of Disease Prevention and Health Promotion, United States Department of Health and Human Services. Increase the proportion of infants who are breastfed at 1 year — MICH-16. Retrieved from **health.gov/healthypeople/objectives-and-data/browse-objectives/infants/increase-proportion-infants-who-are-breastfed-1-year-mich-16** [Accessed March 28, 2022].

Figure 27: Percent of Infants Who Were Exclusively Breastfed Through Three Months in Texas and the United States, NIS 2011-2019



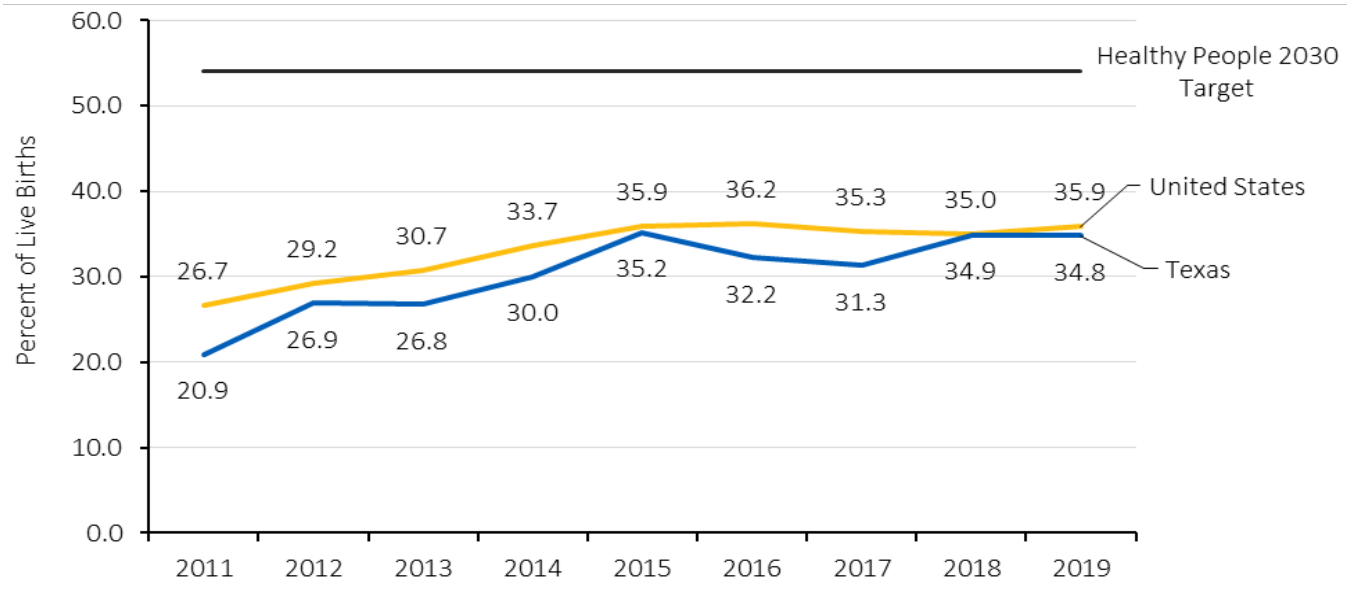
Source: 2011-2019 National Immunization Survey
Prepared by: Maternal & Child Health Epidemiology Unit
Nov 2022

Figure 28: Percent of Infants Who Were Exclusively Breastfed Through Six Months in Texas and the United States, NIS 2011-2019



Source: 2011-2019 National Immunization Survey
Prepared by: Maternal & Child Health Epidemiology Unit
Nov 2022

Figure 29: Percent of Infants Who Were Breastfed for One Year in Texas and the United States, NIS 2011-2019[36]



Source: 2011-2019 National Immunization Survey
Prepared by: Maternal & Child Health Epidemiology Unit
Nov 2022

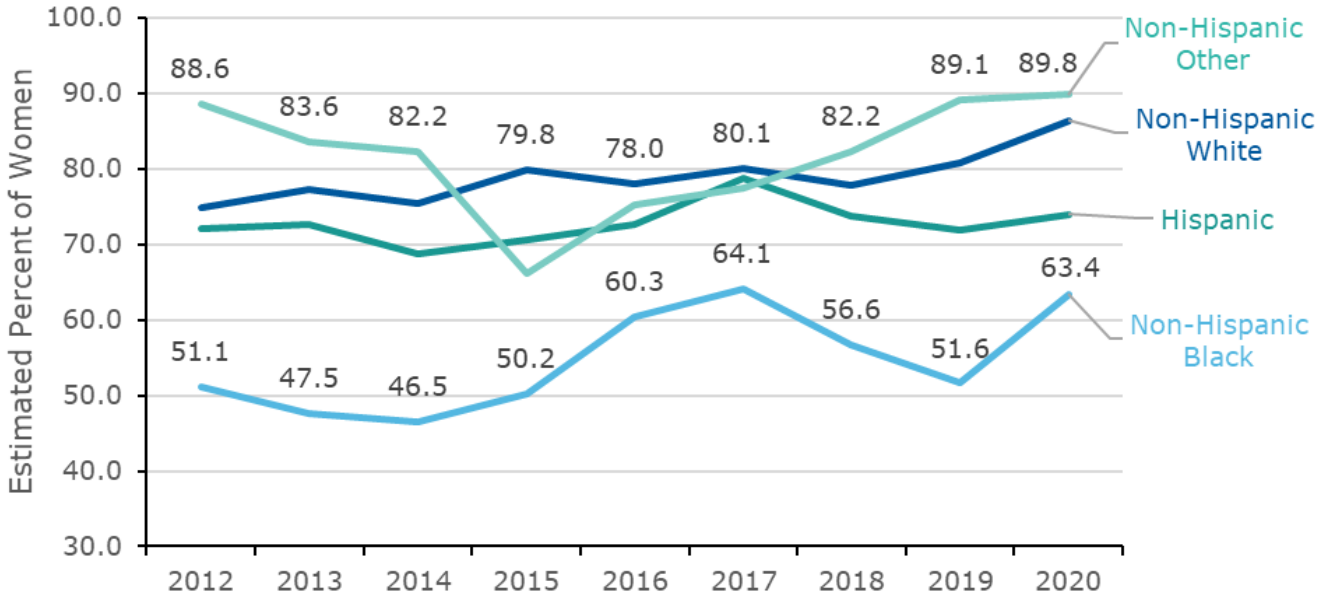
[36] In the 2021 Health Texas Mothers and Babies Data Book, the 2018 rate for the United States was incorrectly recorded as 35.9 percent. The corrected value, 35.0 percent, is shown here.

Safe Sleep

Placing Infants on their Backs to Sleep

Placing an infant on their back to sleep, rather than on their stomach or side, is an important strategy to reduce sleep-related deaths.[37] According to Texas PRAMS data, 78.1 percent of mothers reported placing their infant on their back to sleep in 2020, a 9 percent increase since 2012. Between 2012 and 2020 among racial and ethnic groups, the greatest increase is among non-Hispanic Black mothers (24 percent). The percentage remained significantly lower among non-Hispanic Black mothers in comparison to non-Hispanic White mothers and non-Hispanic mothers of Other races in 2020 (**Figure 30**).

Figure 30: Women Who Reported Placing Infant on Their Back to Sleep by Race and Ethnicity, Texas PRAMS 2012-2020



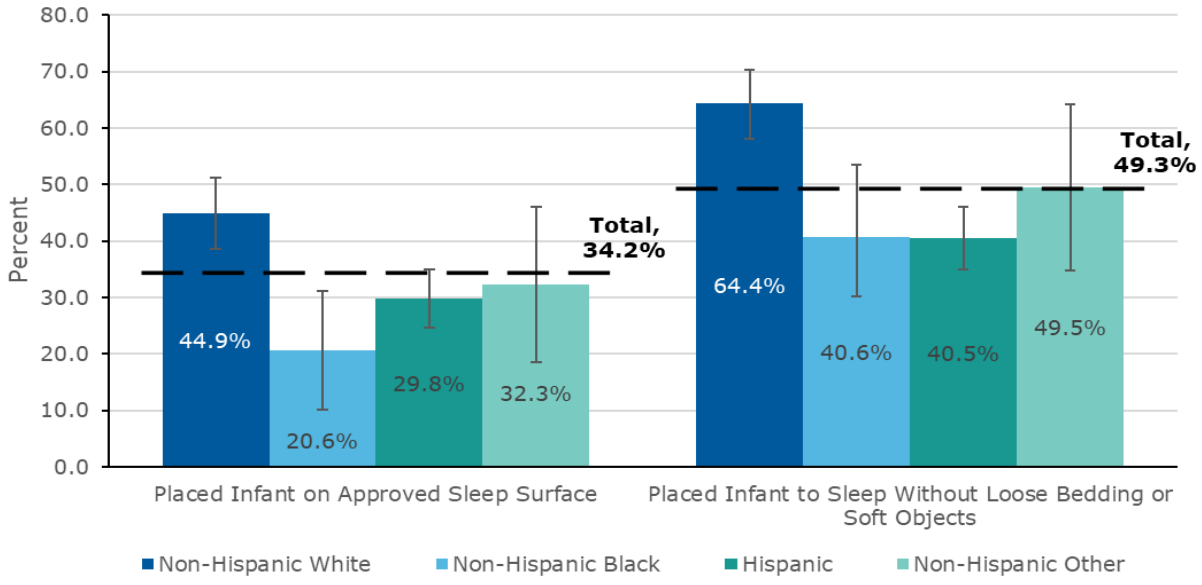
Note: Error bars not shown to improve readability. See Appendix B, Table B-5 for point estimates and confidence intervals.
Source: 2012-2020 Texas PRAMS
Prepared by: Maternal & Child Health Epidemiology Unit
Jan 2023

[37] Moon, R. Y., & TASK FORCE ON SUDDEN INFANT DEATH SYNDROME (2016). SIDS and Other Sleep-Related Infant Deaths: Evidence Base for 2016 Updated Recommendations for a Safe Infant Sleeping Environment. *Pediatrics*, *138*(5), e20162940.

Additional Safe Sleep Practices

Beyond placing infants on their backs to sleep, PRAMS collects data about other sleep safety measures that can reduce unexpected infant death risks during sleep, such as placing infants to sleep on an approved sleep surface (e.g., mattress in a safety-approved crib) and placing infants to sleep without loose bedding or soft objects.[38] Based on 2020 PRAMS data, less than half of Texas mothers reported using each of these safe sleep measures (**Figure 31**). 34.2 percent placed infants to sleep on an approved sleep surface and the percentage was lower among non-Hispanic Black mothers (20.6 percent) compared to Hispanic (29.8 percent), non-Hispanic mothers of Other races or ethnicities (32.3 percent) or non-Hispanic White mothers (44.9 percent). Placing infants to sleep without loose bedding or other soft objects was reported by 49.3 percent of mothers. The highest percentage was among non-Hispanic White mothers (64.4 percent) followed by non-Hispanic Other (49.5 percent) and non-Hispanic Black (40.6 percent), and the lowest percentage was among Hispanic mothers (40.5 percent). The differences between the racial and ethnic groups were statistically significant.

Figure 31: Mothers Who Reported Placing Infant on Approved Sleep Surface to Sleep and Placing Infant to Sleep Without Loose Bedding or Soft Objects by Race and Ethnicity, Texas PRAMS 2020



Error Bars: 95% Confidence Interval
Source: 2020 Texas PRAMS
Prepared by: Maternal & Child Health Epidemiology Unit
Oct 2022

[38] Centers for Disease Control and Prevention. 2023. Helping Babies Sleep Safely. Retrieved from: https://www.cdc.gov/reproductivehealth/features/baby-safe-sleep/index.html#:~:text=Use%20a%20firm%2C%20flat%20(not,be%20more%20comfortable%20while%20sleeping.

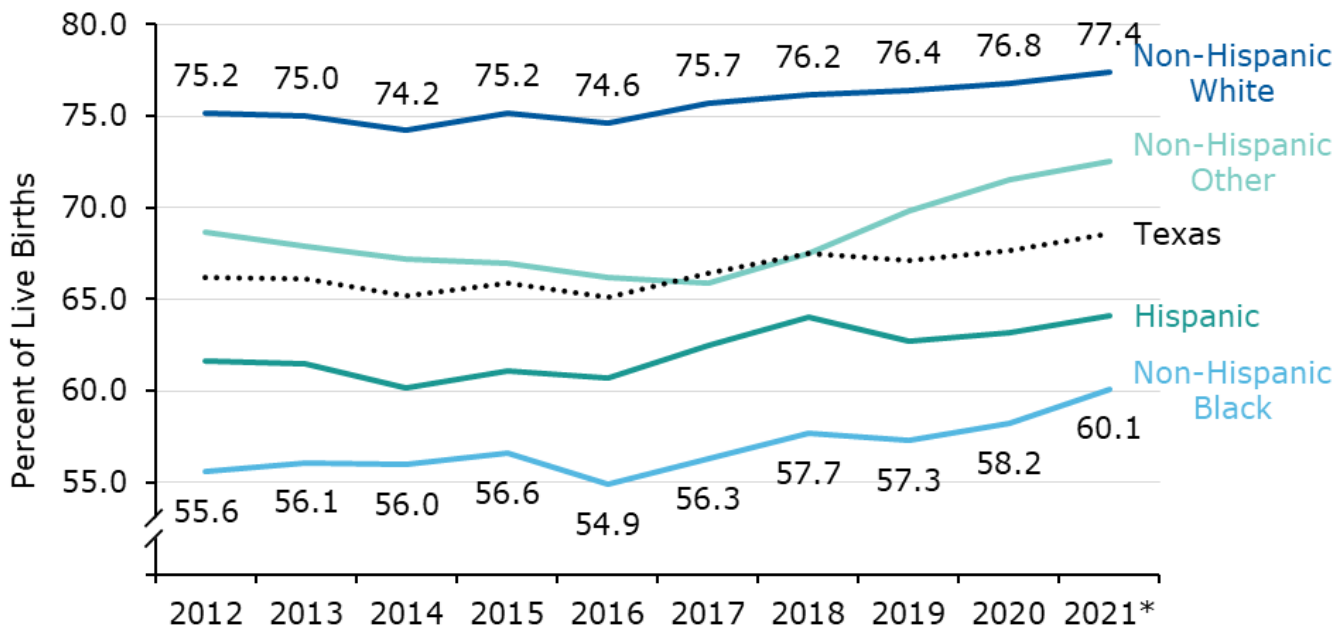
Prenatal, Delivery, and Postpartum Care

Prenatal Care

In 2021, 68.6 percent of Texas mothers entered prenatal care within the first trimester (**Figure 32**). Between 2012 and 2021, mothers of all races and ethnicities had a nonsignificant increase rate of entry into prenatal care during their first trimester (66.2 percent to 68.6 percent) though disparities in early access to prenatal care remained over the last decade. From 2012-2021, a consistently larger percentage of non-Hispanic White women received prenatal care in the first trimester of pregnancy compared to all other racial and ethnic groups. The percentages of Hispanic (61.6 percent to 64.1 percent) and non-Hispanic Black mothers (55.6 percent to 60.1 percent) receiving first trimester prenatal care are consistently below the state average. The proportion of non-Hispanic mothers of Other races or ethnicities who received prenatal care in the first trimester remained similar to the state average across the decade (68.7 percent to 72.5 percent) with percentages above the state average since 2019 (**Figure 32**).

