



2019 Healthy Texas Mothers & Babies Data Book



TEXAS
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1. Purpose

The 2019 Healthy Texas Mothers & Babies Data Book provides an overview of infant and maternal health in Texas. It is hoped that the trends and disparities in infant and maternal health outcomes highlighted in this report can help programs and policymakers make data-driven decisions about how to improve these outcomes in Texas. This data book is not meant to repeat results found in other places; rather, it is meant to bring different data sources together to be analyzed and reported in a way that creates a cohesive view of the status of both infant and maternal health in Texas.

Completion of this Data Book was supported by the Health Resources and Services Administration (HRSA) of the U.S. Department of Health and Human Services (HHS) under grant number and title for grant amount (Grant Number B04MC33869, Maternal and Child Health Services, \$33,958,965, 100 percent). This information or content and conclusions 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 #5U01DP006204) and the Texas Maternal and Child Health Title V Block Grant Program. The contents of this publication are solely the responsibility of the authors and do not necessarily represent the views of the CDC.

2. Data Sources & Terms

Data Sources Used

Vital records data (information from Texas birth, death, fetal death, and linked birth-death files), as well as results from the Texas Pregnancy Risk Assessment Monitoring System (PRAMS) survey, were used in this report.

The Texas Department of State Health Services (DSHS) Vital Statistics Section collects demographic data on all (or the vast majority of) births and deaths in Texas, as well as 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 rich and comprehensive source of data; however, the quality of birth certificate data is dependent on how accurately birth records are completed by hospital staff or providers. It is also thought that the birth file likely underreports the prevalence of several maternal health indicators, such as diabetes and preeclampsia^{1,2}. In addition, 2017 and 2018 Texas birth and death file data are provisional (are available for analysis before these datasets have been thoroughly 'cleaned' and finalized), and as such, certain provisional data elements were not presented due to potential data quality concerns. In this report, no geographic information was analyzed or reported using provisional 2018 data, and 2018 provisional data were also not used when presenting maternal and infant death outcomes by race/ethnicity. Since final 2017 data were not available at the time of this report, these outcomes and maps were presented using provisional 2017 data. All other years of data used in this report are final.

Data were suppressed in maps when there were between 1 and 4 cases in the numerator, to prevent identification of affected individuals that could be possible

¹ N. Haghghat, M. Hu, O. Laurent, J. Chung, P. Nguyen and J. Wu, "Comparison of birth certificates and hospital-based birth data on pregnancy complications in Los Angeles and Orange County, California," *BMC Pregnancy Childbirth*, vol. 16, no. 93, 2016.

² L. Vinikoor, L. Messer, B. Laraia and J. Kaufman, "Reliability of variables on the North Carolina birth certificate: a comparison with directly queried values from a cohort study," *Paediatr Perinat Epidemiol*, vol. 24, no. 1, pp. 102-112, 2010.

with such small numbers, thereby protecting the confidentiality and privacy of these individuals and their families.

In Texas, the PRAMS survey provides the most comprehensive population-based data on maternal health before, during, and after pregnancy. Conducted in partnership with the Centers for Disease Control and Prevention (CDC), DSHS has been implementing PRAMS annually since 2002. The PRAMS survey asks 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. Unlike vital records data, which include information on almost all births and deaths in Texas, PRAMS data are obtained from a sample of women who are residents of Texas and gave birth to a live infant. CDC provides Texas with a survey data file that includes survey weights, and CDC ensures that analyses are representative of women who have given birth to a live infant and are residents of Texas. For example, the 1,756 women who completed the survey in 2017 were representative of all 374,711 Texas residents who had a live birth. PRAMS data/results are generalizable to *women* who are Texas residents with at least one live birth within a specific year, whereas the birth file represents all *live births* in Texas. Because of this, 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, and the width of the confidence interval – in other words, the distance between its upper and lower limits – is an indicator of the variability, and thus the reliability, of the results. Texas PRAMS data are presented as estimated percentages or prevalence estimates to account for complex sampling and weighting. As with any self-reported survey, possibility of recall bias exists; that is, women may not answer the question correctly or leave it blank because they may not remember the event. However, the schedule of survey mailings begins 61 to 183 days after the birth of the infant to minimize this risk.

Despite the few limitations described above, Texas vital records are invaluable sources of data on the status of infant and maternal health, and PRAMS provides much-needed information about maternal risk and health pre-pregnancy, during pregnancy, and post-pregnancy that is not available elsewhere. Both Texas vital records and PRAMS data are used by DSHS and other state agencies and stakeholders to inform, develop, and drive policies and programs to improve the health of mothers and babies, and to understand their emerging health needs. These sources provide a rich understanding of both infant and maternal health and

serve as an important resource for risk factor analysis and for identification of possible avenues for prevention.

Data Terms

Baby-Friendly Hospital: A designation given to birthing facilities that offer an optimal level of care for infant feeding (breastfeeding) and for mother/baby bonding. To achieve accreditation as a Baby-Friendly Hospital, a facility must demonstrate a 75 percent exclusive breastfeeding rate or higher among mothers at discharge, must adhere to the International Code of Marketing Breastmilk Substitutes, and must successfully implement the Ten Steps to Successful Breastfeeding.

Body Mass Index: Body mass index (BMI) is a measure of weight-for-height that is often used to classify adults as being underweight, of normal weight, overweight, or obese³. 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 age⁴.

Causes of Infant Death: Cause of death categories from the NCHS Instruction Manual are used to calculate information regarding the leading causes of infant death in this report⁵. 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.

3

Centers for Disease Control and Prevention. (2024, May 20). About body mass index (BMI). Centers for Disease Control and Prevention. <https://www.cdc.gov/bmi/about/index.html>.

⁴ A. M. Branum, S. E. Kirmeyer and E. C. Gregory, "Prepregnancy Body Mass Index by Maternal Characteristics and State: Data From the Birth Certificate, 2014," 5 August 2016. [Online]. Available: https://www.cdc