In 2020, Texas had the lowest proportion of women receiving first trimester care compared to other states. Nationally, 76.1 percent of mothers entered prenatal care during the first trimester in 2020 compared to 67.7 percent in Texas.[20]

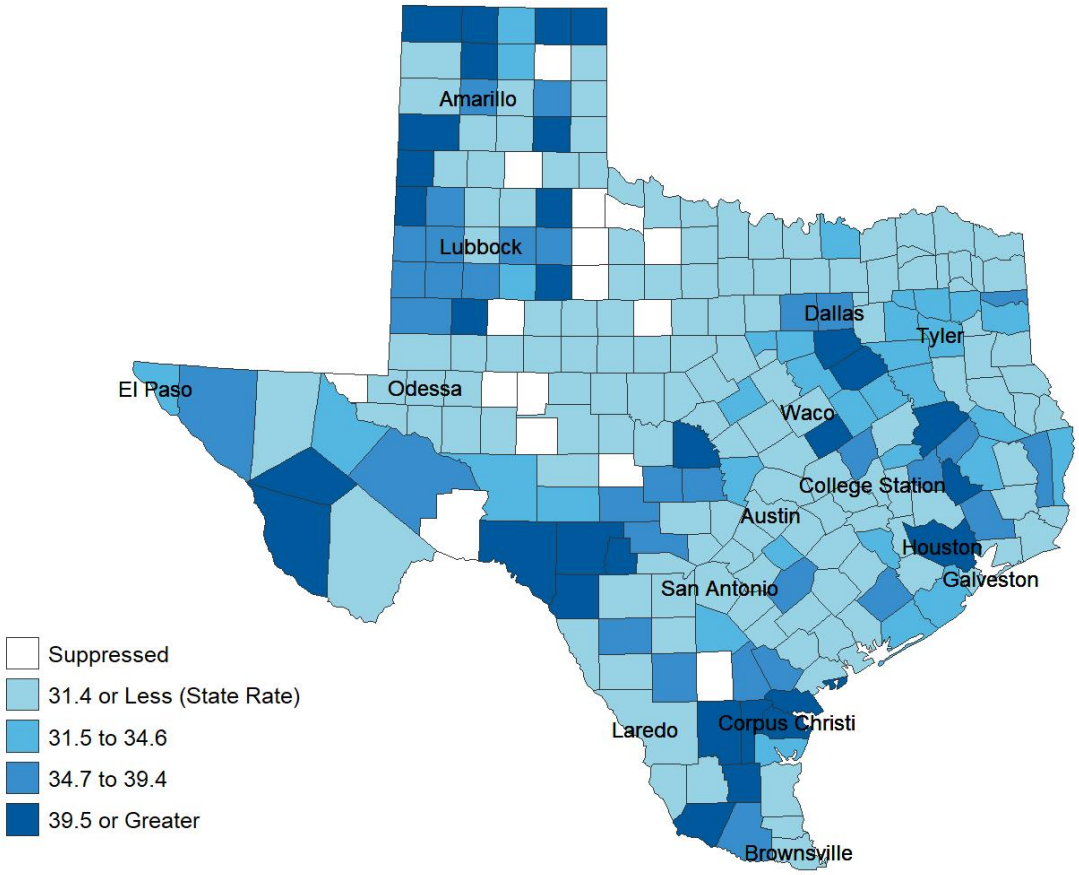
Figure 32: Percent of Live Births Where Mother Received Prenatal Care in the First Trimester by Race and Ethnicity, 2012-2021



*2021 Texas data are provisional
Source: 2012-2021 Birth Files
Prepared by: Maternal & Child Health Epidemiology Unit
Jan 2023

Late entry (after first trimester) into prenatal care is a statewide problem. Over one-third of Texas counties report rates of late prenatal care entry above the state rate of 31.4. In 2021, Kent, Kinney, Duval, Val Verde, Jeff Davis, and Edwards counties reported at least 55 percent of mothers did not enter prenatal care in the first trimester (**Figure 33**).

Figure 33: Percent of Live Births Where Mother Did Not Receive Prenatal Care in the First Trimester (Obstetric Estimate) by County of Residence, 2021



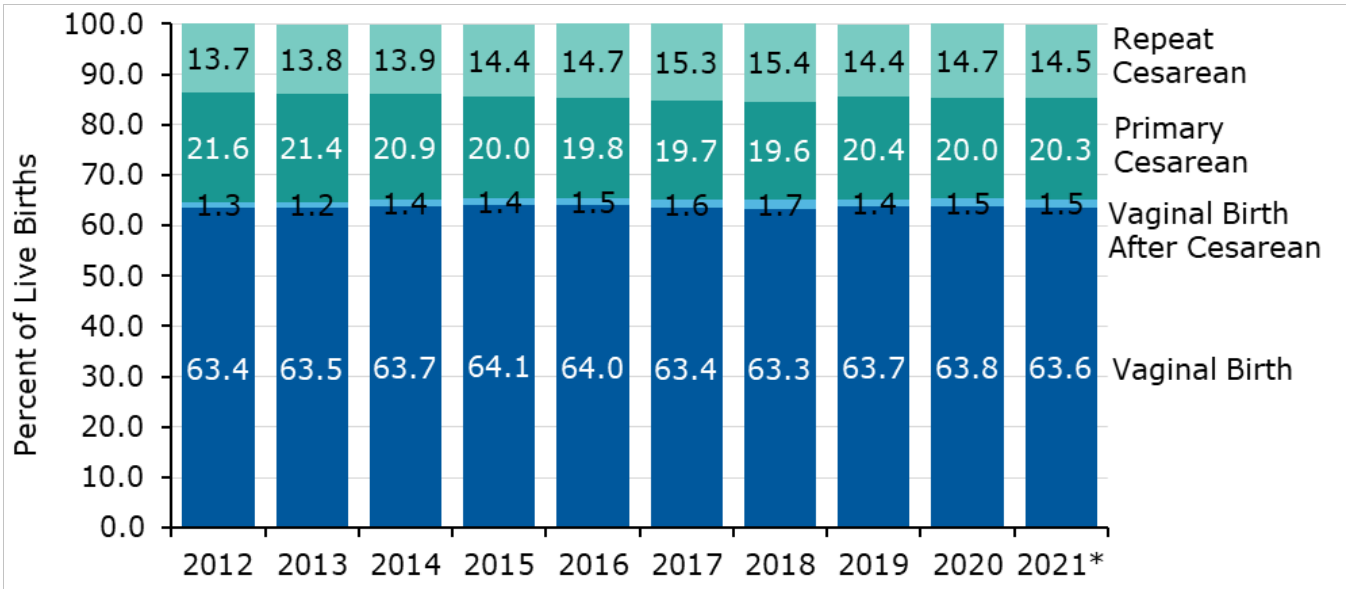
2021 Texas data are provisional
Source: 2021 Live Birth Files, Texas Center for Health Statistics
Prepared by: Maternal & Child Health Epidemiology Unit
Jan 2023

According to Texas PRAMS 2020 survey data, among mothers who reported they did not receive care in the first trimester of their pregnancy, 53.3 percent (95 percent CI: 43.3-63.3) reported they received prenatal care as early as they had wanted. These findings indicate a need for increased education and the importance awareness of obtaining prenatal care starting in the first trimester.

Delivery Method

Texas live birth delivery method remained relatively stable over the past decade (**Figure 34**). In 2021, 65.1 percent of all Texas deliveries were vaginal births and 34.8 percent of deliveries were by cesarean section. Since 2012, the percent of infants born via primary cesarean section decreased slightly (1.3 percent). However, the proportion of infants born via repeat cesarean increased from 13.7 in 2012 to 15.4 in 2018, but it has been less than 15 percent since 2019. In 2021, the Texas cesarean delivery rate (34.8 percent) was higher than the national rate (32.1 percent).[17] In 2021, among Texas low-risk deliveries (defined as a full-term, singleton pregnancy with vertex presentation), 28.3 percent resulted in a cesarean section, which is two percent higher than the national rate of 26.3 percent. The HP 2030 target for cesarean births among low-risk women is 23.6 percent.[39]

Figure 34: Percent of All Births by Delivery Method, 2012-2021



*2021 Texas data are provisional
Source: 2012-2021 Birth Files
Prepared by: Maternal & Child Health Epidemiology Unit
Nov 2022

2020 PRAMS data shows similar trends in delivery method rates — 34.2 percent of mothers had their most recent birth via cesarean. The most cited reason for a cesarean delivery was a previous cesarean birth (47 percent). The next most cited reason for a cesarean birth were pregnancy complications such as preeclampsia, placental problems,

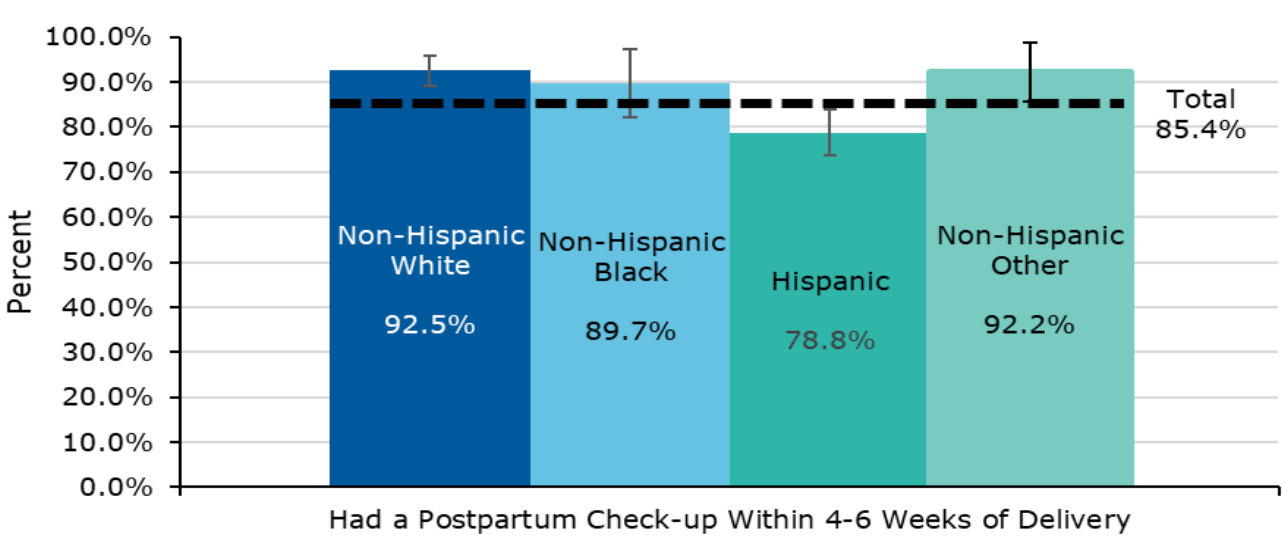
[39] Healthy People 2030, Office of Disease Prevention and Health Promotion, United States Department of Health and Human Services. Reduce cesarean births among low-risk women with no prior births – MICH-06. Retrieved from **health.gov/healthypeople/objectives-and-data/browse-objectives/pregnancy-and-childbirth/reduce-cesarean-births-among-low-risk-women-no-prior-births-mich-06** [Accessed January 5, 2023]

infection, or preterm labor (18.0 percent); prolonged labor (16.6 percent); fetal distress (16.1 percent); and precipitated by an unsuccessful attempt to induce labor medically (14.3 percent) (data not shown).

Postpartum Care

Postpartum care is an important measure to support women and infants in the critical period following birth. The American College of Obstetricians and Gynecologists (ACOG) recommends ongoing postpartum care beginning three weeks after delivery including a comprehensive postpartum visit within 12 weeks after delivery to assess physical, social, and mental health and well-being.[40] According to PRAMS 2020 data, 85.4 percent of Texas women reported a postpartum check-up within 4-6 weeks of birth. Non-Hispanic White women had the highest percentage of postpartum check-ups at 92.5 percent followed by non-Hispanic Other women (92.2 percent) and non-Hispanic Black women (89.7 percent) while Hispanic women had the lowest percent at 78.8 percent (**Figure 35**).

Figure 35: Percent of Texas Mothers Reporting a Postpartum Care Check-up 4-6 Weeks After Delivery by Race and Ethnicity, Texas PRAMS 2020



Error Bars: 95% Confidence Interval
Source: 2020 Texas PRAMS
Prepared by: Maternal & Child Health Epidemiology Unit
Oct 2022

[40] McKinney, J., Keyser, L., Clinton, S., & Pagliano, C. (2018). ACOG Committee Opinion No. 736: optimizing postpartum care. *Obstetrics & Gynecology*, 132(3), 784-785.

Maternal Health

Pregnancy Planning and Birth Spacing

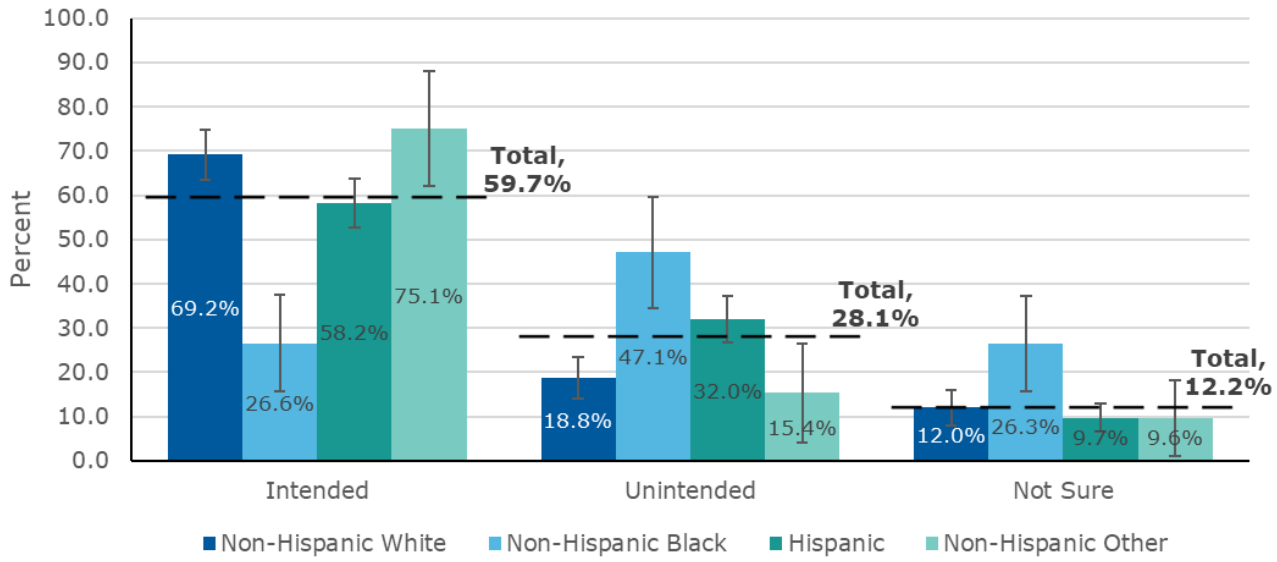
Planned pregnancies are associated with better pregnancy and infant outcomes including reduced risk for delayed prenatal care access and having children with mental and physical health problems.[41] Texas PRAMS surveys women who gave birth in a given year and categorizes women as having intended pregnancies if they reported that when they became pregnant they wanted to become pregnant at that time or sooner. Mothers were categorized as having unintended pregnancies if they said they wanted to become pregnant later or did not want to become pregnant at that time or at any time. Mothers who reported they were unsure if they wanted to be pregnant or not were categorized as not sure.[42]

In 2020, 59.7 percent of Texas mothers had intended pregnancies, 28.1 percent had unintended pregnancies, and 12.2 were not sure. The percent of intended and unintended pregnancies varied by race/ethnicity (**Figure 36**). Non-Hispanic mothers of Other races or ethnicities were most likely to report having intended pregnancies (75.1 percent). Non-Hispanic Black mothers were most likely to report having unintended pregnancies (47.1 percent) or that they were "not sure" (26.3 percent).

[41] Healthy People 2030, Office of Disease Prevention and Health Promotion, United States Department of Health and Human Services. Reduce the proportion of unintended pregnancies — FP-01. Retrieved from **health.gov/healthypeople/objectives-and-data/browse-objectives/family-planning/reduce-proportion-unintended-pregnancies-fp-01** [Accessed March 28, 2022].

[42] Texas Department of Health and Human Services, Maternal and Child Health Epidemiology Unit (2019, May). Pregnancy Risk Assessment Monitoring System (PRAMS) Survey, 2018 Data Book: Summary Tables. Retrieved from **dshs.texas.gov/sites/default/files/mch/pdf/2018-PRAMS-Databook.pdf** [Accessed March 28, 2022].

Figure 36: Percent of Texas Mothers with Intended and Unintended Pregnancies, Texas PRAMS 2020



Error Bars: 95% Confidence Interval
Source: 2020 Texas PRAMS
Prepared by: Maternal & Child Health Epidemiology Unit
Oct 2022

Pregnancy planning can also help with healthy birth spacing which can reduce risks of adverse maternal and infant outcomes. Birth spacing is measured as an interbirth interval (the time between one birth and a subsequent birth) or an interpregnancy interval (the time between one birth and subsequent conception).[43] Increased risks of preterm birth, infants born at a LBW, neonatal morbidity, and possibly maternal morbidity and mortality are associated with interpregnancy intervals ranging from six to 18 months.[44,45,46]

According to the CDC Wide-ranging Online Data for Epidemiologic Research (WONDER) database, in 2020, 62.5 percent of Texas births were to women who had a previous birth,

[43] World Health Organization. (2007). Report of a WHO technical consultation on birth spacing: Geneva, Switzerland 13-15 June 2005 (No. WHO/RHR/07.1). Retrieved from **apps.who.int/iris/bitstream/handle/10665/69855/WHO_RHR_07.1_eng.pdf?sequence=1&ua=1** [Accessed March 28, 2022].

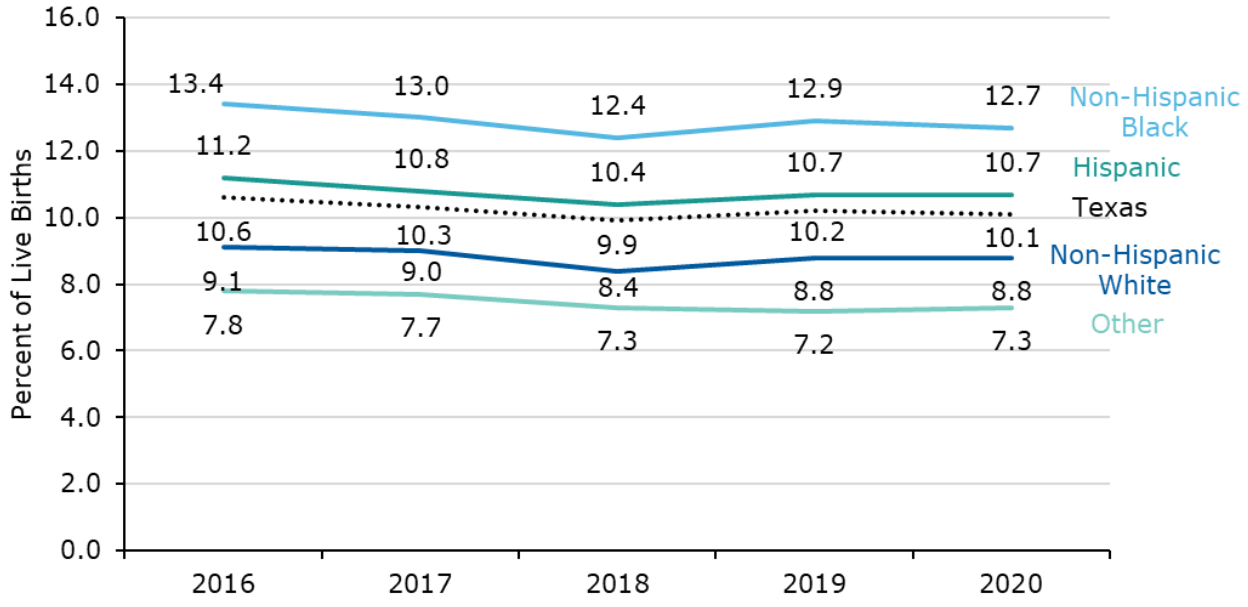
[44] March of Dimes (2015). Fact Sheet: Birth Spacing and Birth Outcomes. Retrieved from https://onprem.marchofdimes.org/materials/MOD-Birth-Spacing-Factsheet-November-2015.pdf [Accessed January 10, 2023].

[45] Conde-Agudelo, A., Rosas-Bermudez, A., Castaño, F., & Norton, M. H. (2012). Effects of birth spacing on maternal, perinatal, infant, and child health: a systematic review of causal mechanisms. *Studies in family planning*, 43(2), 93–114. Retrieved from **doi.org/10.1111/j.1728-4465.2012.00308.x** [Accessed March 30, 2022].

[46] Conde-Agudelo, A., & Belizán, J. M. (2000). Maternal morbidity and mortality associated with interpregnancy interval: cross sectional study. *BMJ* (Clinical research ed.), 321(7271), 1255–1259. Retrieved from **doi.org/10.1136/bmj.321.7271.1255** [Accessed March 28, 2022].

so birth spacing is an important consideration for many.[20] Family planning services and postpartum care are important to prevent short interpregnancy intervals and to promote optimal pregnancy spacing. Of women who had a previous live birth with single deliveries in 2020, 10.1 percent had an interbirth interval of less than 18 months.[20] By race and ethnicity, 12.7 percent of non-Hispanic Black women, 10.7 percent of Hispanic women, 8.8 percent of non-Hispanic White women, and 7.3 percent of non-Hispanic women of Other races or ethnicities had short (less than 18 months) interbirth intervals (**Figure 37**).

Figure 37: Percent of Women in Texas with Interbirth Intervals Less than 18 Months, 2016-2020



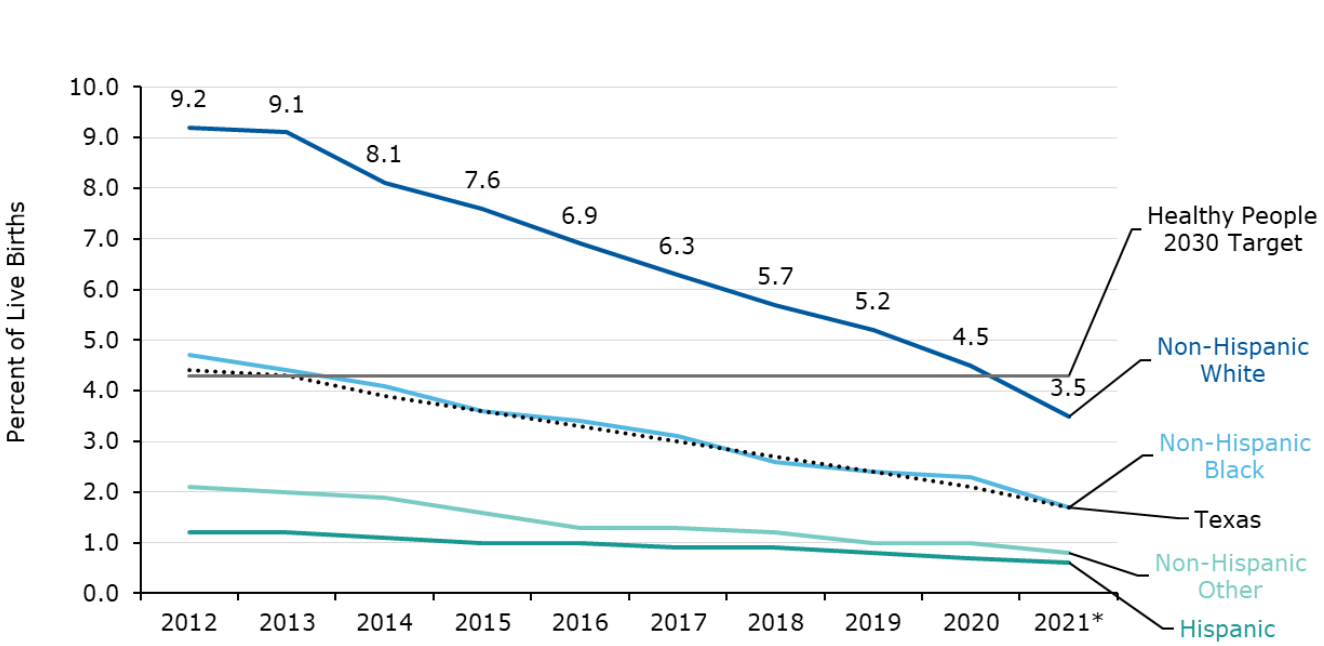
Source: 2016-2020 CDC WONDER
Prepared by: Maternal and Child Health Epidemiology Unit
Oct 2021

Smoking

Texas rates of smoking during pregnancy have decreased considerably since 2012. This decrease has been particularly steep among non-Hispanic White mothers for whom the rate of smoking during pregnancy has decreased by 62 percent over the past decade (**Figure 38**). In 2021, the rate of smoking during pregnancy among non-Hispanic White mothers was 3.5 percent meeting the HP 2030 target of at least 95.7 percent of the population abstaining from smoking during pregnancy for the first time.[47] Overall, the proportion of Texas mothers who smoke during pregnancy has seen a statistically significant decrease by 63.0 percent over the past decade (**Figure 38**).

In 2020, Texas also had the third lowest prevalence of smoking during pregnancy of any state with 2.1 percent of mothers smoking during pregnancy. Comparatively, the national average was 5.9 percent of mothers smoking during pregnancy.[20]

Figure 38: Percent of Live Births Where Mother Smoked Cigarettes During Pregnancy by Race and Ethnicity, 2012-2021

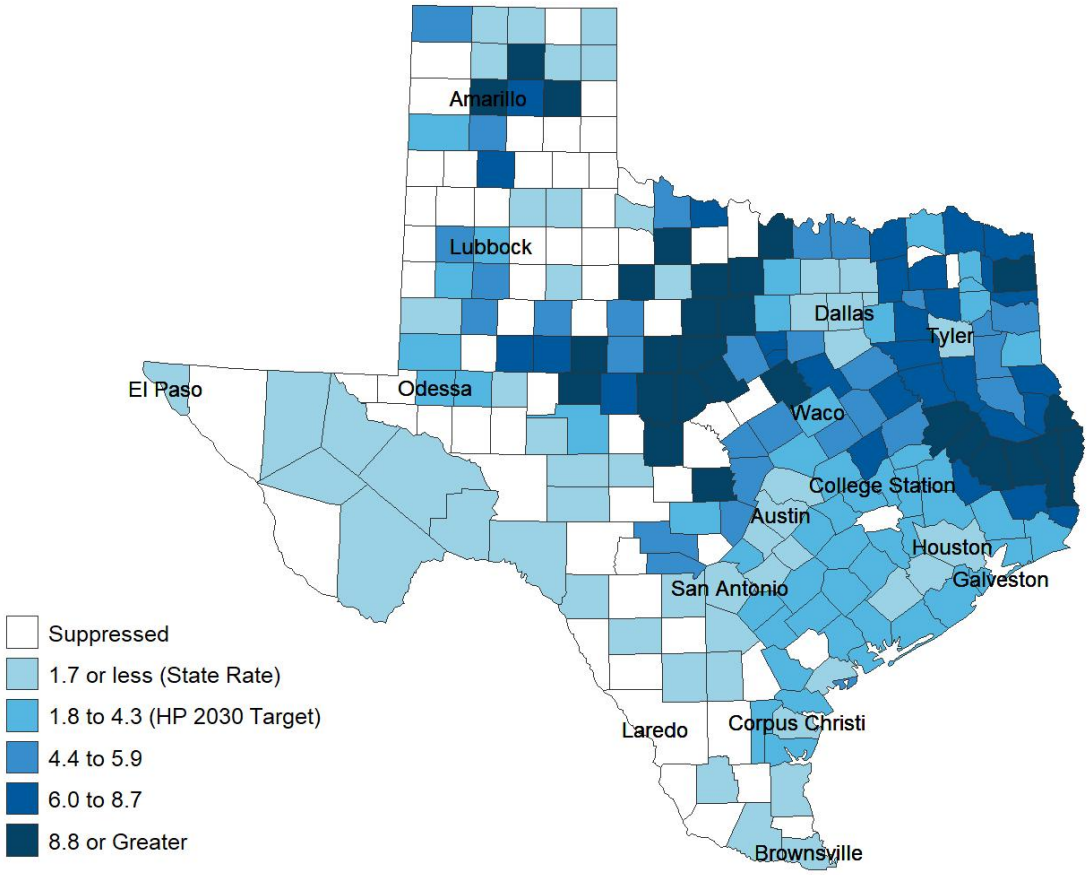


*2021 Texas data are provisional
Source: 2012-2021 Live Birth Files, Texas Center for Health Statistics
Prepared by: Maternal & Child Health Epidemiology Unit
Jan 2023

[47] Healthy People 2030, Office of Disease Prevention and Health Promotion, United States Department of Health and Human Services. Increase abstinence from cigarette smoking among pregnant women — MICH-10. Retrieved from **health.gov/healthypeople/objectives-and-data/browse-objectives/pregnancy-and-childbirth/increase-abstinence-cigarette-smoking-among-pregnant-women-mich-10** [Accessed March, 30, 2022].

Regional differences in the prevalence of smoking during pregnancy exist throughout Texas (**Figure 39**). In 2021, Texas counties near the U.S.-Mexico border had lower rates of smoking during pregnancy whereas higher rates of smoking during pregnancy were observed in many counties in North and East Texas.

Figure 39: Percent of Live Births Where Mother Smoked During Pregnancy by County of Residence, 2021



2021 Texas data are provisional
Source: 2021 Live Birth Files, Texas Center for Health Statistics
Prepared by: Maternal & Child Health Epidemiology Unit
Jan 2023

Maternal Mental Health

Mental health is an important health indicator at all phases of life. However, poor mental health prior to pregnancy can have implications for pregnancy and postpartum. Maternal mental health plays a role not only in the mother's health, but also impacts birth outcomes and infant health and development throughout the life course. Research indicates associations between poor mental health before and during pregnancy and negative birth outcomes, including preterm birth, low birth weight, reduced breastfeeding initiation rates, and birth outcomes that do not result in a live birth.[48,49,50,51] Postpartum depression has been associated with negative consequences for maternal health, quality of life, personal interaction, and the child's development.[52]

Depression can affect women before pregnancy, during pregnancy, or in the postpartum period. Based on Texas PRAMS 2020 data, 45.5 percent of mothers were asked about their mental health by a health care professional in the year prior to becoming pregnant. In the three months leading up to pregnancy, 11.3 percent of mothers reported experiencing depression.

This survey also showed depression screening during pregnancy varied across racial and ethnic groups: 64.6 percent of non-Hispanic White mothers, 83.1 percent of non-Hispanic Black mothers, 74.4 percent of Hispanic mothers, and 59.1 percent of non-Hispanic mothers of Other races or ethnicities reported being screened during pregnancy in 2020. A lower percentage of Hispanic women reported experiencing depression during pregnancy (9.9 percent) than non-Hispanic White mothers (15.0 percent), or non-Hispanic Black mothers (16.4 percent) (**Figure 40**).

Postpartum depression is treatable and screening mothers for depression during medical visits is an important step to accessing treatment resources.[53] The PRAMS 2020 survey showed 84.4 percent of Texas mothers reported they were screened for postpartum depression with no significant variation across race or ethnicity (**Figure 40**).

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[48] Witt, W. P., Wisk, L. E., Cheng, E. R., Hampton, J. M., & Hagen, E. W. (2012). Preconception mental health predicts pregnancy complications and adverse birth outcomes: a national population-based study. *Maternal and child health journal*, *16*(7), 1525–1541. Retrieved from **doi.org/10.1007/s10995-011-0916-4** [Accessed March 28, 2022].

[49] Grote, N. K., Bridge, J. A., Gavin, A. R., Melville, J. L., Iyengar, S., & Katon, W. J. (2010). A meta-analysis of depression during pregnancy and the risk of preterm birth, low birth weight, and intrauterine growth restriction. *Archives of general psychiatry*, 67(10), 1012–1024. Retrieved from **doi.org/10.1001/archgenpsychiatry.2010.111** [Accessed March 28, 2022].

[50] Gavin, A. R., Chae, D. H., Mustillo, S., & Kiefe, C. I. (2009). Prepregnancy depressive mood and preterm birth in black and white women: findings from the CARDIA Study. *Journal of women's health (2002)*, *18*(6), 803–811. Retrieved from **doi.org/10.1089/jwh.2008.0984** [Accessed March 28, 2022].

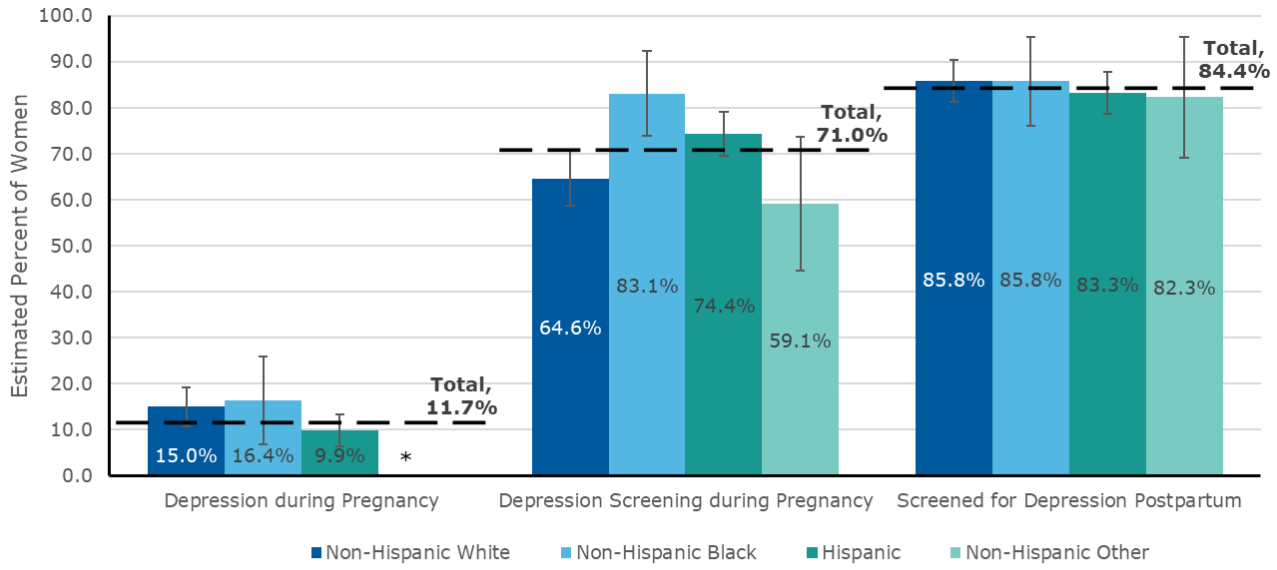
[51] Grigoriadis, S., VonderPorten, E. H., Mamisashvili, L., et al (2013). The impact of maternal depression during pregnancy on perinatal outcomes: a systematic review and meta-analysis. *The Journal of clinical psychiatry*, 74(4), 321-341.

[52] Slomian, J., Honvo, G., Emonts, P., Reginster, J.-Y., & Bruyère, O. (2019). Consequences of maternal postpartum depression: A systematic review of maternal and infant outcomes. *Women's Health*. Retrieved from **doi.org/10.1177/1745506519844044** [Accessed March 28, 2022].

[53] Centers for Disease Control and Prevention (CDC, 2019). Depression During and After Pregnancy. Retrieved from **cdc.gov/reproductivehealth/features/maternal-depression/index.html** [Accessed March 28, 2022].

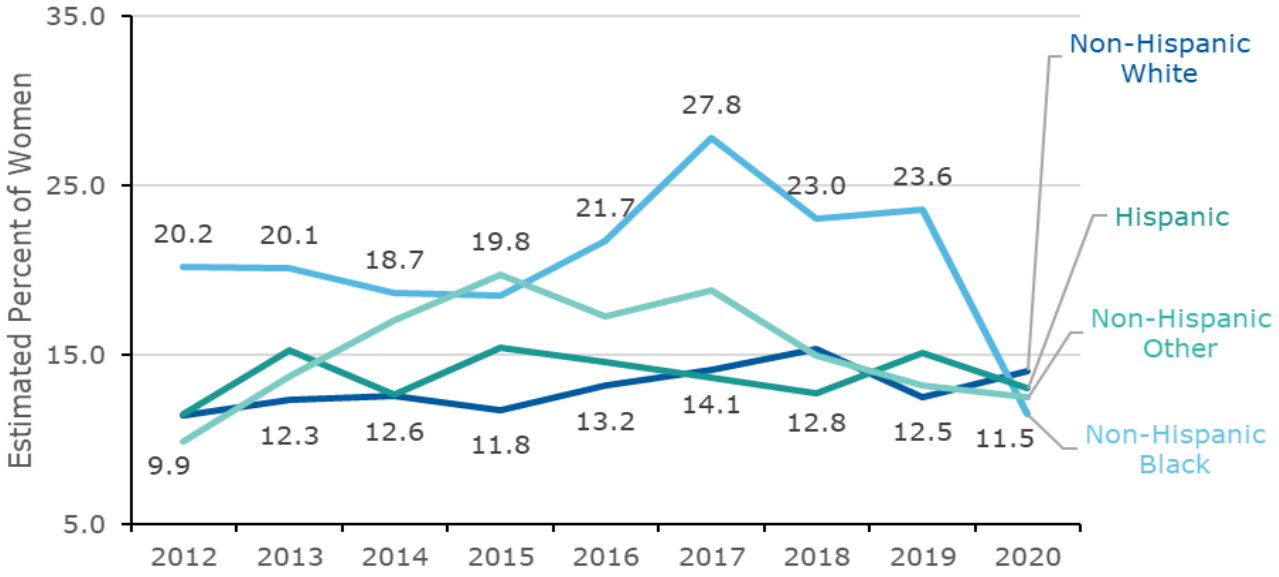
The Texas PRAMS 2020 survey showed 13.2 percent of Texas mothers reported symptoms of postpartum depression. Previous years of Texas PRAMS data found non-Hispanic Black mothers had the highest rates of postpartum depression symptoms compared to other racial or ethnic groups. However, 2020 data found non-Hispanic Black mothers had the lowest rate of 11.5 percent, a decrease from 23.6 percent from 2019 (**Figure 41**). This change from 2019 to 2020 for non-Hispanic Black mothers should be interpreted with caution and considered alongside trends from previous years. In 2020, non-Hispanic White mothers reported the highest rates (14.1 percent), followed by Hispanic (13.1 percent), and non-Hispanic mothers of Other races or ethnicities (12.5 percent).

Figure 40: Percent of Texas Mothers with Symptoms of Depression during Pregnancy, Screened for Depression during Pregnancy, and Screened for Depression Postpartum, by Race and Ethnicity, Texas PRAMS 2020



* n < 5
Error Bars: 95% Confidence Interval
Source: 2020 Texas PRAMS
Prepared by: Maternal & Child Health Epidemiology Unit
Oct 2022

Figure 41: Postpartum Depression Symptoms by Race and Ethnicity, Texas PRAMS 2012-2020



Note: Error bars not shown to improve readability. See Appendix B, Table B-8 for point estimates and confidence intervals.
Source: 2012-2020 Texas PRAMS
Prepared by: Maternal & Child Health Epidemiology Unit
Dec 2022

Pre-Pregnancy Weight Status

Obesity is a well-known risk factor for developing hypertension, diabetes, and a variety of other medical problems during pregnancy.[54] Obesity and conditions associated with obesity during pregnancy increase the risk of developing chronic conditions later in life for both mothers and babies.[55,56,57,58]

A rise in pre-pregnancy obesity has been observed over the past decade both in Texas and in other states.7 Between 2012 and 2020, the percentage of mothers with a pre-pregnancy BMI in the obese range increased 34.0 percent in Texas (**Figure 42**). In 2021, the percentage of women at a normal pre-pregnancy weight was 37.3, about ten percentage point below the Healthy People 2030 target of 47.1 percent.[59] Being underweight is also a risk factor for poor pregnancy outcomes.[60] In Texas, the rate of pre-pregnancy BMI in the underweight range decreased by 30 percent over the last decade.

[54] Gaillard, R., Durmuş, B., Hofman, A., Mackenbach, J. P., Steegers, E. A., & Jaddoe, V. W. (2013). Risk factors and outcomes of maternal obesity and excessive weight gain during pregnancy. *Obesity, 21*(5), 1046-1055.

[55] Rath, S. R., Marsh, J. A., Newnham, J. P., Zhu, K., Atkinson, H. C., Mountain, J., Oddy, W. H., Hughes, I. P., Harris, M., Leong, G. M., Cotterill, A. M., Sly, P. D., Pennell, C. E., and Choong, C. S. (2016) Parental pre-pregnancy BMI is a dominant early-life risk factor influencing BMI of offspring in adulthood. *Obesity Science & Practice*, 2: 48– 57. doi: 10.1002/osp4.28.

[56] Papachatzi, E., Dimitriou, G., Dimitropoulos, K., & Vantarakis, A. (2013). Pre-pregnancy obesity: maternal, neonatal and childhood outcomes. *Journal of neonatal-perinatal medicine*, 6(3), 203-216.

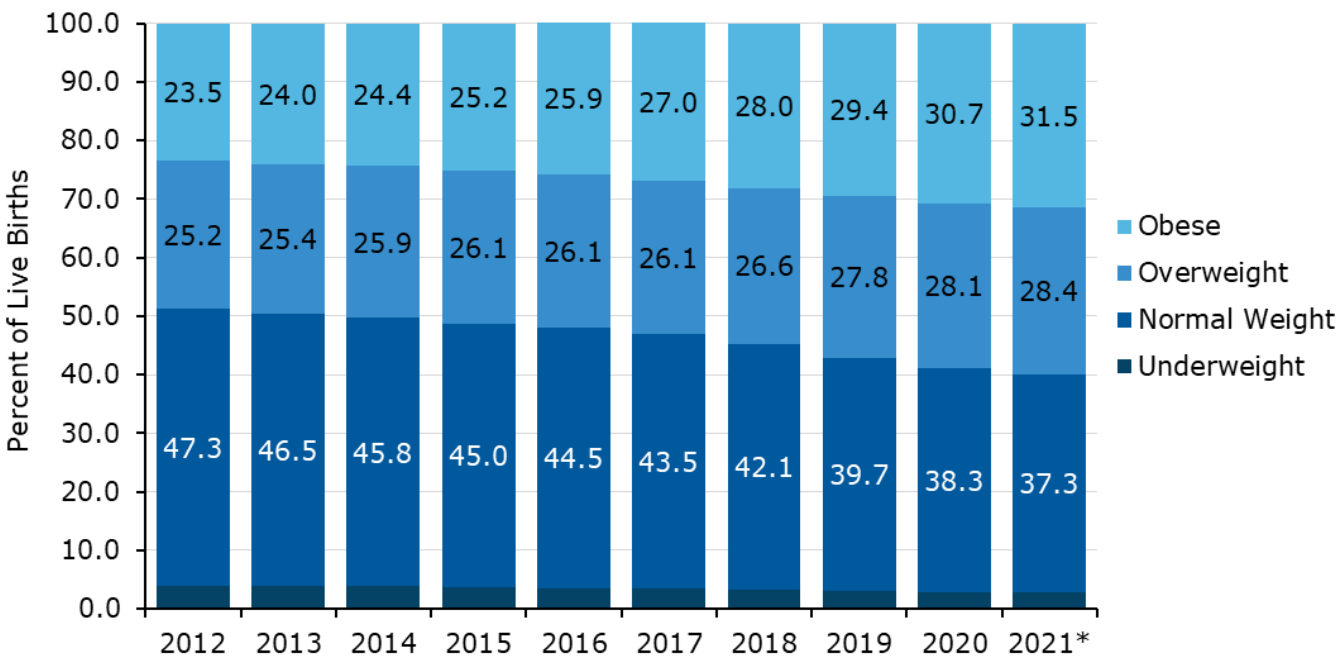
[57] Mayo Clinic News Network (2018, April 13). Mayo Clinic Minute: Long-term health risks of gestational diabetes. Retrieved from **newsnetwork.mayoclinic.org/discussion/mayo-clinic-minute-long-term-health-risks-of-gestational-diabetes/** [Accessed March 28, 2022].

[58] Ayansina, D., Black, C., Hall, S. J., Marks, A., Millar, C., Prescott, G. J., Wilde, K., & Bhattacharya, S. (2016). Long term effects of gestational hypertension and pre-eclampsia on kidney function: Record linkage study. *Pregnancy hypertension, 6*(4), 344–349. Retrieved from **doi.org/10.1016/j.preghy.2016.08.231** [Accessed from March 28, 2022].

[59] Healthy People 2030, Office of Disease Prevention and Health Promotion, United States Department of Health and Human Services. Increase the proportion of women who had a healthy weight before pregnancy — MICH-13. Retrieved from **health.gov/healthypeople/objectives-and-data/browse-objectives/pregnancy-and-childbirth/increase-proportion-women-who-had-healthy-weight-pregnancy-mich-13** [Accessed March 28, 2022]**.**

[60] Doherty, D. A., Magann, E. F., Francis, J., Morrison, J. C., & Newnham, J. P. (2006). Pre-pregnancy body mass index and pregnancy outcomes. International Journal of Gynecology & Obstetrics, 95(3), 242-247.

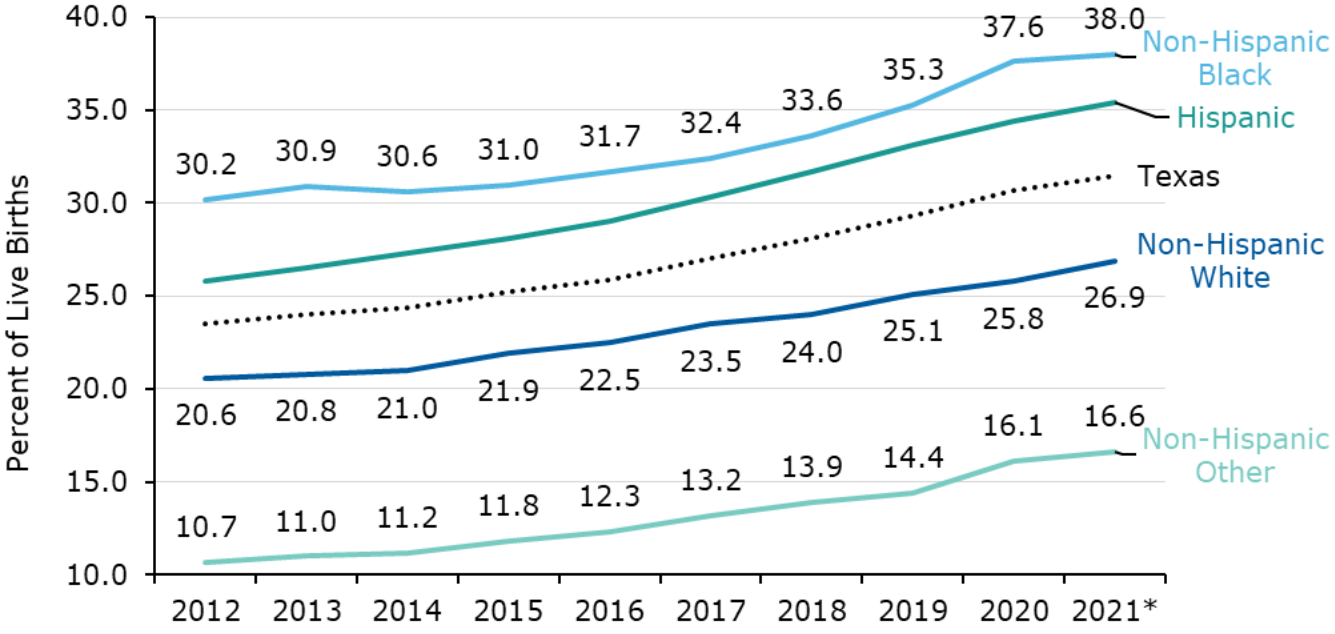
Figure 42: Maternal Pre-pregnancy BMI Distribution for All Live Births, 2012-2021



*2021 Texas data are provisional
Source: 2012-2021 Live Birth Files, Texas Center for Health Statistics
Prepared by: Maternal & Child Health Epidemiology Unit
Jan 2023

Between 2012 and 2021, Texas women's pre-pregnancy obesity experienced a statistically significant increase. Pre-pregnancy obesity is more prevalent among non-Hispanic Black and Hispanic mothers than among non-Hispanic White mothers or mothers of Other races or ethnicities (**Figure 43**). However, over the past decade, the rate of pre-pregnancy obesity rose most steeply among mothers of Other races or ethnicities — a 55.1 percent increase since 2012. Hispanic mothers have seen a relatively large increase in pre-pregnancy obesity between 2012 and 2021 — a 37.2 percent increase among Hispanic mothers compared with increases of 25.8 and 30.6 percent among non-Hispanic Black and non-Hispanic White mothers.

Figure 43: Maternal Pre-pregnancy Obesity by Race and Ethnicity, 2012-2021

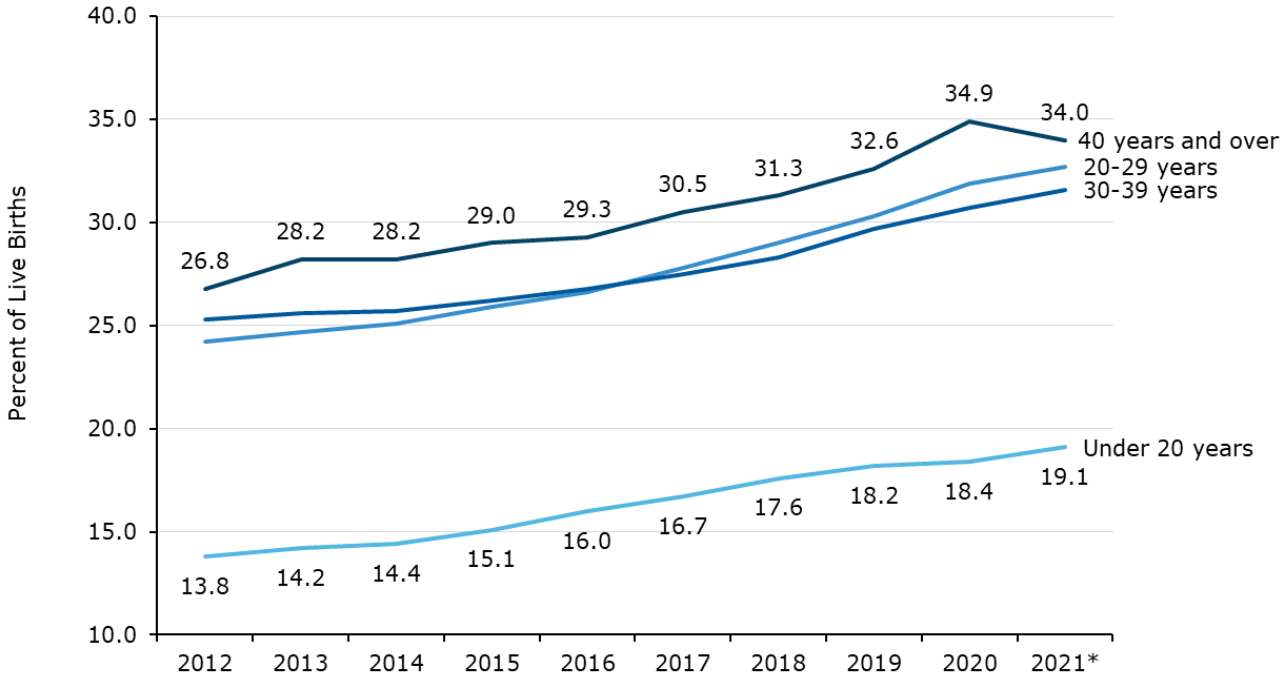


*2021 Texas data are provisional
Source: 2012-2021 Live Birth Files, Texas Center for Health Statistics
Prepared by: Maternal & Child Health Epidemiology Unit
Jan 2023

Prevalence of pre-pregnancy obesity also differed by maternal age. In 2021, a much lower percentage of mothers younger than 20 years old were obese prior to pregnancy compared with all older age groups. Mothers 40 years or older had the highest percentage of pre-pregnancy obesity.

The rise in obesity rates over time has also differed by maternal age. Over the past decade, there was the largest percent increase in pre-pregnancy obesity in mothers younger than 20 years old, followed by mothers 20-29 years old (**Figure 44**).

Figure 44: Maternal Pre-pregnancy Obesity by Age Group, 2012-2021

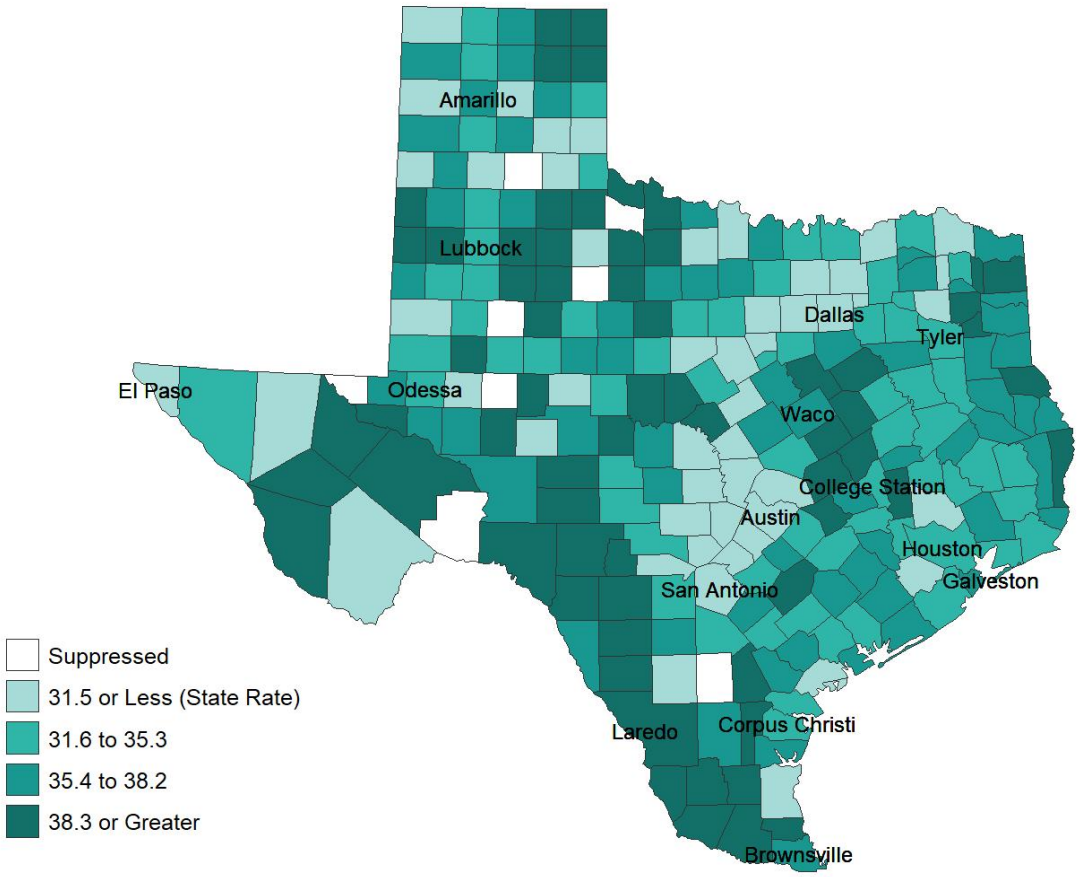


*2021 Texas data are provisional
Source: 2012-2021 Live Birth Files, Texas Center for Health Statistics
Prepared by: Maternal & Child Health Epidemiology Unit
Jan 2023

High pre-pregnancy obesity rates were observed in counties across Texas (**Figure 45**). It is likely within-county differences also exist because neighborhood environments (e.g., walkability, access to parks/sidewalks, access to healthy food choices) and other community drivers of health can vary widely within the same county.[61,62]

[61] Kolak, M., Bhatt, J., Park, Y. H., Padrón, N. A., & Molefe, A. (2020). Quantification of neighborhood-level social determinants of health in the continental United States. *JAMA network open*, *3*(1), e1919928-e1919928.
[62] McKey, T., Kim, D., & Seo, S. (2020). Crowdsourced Mapping for Healthy Food Accessibility in Dallas, Texas: A Feasibility Study. *Frontiers in Public Health*, *8*, 71.

Figure 45: Percent of Births to an Obese Mother by County of Residence, 2021

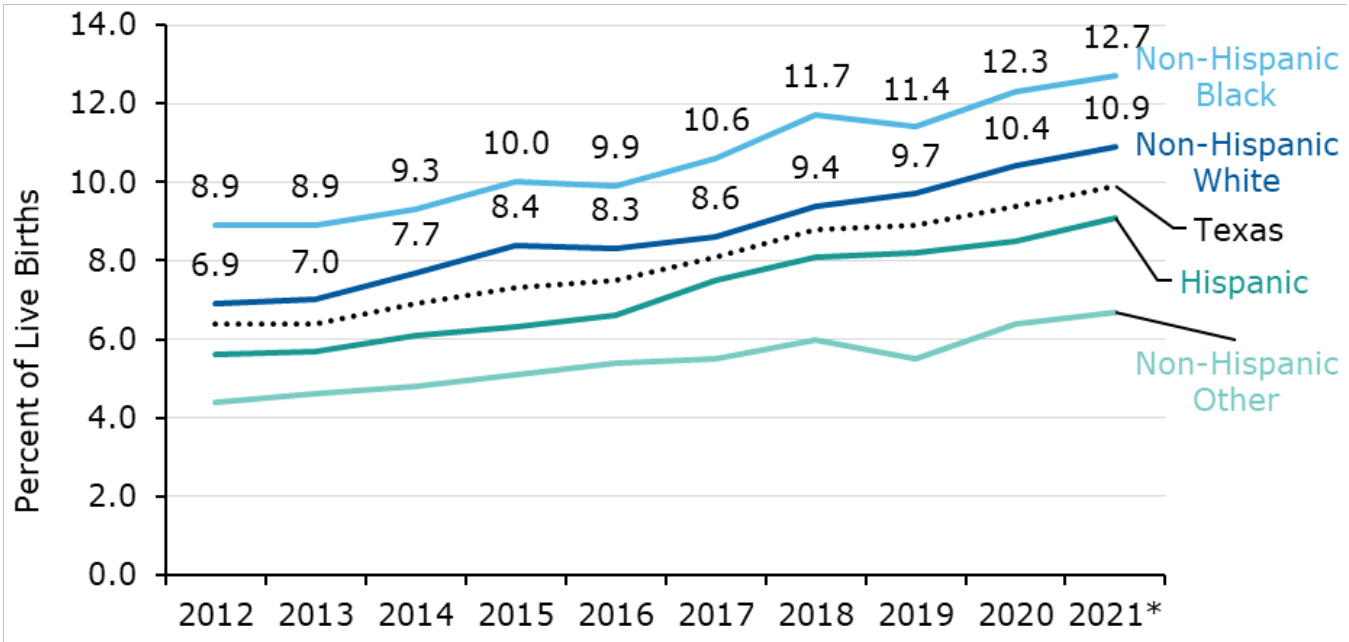


2021 Texas data are provisional
Source: 2021 Live Birth Files, Texas Center for Health Statistics
Prepared by: Maternal & Child Health Epidemiology Unit
Jan 2023

Hypertension and Diabetes

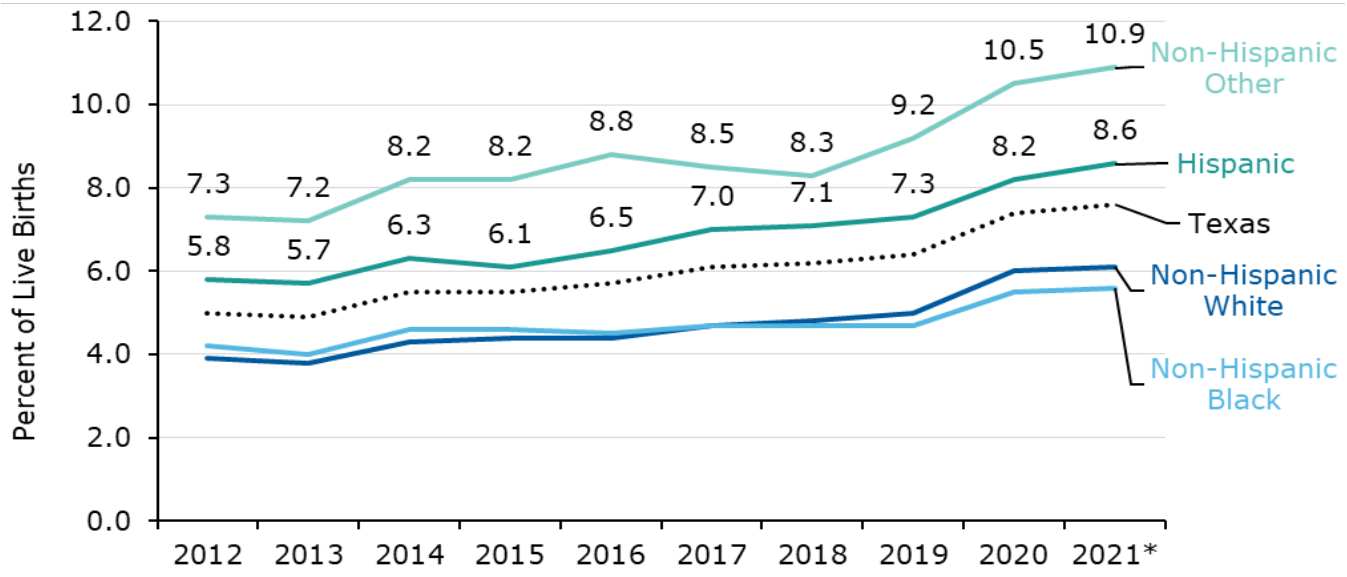
According to 2021 birth files, 9.9 percent of all live Texas births were to mothers with some form of hypertension and 7.6 percent of all live births were to mothers who had diabetes (these mothers either had diabetes or hypertension pre-pregnancy or developed the condition over the course of the pregnancy). Rates of both hypertension and diabetes among mothers increased in Texas over the last decade (**Figure 46** and **Figure 47**). As with many health outcomes hypertension and diabetes rates differ by race and ethnicity. Of all racial or ethnic groups, non-Hispanic Black mothers and non-Hispanic White mothers had the highest percentages of maternal hypertension (**Figure 46**) while non-Hispanic mothers of Other races or ethnicities and Hispanic mothers had the highest percentages of maternal diabetes (**Figure 47**).

Figure 46: Maternal Hypertension by Race and Ethnicity, 2012-2021



*2021 Texas data are provisional
Source: 2012-2021 Live Birth Files, Texas Center for Health Statistics
Prepared by: Maternal & Child Health Epidemiology Unit
Jan 2023

Figure 47: Maternal Diabetes by Race and Ethnicity, 2012-2021



*2021 Texas data are provisional
Source: 2012-2021 Live Birth Files, Texas Center for Health Statistics
Prepared by: Maternal & Child Health Epidemiology Unit
Jan 2023

Pre-pregnancy obesity is associated with both hypertension and diabetes.[62] Analysis of Texas 2021 birth files showed 25.1 percent of all mothers with pre-pregnancy obesity also had hypertension, diabetes, or both. In contrast, only 9.0 percent of mothers with normal pre-pregnancy BMI were hypertensive, diabetic, or had both (data not shown).

Mothers with diabetes or hypertension during pregnancy and their infants are at increased risk for a variety of complications including infant or fetal death.[63,64] From 2017-2020, the infant mortality rate was 9.4 per 1,000 Texas births to mothers with pre-pregnancy hypertension and 10.2 for infants of mothers with pre-pregnancy diabetes. These rates are higher than the mortality rate for mothers with gestational hypertension (5.0), gestational diabetes (3.5), or mothers without either form of diabetes or hypertension (5.3).[65] Additionally, mothers with these conditions experience high rates of severe maternal morbidity (SMM). Hypertension/eclampsia diagnoses are both leading indicators of SMM and were a leading cause of maternal death for non-Hispanic Black mothers.[14]

[63] Tennant, P. W., Glinianaia, S. V., Bilous, R. W., Rankin, J., & Bell, R. (2014). Pre-existing diabetes, maternal glycated haemoglobin, and the risks of fetal and infant death: a population-based study. *Diabetologia*, 57(2), 285-294.
[64] von Dadelszen, P., & Magee, L. A. (2016). Preventing deaths due to the hypertensive disorders of pregnancy. Best practice & research. Clinical obstetrics & gynecology, 36, 83–102. Retrieved from **doi.org/10.1016/j.bpobgyn.2016.05.005** [Accessed March 28, 2022].
[65] United States Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, Division of Vital Statistics. Linked Birth / Infant Death Records 2017, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program, on CDC WONDER On-line Database. Retrieved from **wonder.cdc.gov/lbd-current-expanded.html** [Accessed April 13, 2023].

Maternal Mortality

In October 2023, DSHS researchers and the Texas Maternal Mortality and Morbidity Review Committee (MMMRC) published findings for the 2019 MMMRC case cohort.[66] This section of the Data Book presents DSHS analyses of statewide maternal death trends.

Accurate identification of maternal deaths is essential to computing the Texas maternal mortality ratio, which is a key performance indicator to improve maternal health and safety before, during, and after delivery. Maternal death is a term used for the death of a woman while pregnant or within 42 days after 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-10 coding.[15] The standard method for identifying maternal deaths relies on an obstetric cause-of-death code on the official death certificate. However, in 2012, because of errors associated with the death certificate, DSHS researchers developed the three-step enhanced method for the identification of maternal deaths.[67]

In 2013, DSHS further refined this method by creating a four-step method. This method includes a review of medical records for all non-obstetric coded deaths with a pregnancy status indicating pregnancy at the time of death or within 42 days. DSHS then calculates 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.[14]

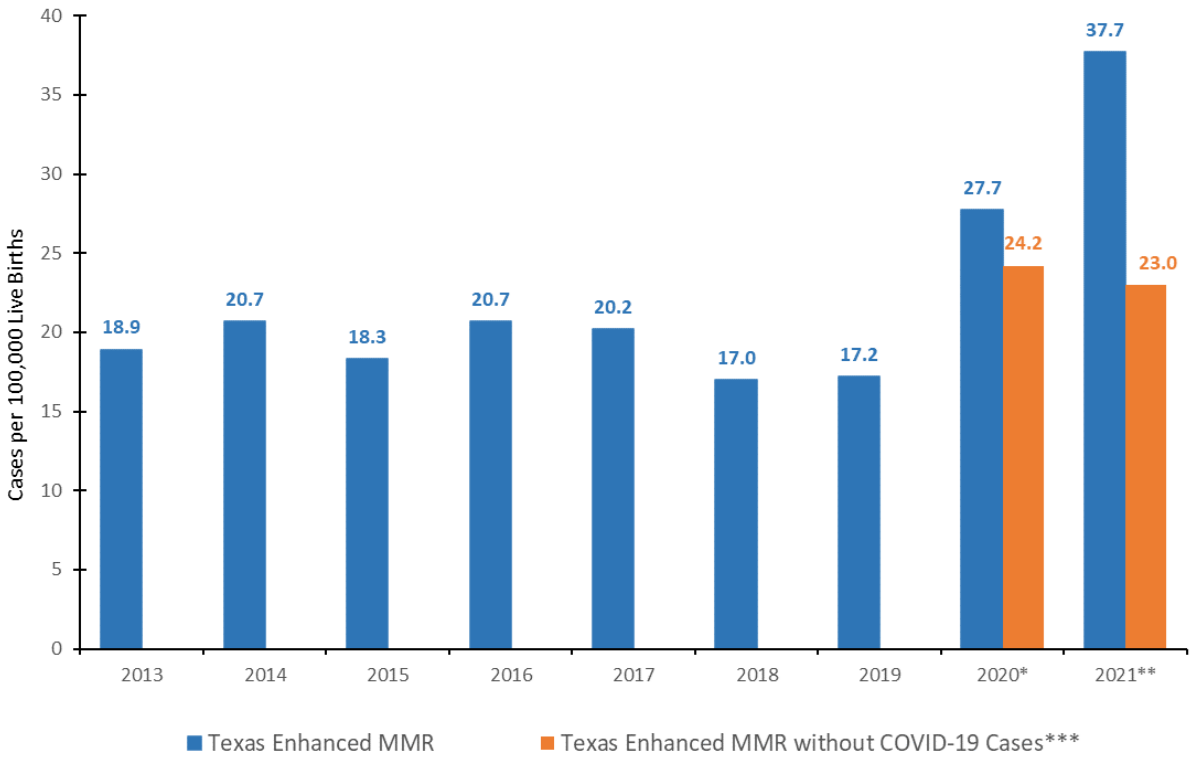
The enhanced Texas maternal mortality ratios for 2013 through 2021 are shown in **Figure 48**. The enhanced Texas method is different from the method used by other states to calculate maternal mortality numbers and ratios and cannot be compared with other maternal mortality ratios or rates calculations. DSHS researchers will continue to apply this methodology for additional years so that trends can continue to be assessed.[14]

The enhanced maternal mortality ratio remained relatively stable from 2013-2017, fluctuating between 18.3 and 20.7 deaths per 100,000 live births. In 2018 and 2019, the enhanced maternal mortality ratio decreased to 17.0 and 17.2 respectively. However, during the COVID-19 pandemic, the enhanced maternal mortality ratio rose to 27.7 deaths per 100,000 live births in 2020 and 37.7 deaths per 100,000 live births in 2021. DSHS researchers are exploring methods to identify maternal deaths due to COVID-19. Thus far, DSHS researchers are able to identify maternal deaths due to COVID-19 using information from the death certificate. If COVID-19 maternal deaths are removed from the enhanced maternal mortality ratio, the ratios decreased to 24.2 in 2020 and 23.0 in 2021. While these ratios still represent an increase compared to previous years, these

[66] Texas Department of State Health Services. 2022. Texas Maternal Mortality and Morbidity Review Committee and Department of State Health Services Joint Biennial Report 2022, Updated October 2023. Retrieved from https://www.dshs.texas.gov/sites/default/files/legislative/2022-Reports/2022-MMMRC-DSHS-Joint-Biennial-Report.pdf.
[67] Baeva, S., Saxton, D. L., Ruggiero, K., Kormondy, M. L., Hollier, L. M., Hellerstedt, J., ... & Archer, N. P. (2018). Identifying maternal deaths in Texas using an enhanced method, 2012. *Obstetrics & Gynecology*, *131*(5), 762-769

trends are also seen at the national level. DSHS researchers will continue to investigate the additional causes of this increase.

Figure 48: Enhanced Maternal Mortality Ratios for Texas, 2013-2021



** 2020 Texas Enhanced MMR is considered "provisional" because DSHS staff are continuing to confirm pregnancy-associated cases through records review*
*** 2021 Texas Enhanced MMR is considered "provisional" because they are based on provisional brith, death, and fetal death records.*
**** Only cases with COVID-19 listed as the underlying cause of death and/or cases that have COVID-19 notes in the death narrative are included.*
Note: The enhanced method is different from methods used by other states to calculate maternal mortality rates or ratios. Therefore, calculated enhanced maternal mortality is not directly comparable with other maternal mortality rates or ratios, including national data. The data shown here includes maternal deaths during or within 42 days following end of pregnancy.
Sources: Texas Live Birth, Death, and Fetal Death Files, 2013-2021
Prepared by: Maternal and Child Health Epidemiology, August 2023

Timing of Death Analysis

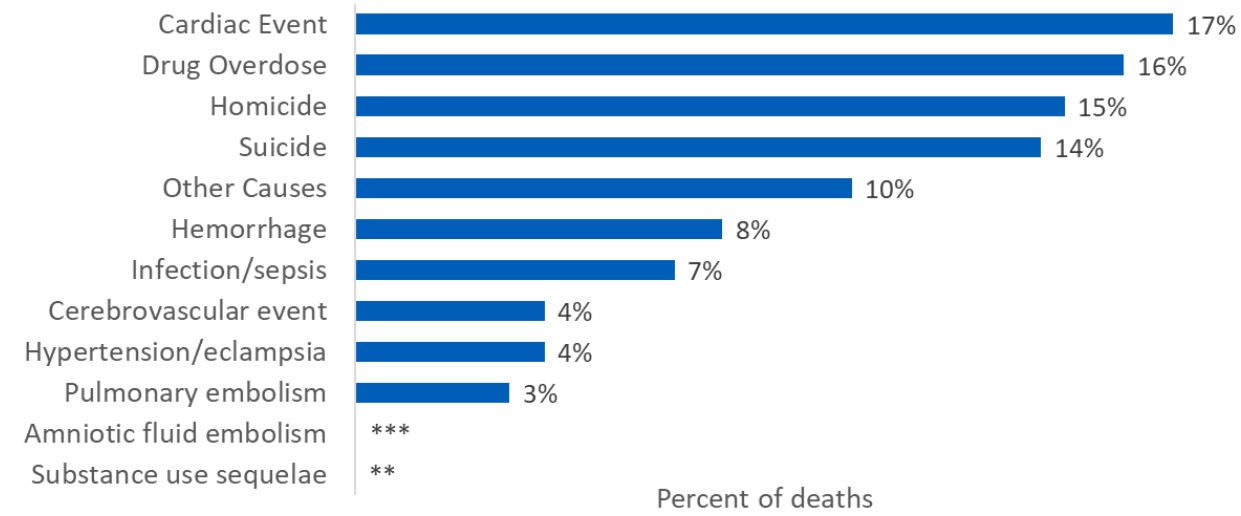
In 2023, DSHS researchers conducted a timing and cause of death analysis for linked maternal deaths from 2016-2019. Cases were included if a death certificate was matched to either a live birth or fetal death record within 365 days of the death. Deaths due to cancer or motor vehicle accidents were excluded. Cases confirmed through MCH epidemiology records review were also excluded if they were not linked to a birth or fetal

death record. Therefore, the cases from this analysis are a subset of the total Texas population of pregnancy-associated deaths from 2016-2019.

Timing of death is determined by the pregnancy status on the death record and days elapsed between delivery and death. A death while pregnant is defined as pregnant at the time of death and 0 days elapsed between delivery and death. All other deaths were categorized as postpartum deaths based on the number of days elapsed between delivery and death: 0-7 days, 8-42 days, 43-60 days, and 61 or more days. The cause of death was obtained from the death record.

DSHS identified 407 linked maternal death cases from 2016-2019. Results of this timeline analysis are shown in **Appendix B, Table B-11**. The leading causes of death were cardiac events including heart attack and chronic conditions (17 percent), drug overdose (16 percent), homicide (15 percent), and suicide (14 percent). These four events comprised 62 percent of all linked maternal death cases from 2016-2019 (**Figure 49**). Ten percent of cases were due to other causes, including complications of diabetes, respiratory illness, other conditions, and causes that are undetermined, unknown, or pending further investigation.

Figure 49. Percent of Linked Maternal Deaths by Cause of Death, Texas, 2016-2019 (N=407)



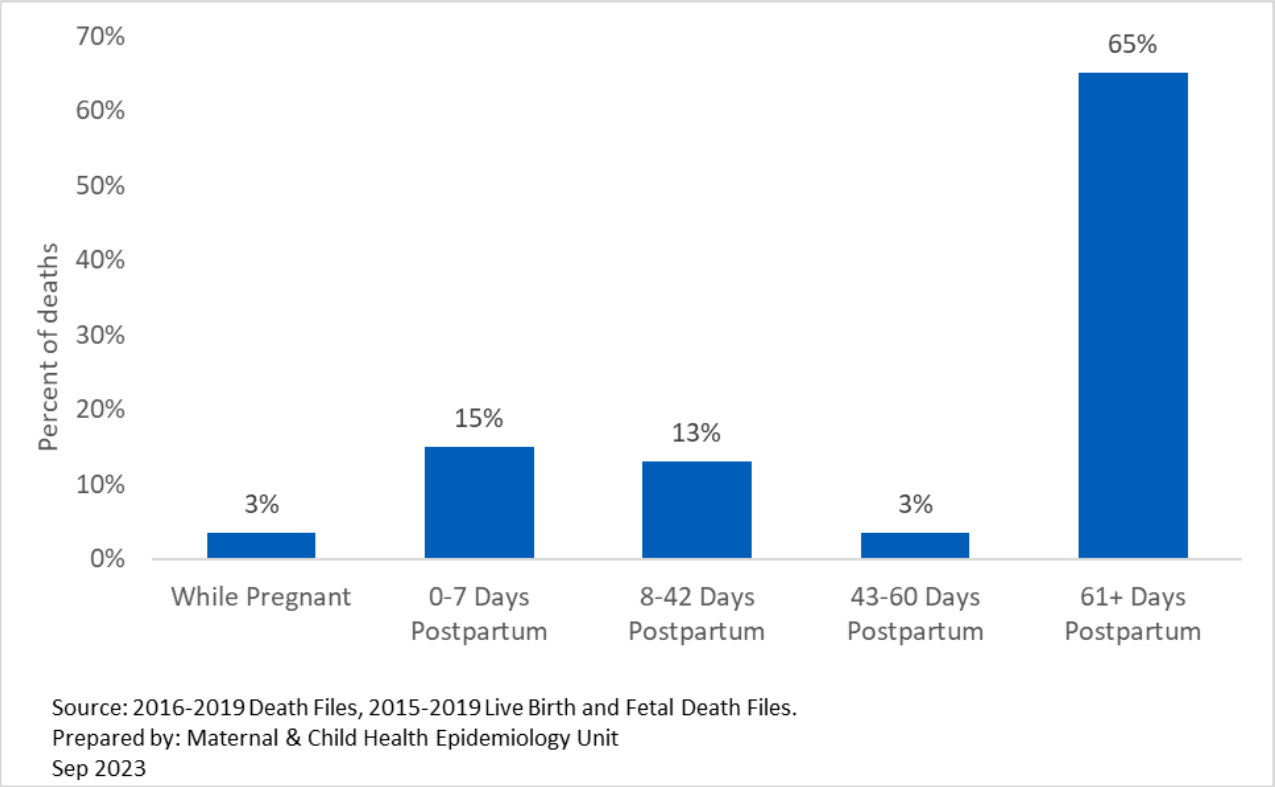
Notes: Causes of death with counts between 1 and 4 are suppressed with ** to protect confidentiality. Causes of death with *** are suppressed to prevent calculation of small counts. Cardiac event includes heart attack and chronic conditions. "Other causes" include complications of diabetes, respiratory illness, other conditions, and causes that are undetermined, unknown, or pending further investigation.
Source: 2016-2019 Death Files, 2015-2019 Live Birth and Fetal Death Files.
Prepared by: Maternal & Child Health Epidemiology Unit
Sep 2023

Of the 407 linked maternal deaths, most occurred 61 or more days postpartum (65 percent), followed by 0-7 days postpartum (15 percent) and 8-42 days postpartum (13

percent) (**Figure 50**). Only three percent of deaths occurred while pregnant and three percent occurred 43-60 days postpartum.

The timing of death varied among the four leading causes of death. Most deaths caused by overdose (82 percent), homicide (83 percent), and suicide (90 percent) occurred 61 or more days postpartum whereas 46 percent of cardiac events occurred less than 43 days postpartum (data not shown).

Figure 50. Percent of Linked Maternal Deaths by Timing of Death, Texas, 2016-2019 (N=407)



Among the 407 linked maternal deaths from 2016-2019, the maternal death rate was highest among Non-Hispanic Black women (49.8 deaths per 100,000 live births), women who were not married (36.0 deaths per 100.000 live births), women with a high school education or equivalent (39.9 deaths per 100,000 live births), and women enrolled in Medicaid at the time of delivery (34.3 deaths per 100,000 live births) (data not shown). The maternal death rate increased with age with 43.6 deaths per 100,000 live births among women ages 40 years and older (data not shown). The maternal death rate was highest among women in rural areas: PHR 1 (40.9 deaths per 100,000 live births) which includes the Texas Panhandle, and PHR 4/5N (33.1 per 100,000 live births), which includes East Texas. Results of this analysis are shown in **Appendix B, Table B-12**.

Additionally, the death rate was highest among women with diabetes (34.3 deaths per 100,000 live births), hypertension (52.7 deaths per 100,000 live births), pre-pregnancy

obesity (30.0 deaths per 100,000 live births), cesarean delivery (35.4 deaths per 100,000 live births), and late or no prenatal care. The maternal death rate among women who began prenatal care in the first trimester (20.5 deaths per 100,000 live births) was lower than those who began care in the second (30.7 deaths per 100,000 live births) and third (23.5 deaths per 100,000 live births) trimesters. The maternal death rate for women who did not receive prenatal care was 74.7 deaths per 100,000 live births (data not shown). Results of this analysis are shown in **Appendix B, Table B-13**.

Of the 2016-2019 65 linked maternal deaths due to drug overdose, some form of opioid (excluding heroin and fentanyl) was mentioned on 28 percent of death certificates, followed by methamphetamine (28 percent), heroin (25 percent), sedatives (23 percent), cocaine (20 percent), and alcohol (14 percent). Deaths involving more than one drug (n=26) were counted more than once. The drug overdose maternal death rate was highest among non-Hispanic White women (6.8 deaths per 100,000 live births), ages 35-39 years (5.6 deaths per 100,000 live births), living in rural areas (4.7 deaths per 100,000 live births), and enrolled in Medicaid (6.3 deaths per 100,000 live births). Women living in PHR 7, which includes Austin and other parts of Central Texas, had the highest drug overdose maternal death rate of any region with 5.1 deaths per 100,000 live births (data not shown). Results of this analysis are shown in **Appendix B, Table B-14** and **Appendix B, Table B-15**.

Neonatal Abstinence Syndrome

Opiate use during pregnancy is associated with an increase in infants born with NAS, a group of conditions that cause neonatal withdrawal such as body shakes, seizures, fever, and low birth weight.[68] Newborns with NAS are more likely to have low birth weight, respiratory and feeding problems, and other complications.[69] Mothers who use drugs such as opioids during pregnancy are more likely to have complications like prolonged hospital stays and death before hospital discharge.[70] Since drug overdose is a frequent cause of pregnancy-associated death, it is important to monitor maternal drug use during pregnancy. Not all newborns whose mothers use drugs will develop NAS so the true incidence of drug use during pregnancy should be expected to be higher than the observed NAS rate.[71]

Between 2012 and 2014, Texas Hospital Inpatient Discharge data indicates the rate of infants born each year experiencing NAS increased from 1.9 per 1,000 hospital births to 2.4 and has fluctuated between 2.0 and 2.4 cases per 1,000 ever since (**Figure 51**). This was less than the increase observed in the rest of the U.S. where NAS rates increased from 4.0 to 7.3 from 2010 to 2017, before declining to 6.3 in 2019. Texas had lower rates of NAS than the national average over the past decade.[72]

[68] March of Dimes (2019) Neonatal Abstinence Syndrome (NAS). Retrieved from marchofdimes.org/complications/neonatal-abstinence-syndrome-(nas).aspx# [Accessed March 28, 2022].

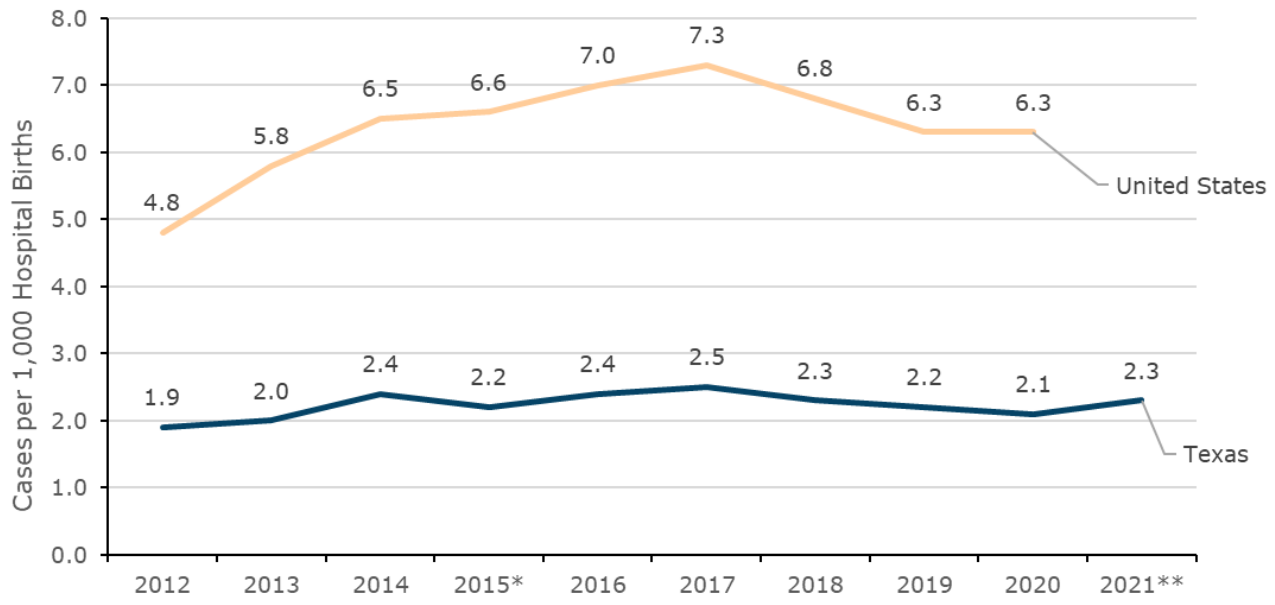
[69] National Institute on Drug Abuse. Dramatic Increases in Maternal Opioid Use and Neonatal Abstinence Syndrome. Retrieved from drugabuse.gov/related-topics/trends-statistics/infographics/dramatic-increases-in-maternal-opioid-use-neonatal-abstinence-syndrome [Accessed March 28, 2022].

[70] Whiteman, V. E., Salemi, J. L., Mogos, M. F., Cain, M. A., Aliyu, M. H., & Salihu, H. M. (2014). Maternal opioid drug use during pregnancy and its impact on perinatal morbidity, mortality, and the costs of medical care in the United States. *Journal of pregnancy*, *2014*.

[71] Centers for Disease Control and Prevention. About Opioid Use During Pregnancy: Health Outcomes From Exposure During Pregnancy. Retrieved from https://www.cdc.gov/pregnancy/opioids/basics.html#:~:text=Not%20all%20babies%20exposed%20to,to%20opioid%20exposure%20during%20pregnancy. [Accessed January 25, 2023].

[72] Hirai, A. H., Ko, J. Y., & Owens, P. L. (2021). Neonatal Abstinence Syndrome and Maternal Opioid-Related Diagnoses in the US, 2010-2017. *JAMA.* 325(2):146-155. https://jamanetwork.com/journals/jama/fullarticle/2774834.

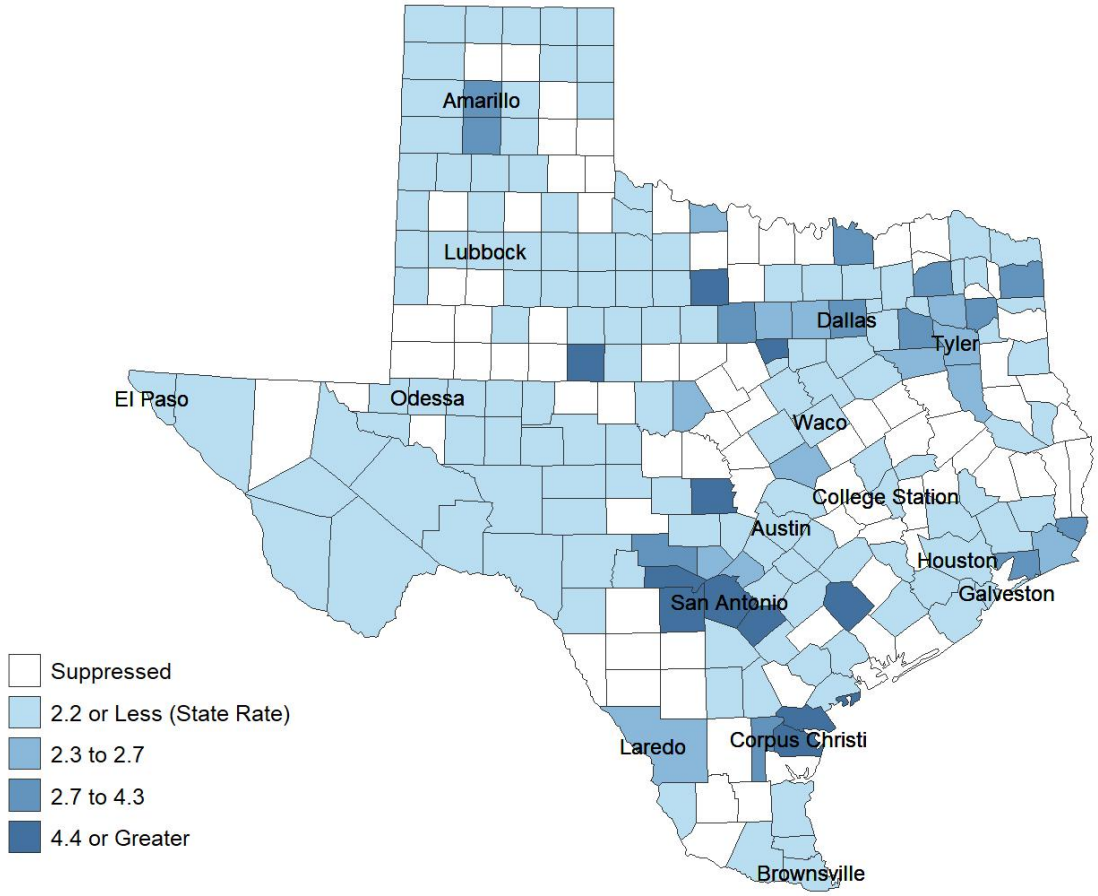
Figure 51: Rate of Neonatal Abstinence Syndrome in Texas and the United States, 2012-2021



*Data transitioned to ICD-10-CM in the last quarter of 2015
**2021 Texas data are provisional
Source: 2012-2021 Health Care Utilization Project
Prepared by: Maternal & Child Health Epidemiology Unit
Nov 2022

Based on combined data from 2017 to 2021, the Texas county with the highest NAS rate in the state was Bexar County (7.7 per 1,000 hospital births), which accounted for more than 23 percent of Texas's total NAS cases during 2017 to 2021 (**Figure 52**).

Figure 52: Neonatal Abstinence Syndrome Rate per 1,000 Hospital Births by County of Residence, 2017-2021



Source: 2017-2021 Texas Hospital Inpatient Public Use Data Files
Prepared by: Maternal & Child Health Epidemiology Unit
Nov 2022

Conclusion

The DSHS Healthy Texas Mothers and Babies Data Book provides an overview of a variety of infant and maternal health indicators including maternal behaviors during pregnancy and after birth.

The data provided here show improvements in several indicators over the past decade. During that time, Texas has seen a reduction in the teen birth rate. There have also been increases in the initiation and continuation of breastfeeding, including exclusive breastfeeding through three and six months. In addition, more mothers report practicing safe infant sleep behavior and receiving prenatal care in the first trimester of pregnancy. Lastly, there have been decreases in the percentage of mothers who smoked cigarettes during pregnancy.

However, during this same period, Texas experienced an increase in pre-pregnancy obesity, maternal diabetes, and maternal hypertension. Additionally, in 2022, the provisional infant mortality rate increased after decreasing in 2021. Lastly, in 2021, the percentages of babies born preterm or with low birth weight in Texas increased after respective decreases in 2020. Both these provisional rates are the highest in over ten years.

Substantial disparities persist for infant and maternal health indicators, including rates of infant mortality, preterm birth, pre-pregnancy obesity, maternal hypertension, and depression during pregnancy. Non-Hispanic Black mothers and infants have significantly higher rates of each of these adverse health outcomes than do other racial or ethnic groups. In addition, a lower percentage of non-Hispanic Black women initiate and continue breastfeeding and report safe infant sleep practices. Hispanic women experience higher rates of teen births and report accessing postpartum care less than non-Hispanic White women. Non-Hispanic White mothers continue to report smoking during pregnancy at higher rates than other racial or ethnic groups, although rates of smoking among Non-Hispanic White women fell below HP 2030 goal for the first time in 2021. In addition, geographic and regional differences were observed throughout Texas, especially for maternal age, teen birth rates, infant mortality rates, the prevalence of smoking during pregnancy, and NAS rates.

The information presented in this report can help public health workers, researchers, and policymakers identify trends and disparities in Texas infant and maternal health outcomes to assist data-driven decisions on where best to allocate resources and efforts to improve these outcomes.

List of Acronyms

Acronym	Full Name
ACOG	American College of Obstetricians and Gynecologists
ARR	Adjusted Risk Ratio
BMI	Body Mass Index
BW	Birth Weight
CDC	Centers for Disease Control and Prevention
CI	Confidence Interval
DSHS	Texas Department of State Health Services
F-IMR	Feto-Infant Mortality Rate
HHS	U.S. Department of Health and Human Services
HP 2030	Healthy People 2030
ICD-10	International Classification of Diseases, tenth revision
IFPS	WIC Infant Feeding Practices Survey
IH	Infant Health (Prenatal Period of Risk)
IMR	Infant Mortality Rate
LBW	Low Birth Weight
MC	Maternal Care (Prenatal Period of Risk)
MCH	Maternal and Child Health
MHP	Maternal Health/Prematurity (Prenatal Period of Risk)
MMMRC	Maternal Mortality and Morbidity Review Committee

Acronym	Full Name
NAS	Neonatal Abstinence Syndrome
NC	Neonatal Care (Prenatal Period of Risk)
NCHS	National Center for Health Statistics
NIS	National Immunization Survey
PAR	Population Attributable Risk
PHR	Public Health Region
PPOR	Perinatal Periods of Risk
PRAMS	Pregnancy Risk Assessment Monitoring System
PUDF	Public Use Data File
SIDS	Sudden Infant Death Syndrome
SMM	Severe Maternal Morbidity
THCIC	Texas Health Care Information Collection
VLBW	Very Low Birth Weight
WHO	World Health Organization
WIC	Special Supplemental Nutrition Program for Women, Infants, and Children
WONDER	Wide-ranging Online Data for Epidemiologic Research (A CDC Database)

Appendix A: Information on Maternal and Infant Health in Texas

Diabetes Prevention and Control Reports and Data:

https://www.dshs.texas.gov/diabetes/data-reports

https://www.hhs.texas.gov/sites/default/files/documents/laws-regulations/reports-presentations/2020/texas-medicaid-diabetes-council-coord-report-aug-2020.pdf

The above links contain data sources and reports focusing on the prevalence, prevention, and treatment of diabetes in Texas, including reports focusing on gestational diabetes. Links also navigate to reports on Texas Medicaid recipients and diabetes, including information on screening for gestational diabetes for pregnant women enrolled in Medicaid and the latest available assessment of existing programs for diabetes prevention and treatment across Texas.

Center for Health Statistics: Direct links to health-related data:

dshs.texas.gov/chs/links-to-health-related-data.shtm

The above DSHS webpage contains vital statistics tables and reports providing basic health-related data at the state and county level.

Texas DSHS Legislative Reports:

https://www.dshs.texas.gov/about-dshs/legislative-information/legislative-reports

DSHS legislatively mandated reports are available on the above DSHS webpage. This includes the 2022 Texas Maternal Mortality and Morbidity Review Committee and Department of State Health Services Joint Biennial Report, updated October 2023 and Maternal Health and Safety Initiatives Biennial Report 2022. DSHS posts reports upon completion.

Texas Health and Human Services (HHS) Laws and Regulations Reports and Presentations

hhs.texas.gov/regulations/reports-presentations

The above HHS webpage contains reports and presentations provided to the Texas Legislature and other governing bodies on implementation activities.

Texas Health Data:

healthdata.dshs.texas.gov/Home

This online DSHS query tool allows visitors to create tables of basic birth statistics at the state or county level. The tool can be used to compare race/ethnicities, education level, marital status, and a variety of other demographics across major birth outcome indicators.

Maternal & Child Health Epidemiology:

dshs.texas.gov/mch/epi/MCH-Epidemiology.aspx

The above DSHS webpage contains the PRAMS annual reports and dashboards and links to other information and presentations about maternal and child health and related community-based initiatives.

March of Dimes Peristats:

marchofdimes.org/peristats/Peristats.aspx

This online query tool from the March of Dimes covers a variety of maternal and infant health indicators that can be compared across different states in the country or across years for single regions/states.

Appendix B: Tables for Select Figures

Table B-1: Teen (15-19 Years of Age) Birth Rate per 1,000 Females by Race and Ethnicity, 2012-2021 (Figure 5)[a]

Year	Non-Hispanic White	Non-Hispanic Black	Hispanic	Non-Hispanic Other	Texas
2012	24.4	43.0	59.9	14.9	**42.3**
2013	23.9	39.9	54.3	15.0	**39.7**
2014	21.8	36.9	49.4	13.4	**36.3**
2015	20.5	33.1	44.3	12.0	**33.0**
2016	17.6	29.5	39.4	10.9	**29.3**
2017	15.7	27.4	37.6	9.9	**27.1**
2018	13.7	26.3	34.4	8.8	**24.8**
2019	13.5	24.9	32.9	8.8	**23.8**
2020	12.4	23.6	30.5	7.4	**22.2**
2021[b]	11.5	22.3	27.9	7.1	**20.4**

[a] Rate per 1,000 population. Source: 2012-2021 Live Birth Files, Texas Center for Health Statistics
[b] 2021 data are provisional and subject to change

Table B-2: Infant Mortality Rate in Texas by Race and Ethnicity, 2012-2021 (Figure 8)[a]

Year	Non-Hispanic White	Non-Hispanic Black	Hispanic	Non-Hispanic Other	Texas
2012	5.3	11.6	5.2	3.4	**5.8**
2013	5.0	11.9	5.2	4.0	**5.8**
2014	4.9	11.1	5.4	4.2	**5.8**
2015	4.9	10.9	5.2	3.4	**5.6**
2016	5.0	11.1	5.2	3.9	**5.7**
2017	4.8	11.0	5.4	3.9	**5.8**
2018	4.6	10.9	5.0	4.0	**5.5**
2019	4.6	10.7	5.1	3.6	**5.5**
2020	4.7	10.4	4.8	3.4	**5.4**
2021[b]	4.5	9.4	4.9	3.4	**5.2**

[a] Rate per 1,000 live births. Source: 2012-2021 Live Birth and Death Files, Texas Center for Health Statistics
[b] 2021 data are provisional and subject to change

Table B-3: Percent of Births That Are Low Birth Weight (less than 2,500 grams) in Texas by Race and Ethnicity, 2012-2021 (Figure 17)[a]

Year	Non-Hispanic White	Non-Hispanic Black	Hispanic	Non-Hispanic Other	Texas
2012	7.3	13.9	7.5	9.1	**8.3**
2013	7.3	13.2	7.7	9.7	**8.3**
2014	7.2	13.4	7.5	9.1	**8.2**
2015	7.1	13.3	7.7	9.1	**8.3**
2016	7.2	13.5	7.9	9.0	**8.4**
2017	7.1	13.9	7.9	8.9	**8.4**
2018	7.0	14.1	7.9	9.1	**8.5**
2019	7.0	14.2	7.9	8.9	**8.4**
2020	6.8	13.6	7.7	9.0	**8.3**
2021[b]	7.0	14.3	8.3	9.5	**8.7**

[a] Source: 2012-2021 Live Birth Files, Texas Center for Health Statistics
[b] 2021 data are provisional and subject to change

Table B-4: Percent of Women Who Ever Breastfed Their Baby by Race and Ethnicity, Texas PRAMS 2012-2020 (Figure 26)

Year	Non-Hispanic White	Non-Hispanic Black	Hispanic	Non-Hispanic Other
2012	86.9	73.6	88.4	95.1
95% CI	*82.4-91.3*	*68.2-79.0*	*83.9-92.9*	*87.2-100.0*
2013	88.5	73.6	87.4	96.7
95% CI	*84.9-92.0*	*68.9-78.3*	*83.4-91.3*	*92.7-100.0*
2014	89.7	77.7	91.6	95.0
95% CI	*86.5-93.0*	*73.2-82.2*	*88.2-95.0*	*90.4-99.6*
2015	90.3	83.8	86.8	96.7
95% CI	*87.2-935*	*79.8-87.8*	*82.4-91.2*	*92.1-100.0*
2016	90.0	79.3	90.0	98.2
95% CI	*86.9-93.1*	*71.6-86.9*	*87.5-92.5*	*95.5-100.0*
2017	91.9	86.2	88.6	98.5
95% CI	*89.6-94.3*	*80.0-92.4*	*86.0-91.2*	*96.9-100.0*
2018	92.3	86.3	89.1	95.9
95% CI	*89.8-94.9*	*79.9-92.8*	*86.4-91.7*	*91.4-100.0*
2019	90.5	72.8	92.3	97.0
95% CI	*87.3-93.7*	*62.0-83.5*	*89.7-94.9*	*93.4-100.0*
2020	91.6	85.3	91.9	96.5
95% CI	*88.3-94.8*	*76.9-93.8*	*88.9-94.9*	*92.5-100.0*

Table B-5: Women Who Reported Placing Infant on Their Back to Sleep by Race and Ethnicity, Texas PRAMS 2012-2020 (Figure 30)

Year	Non-Hispanic White	Non-Hispanic Black	Hispanic	Non-Hispanic Other
2012	74.8	51.1	72.2	88.6
95% CI	*69.2-80.4*	*44.8-57.3*	*66.0-78.3*	*79.5-97.7*
2013	77.3	47.5	72.6	83.6
95% CI	*72.7-81.9*	*42.1-52.9*	*67.3-77.9*	*74.9-92.2*
2014	75.4	46.5	68.8	82.2
95% CI	*70.9-79.8*	*41.1-52.0*	*63.1-74.5*	*72.2-92.1*
2015	79.8	50.2	70.6	66.2
95% CI	*75.6-84.1*	*44.9-55.5*	*65.1-76.0*	*54.8-77.6*
2016	78.0	60.3	72.6	75.3
95% CI	*73.8-82.2*	*51.2-69.5*	*68.8-76.4*	*65.3-85.2*
2017	80.1	64.1	78.8	77.4
95% CI	*76.6-83.7*	*55.4-72.8*	*75.5-82.0*	*68.7-86.2*
2018	77.9	56.6	73.8	82.1
95% CI	*73.9-81.8*	*47.2-66.1*	*70.0-77.6*	*74.3-90.1*
2019	80.8	51.6	71.9	89.1
95% CI	*76.7-84.8*	*39.7-63.4*	*67.6-76.2*	*81.0-97.2*
2020	86.4	63.4	74.0	89.8
95% CI	*82.4-90.4*	*50.9-75.8*	*69.1-78.9*	*79.9-99.7*

Table B-6: Percent of Live Births Where Mother Received Prenatal Care in the First Trimester by Race and Ethnicity, 2012-2021 (Figure 32)[a]

Year	Non-Hispanic White	Non-Hispanic Black	Hispanic	Non-Hispanic Other	Texas
2012	75.2	55.6	61.6	68.7	**66.2**
2013	75.0	56.1	61.5	67.9	**66.1**
2014	74.2	56.0	60.2	67.2	**65.2**
2015	75.2	56.6	61.1	67.0	**65.9**
2016	74.6	54.9	60.7	66.2	**65.1**
2017	75.7	56.3	62.5	65.9	**66.4**
2018	76.2	57.7	64.0	67.5	**67.5**
2019	76.4	57.3	62.7	69.8	**67.1**
2020	76.8	58.2	63.2	71.5	**67.7**
2021[b]	77.4	60.1	64.1	72.5	**68.6**

[a] Computed using the obstetric estimate of gestation. Source: 2012-2021 Live Birth Files, Texas Center for Health Statistics
[b] 2021 data are provisional and subject to change

Table B-7: Percent of Live Births Where Mother Smoked Cigarettes During Pregnancy by Race and Ethnicity, 2012-2021 (Figure 38)[a]

Year	Non-Hispanic White	Non-Hispanic Black	Hispanic	Non-Hispanic Other	Texas
2012	9.2	4.7	1.2	2.1	**4.4**
2013	9.1	4.4	1.2	2.0	**4.3**
2014	8.1	4.1	1.1	1.9	**3.9**
2015	7.6	3.6	1.0	1.6	**3.6**
2016	6.9	3.4	1.0	1.3	**3.3**
2017	6.3	3.1	0.9	1.3	**3.0**
2018	5.7	2.6	0.9	1.2	**2.7**
2019	5.2	2.4	0.8	1.0	**2.4**
2020	4.5	2.3	0.7	1.0	**2.1**
2021[b]	3.5	1.7	0.6	0.8	**1.7**

[a] Source: 2012-2021 Live Birth Files, Texas Center for Health Statistics
[b] 2021 data are provisional and subject to change

Table B-8: Postpartum Depression Symptoms by Race and Ethnicity, Texas PRAMS 2012-2020 (Figure 41)

Year	Non-Hispanic White	Non-Hispanic Black	Hispanic	Non-Hispanic Other
2012	11.4	20.2	11.5	9.9
95% CI	*7.5 - 15.4*	*15.3 - 25.1*	*7.2 - 15.8*	*-0.8[a] - 20.7*
2013	12.3	20.1	15.3	13.8
95% CI	*8.5 - 16.1*	*15.9 - 24.4*	*11.0 - 19.6*	*5.4 - 22.2*
2014	12.6	18.7	12.7	17.0
95% CI	*9.2 - 15.9*	*14.5 - 22.9*	*8.6 - 16.8*	*7.1 - 27.0*
2015	11.8	18.5	15.4	19.8
95% CI	*8.3 - 15.2*	*14.4 - 22.5*	*11.2 - 19.6*	*9.9 - 29.6*
2016	13.2	21.7	14.6	17.3
95% CI	*9.8 - 16.6*	*14.0 - 29.5*	*11.7 - 17.5*	*8.8 - 25.8*
2017	14.1	27.8	13.6	18.9
95% CI	*11.0 - 17.2*	*19.7 - 35.9*	*10.9 - 16.4*	*10.8 - 26.9*
2018	15.3	23.0	12.8	14.9
95% CI	*11.8 - 18.9*	*14.9 - 31.2*	*9.9 - 15.6*	*7.7 - 22.2*
2019	12.5	23.6	15.1	13.2
95% CI	*9.2 - 15.9*	*13.7 - 33.4*	*11.7 - 18.6*	*4.8 - 21.6*
2020	14.1	11.5	13.1	12.5
95% CI	*9.8 - 18.3*	*3.8 - 19.3*	*9.3 - 16.8*	*2.4 - 22.6*

[a] This lower bound is less than zero and should be interpreted with caution.

Table B-9: Maternal Hypertension by Race and Ethnicity, 2012-2021 (Figure 46)[a]

Year	Non-Hispanic White	Non-Hispanic Black	Hispanic	Non-Hispanic Other	Texas
2012	6.9	8.9	5.6	4.4	**6.4**
2013	7.0	8.9	5.7	4.6	**6.4**
2014	7.7	9.3	6.1	4.8	**6.9**
2015	8.4	10.0	6.3	5.1	**7.3**
2016	8.3	9.9	6.6	5.4	**7.5**
2017	8.6	10.6	7.5	5.5	**8.1**
2018	9.4	11.7	8.1	6.0	**8.8**
2019	9.7	11.4	8.2	5.5	**8.9**
2020	10.4	12.3	8.5	6.4	**9.4**
2021[b]	10.9	12.7	9.1	6.7	**9.9**

[a] Source: 2012-2021 Live Birth Files, Texas Center for Health Statistics
[b] 2021 data are provisional and subject to change

Table B-10: Maternal Diabetes by Race and Ethnicity, 2012-2021 (Figure 47)[a]

Year	Non-Hispanic White	Non-Hispanic Black	Hispanic	Non-Hispanic Other	Texas
2012	3.9	4.2	5.8	7.3	**5.0**
2013	3.8	4.0	5.7	7.2	**4.9**
2014	4.3	4.6	6.3	8.2	**5.5**
2015	4.4	4.6	6.1	8.2	**5.5**
2016	4.4	4.5	6.5	8.8	**5.7**
2017	4.7	4.7	7.0	8.5	**6.1**
2018	4.8	4.7	7.1	8.3	**6.2**
2019	5.0	4.7	7.3	9.2	**6.4**
2020	6.0	5.5	8.2	10.5	**7.4**
2021[b]	6.1	5.6	8.6	10.9	**7.6**

[a] Source: 2012-2021 Live Birth Files, Texas Center for Health Statistics
[b] 2021 data are provisional and subject to change

Table B-11: Linked Maternal Deaths by Timing and Cause of Death, Texas, 2016-2019 (Figure 49 and Figure 50).[a,b]

Cause of Death	While Pregnant	0-7 Days Post-partum	8-42 Days Post-partum	43-60 Days Post-partum	61+ Days Post-partum	Total
Cardiac Event	**	15	13	***	36	**67**
Drug Overdose	**	0	6	**	53	**65**
Homicide	**	**	**	**	50	**60**
Suicide	0	**	**	**	52	**58**
Other Causes	**	6	5	**	28	**42**
Hemorrhage	**	15	6	***	7	**31**
Infection/ Sepsis	0	**	8	**	14	**27**
Cerebro-vascular Event	0	**	**	**	10	**16**
Hypertension/ Eclampsia	**	7	**	0	6	**16**
Pulmonary Embolism	**	**	**	**	5	**13**
Amniotic Embolism	0	7	**	0	***	*****
Substance Use Sequelae (e.g., liver cirrhosis)	0	0	0	0	**	**
Total	**14**	**61**	**53**	**14**	**265**	**407**

[a] Source: 2016-2019 Death Files, 2015-2019 Live Birth and Fetal Death Files. Center for Health Statistics, DSHS.
[b] Notes: Maternal deaths were confirmed by matching each woman's death certificate with a birth or fetal death record within 365 days of death. Deaths due to cancer or motor vehicle accidents were excluded from these analyses. Timing of

death was determined using a combination of pregnancy status on the death records and days elapsed between delivery. and death. If a woman was identified as pregnant at the time of death and 0 days elapsed between delivery and death, then this was counted as a death while pregnant. All other deaths were identified as postpartum maternal deaths and were categorized based on the number of days that elapsed between delivery and death. Cause of death was taken directly from the death record. ”Other causes” include complications of diabetes, respiratory illness, other conditions, and causes that are undetermined, unknown, or pending further investigation. Cells with counts between 1 and 4 are suppressed with ** to protect confidentiality. Cells with *** are suppressed to prevent calculation of cells with small counts.

Table B-12: Linked Maternal Death Rates by Demographic Characteristics, Texas, 2016-2019 (N=407)[a,b]

Demographic Characteristic	Number of Live Births	Number (%) of Maternal Deaths	Rate (per 100,000 live births)
RACE/ETHNICITY			
Non-Hispanic Black	186,689	93 (23%)	49.8
Non-Hispanic White	502,956	150 (37%)	29.8
Hispanic	725,568	147 (36%)	20.4
Non-Hispanic Other	117,726	17 (4%)	14.4
AGE (YEARS)			
<20	106,876	20 (5%)	18.7
20-24	344,162	70 (17%)	20.3
25-29	444,877	124 (30%)	27.9
30-34	397,501	107 (26%)	26.9
35-39	195,821	67 (16%)	34.2
40+	43,619	19 (5%)	43.6
MARITAL STATUS			
Married	900,916	***	***
Not married	631,264	227 (56%)	36.0
Unknown	-	**	-
HIGHEST EDUCATION LEVEL			

Less than High School Diploma	261,263	81 (20%)	31.0
High School Diploma or Equivalent	423,897	169 (42%)	39.9
Some College, No Degree	328,284	78 (19%)	23.8
Associate degree	98,203	24 (6%)	24.4
Bachelor's Degree	282,146	39 (9%)	13.8
Master's Degree, PhD, or Professional Degree	136,491	***	***
Unknown	-	**	
HEALTH INSURANCE AT DELIVERY			
Medicaid	728,191	250 (62%)	34.3
Self-Pay/No Insurance	113,197	34 (8%)	30.0
Private Insurance	614,862	88 (22%)	14.3
Other Insurance	74,382	18 (4%)	24.2
Unknown/Not Applicable	-	17 (4%)	-
GEOGRAPHIC LOCATION			
Public Health Region 1 (Texas Panhandle)	46,508	19 (5%)	40.9
Public Health Region 2/3 (includes Dallas-Ft Worth)	437,974	118 (29%)	26.9
Public Health Region 4/5N (East Texas)	72,586	24 (6%)	33.1
Public Health Region 6/5S (includes Houston)	415,799	113 (28%)	27.2

Public Health Region 7 (Central Texas)	175,203	45 (11%)	25.7
Public Health Region 8 (includes San Antonio)	156,205	42 (10%)	26.9
Public Health Region 9/10 (West Texas)	90,036	26 (6%)	28.9
Public Health Region 11 (South Texas)	138,628	20 (5%)	14.4

[a] Source: 2016-2019 Death Files, 2015-2019 Live Birth and Fetal Death Files. Center for Health Statistics, DSHS.
[b] Notes: Maternal deaths were confirmed by matching each woman's death record with a birth or fetal death within 365 days. Deaths due to cancer or motor vehicle accidents were excluded from these analyses. Data on age, marital status, education, and region of residence come from the death certificate. Data on race/ethnicity and health insurance at time of delivery come from the birth or fetal death certificate. Percentages may not add to exactly 100% due to rounding. Rates were suppressed for unknown/missing values. Cells with counts between 1 and 4 are suppressed with ** to protect confidentiality. Cells with *** are suppressed to prevent calculation of cells with small counts.

Table B-13: Maternal Death Rates by Health Factor, Texas, 2016-2019 (N=407)[a,b]

Health Factor	Number of Live Births	Number of Maternal Deaths	Rate (per 100,000 live births)
PRE-PREGNANCY WEIGHT			
Underweight (BMI: less than 18.5)	50,950	15 (4%)	29.4
Normal weight (BMI: 18.5-24.9)	647,929	161 (39%)	24.8
Overweight (BMI: 25.0-29.9)	405,983	93 (23%)	22.9
Obese (BMI: 30.0 or greater)	420,006	126 (31%)	30.0
Unknown	-	12 (3%)	-
DIABETES			
Yes	93,301	32 (8%)	34.3
No	1,439,638	375 (92%)	26.0
HYPERTENSION			
Yes	127,168	67 (17%)	52.7
No	1,405,771	340 (83%)	24.2
SMOKING DURING PREGNANCY			
Yes	43,584	***	***
No	1,489,128	358 (88%)	24.0

Unknown	-	**	-
TRIMESTER PRENATAL CARE BEGAN			
First Trimester	932,434	191 (47%)	20.5
Second Trimester	348,801	107 (26%)	30.7
Third Trimester	101,962	24 (6%)	23.5
No Prenatal Care	58,867	44 (11%)	74.7
Unknown	-	41 (10%)	-
LABOR AND DELIVERY PRACTITIONER			
Medical Doctor	1,448,775	389 (96%)	26.9
Certified Nurse-Midwife/Certified Midwife	67,492	9 (2%)	13.3
Other/Unknown[c]	-	9 (2%)	-
MODE OF DELIVERY			
Vaginal	999,092	215 (53%)	21.5
Cesarean	533,502	***	***
Unknown	-	**	-

[a] Source: 2016-2019 Death Files, 2015-2019 Live Birth and Fetal Death Files. Center for Health Statistics, DSHS.
[b] Notes: Maternal deaths were confirmed by matching each woman's death record with a birth or fetal death within 365 days. Deaths due to motor vehicle accidents were excluded from these analyses. All data in this table come from the birth or fetal death certificate. Percentages may not add to 100% due to rounding. Rates were suppressed for unknown/missing values. Cells with counts between 1 and 4 are suppressed with ** to protect confidentiality. Cells with *** are suppressed to prevent calculation of cells with small counts.
[c] Attendants in the Other/Unknown category may include medical and administrative staff, family members, and unknown/unidentified persons. Due to the heterogeneity of this category, and small numbers within its subcategories, rates are unreliable and have been suppressed.

Table B-14: Specific Drugs Identified from Death Certificate Narratives for Drug Overdose Confirmed Maternal Deaths, 2016-2019[a,b]

Specific Drugs	Count
OPIOIDS[c]	
Opioid	18
Heroin	15
Fentanyl	**
NON-OPIOIDS	
Methamphetamine	18
Sedative	15
Cocaine	13
Alcohol	9
Anticonvulsant	**
Antidepressant	**
Cannabinoid	**
Anorectic	**
UNKNOWN	6

[a] Source: 2016-2019 Death Files, 2015-2019 Live Birth and fetal Death Files. Center for Health Statistics, DSHS.
[b] Notes: A portion of the drug overdose maternal deaths (26) involved a combination of drugs and were counted more than once. Drugs were counted based on the classes that appear in the table, rather than each individual drug. Cells with counts between 1 and 4 are suppressed with ** to protect confidentiality. Cells with *** are suppressed to prevent calculation of cells with small counts.
[c] Although considered opioids, heroin and fentanyl are listed separately because different tests are used to verify these drugs.

Table B-15: Drug Overdose Maternal Death Rate by Demographic Characteristics, Texas, 2016-2019[a,b]

Demographic Characteristic	Number of Live Births	Number (%) of Maternal Deaths	Rate (per 100,000 live births)
RACE/ETHNICITY			
White	502,956	34 (52%)	6.8
Black	186,689	***	***
Hispanic	725,568	20 (31%)	2.8
Other	117,726	**	**
AGE (YEARS)			
<20	106,876	**	**
20-24	344,162	9 (14%)	2.6
25-29	444,877	23 (35%)	5.2
30-34	397,501	21 (32%)	5.3
35-39	195,821	11 (17%)	5.6
40+	43,619	***	***
COUNTY OF RESIDENCE			
Urban	1,383,698	58 (89%)	4.2
Rural	149,241	7 (11%)	4.7
REGION OF RESIDENCE			
Region 1 (Panhandle)	46,508	**	**
Region 2/3 (includes Dallas-Ft Worth)	437,974	21 (32%)	4.8
Region 4/5N (East Texas)	72,586	**	**
Region 6/5S (includes Houston)	415,799	18 (27%)	4.3
Region 7 (Central Texas)	175,203	9 (14%)	5.1

Region 8 (includes San Antonio)	156,205	5 (8%)	3.2
Region 9/10 (West Texas)	90,036	**	**
Region 11 (South Texas)	138,628	5 (8%)	3.6
HEALTH INSURANCE AT DELIVERY			
Medicaid	728,191	46 (71%)	6.3
Private Insurance	614,862	7 (11%)	1.1
Self-Pay/No Insurance	113,197	8 (12%)	7.1
Other Insurance	74,382	**	**
Unknown	-	**	**

[a] Source: 2016-2019 Death Files, 2015-2019 Live Birth and Fetal Death Files. Center for Health Statistics, DSHS.
[b] Notes: Percentages may not add to 100% due to rounding. All data in this table come from the birth or fetal death certificate. Rates were suppressed for unknown/missing values. Cells with counts between 1 and 4 are suppressed with ** to protect confidentiality. Cells with *** are suppressed to prevent calculation of cells with small counts.

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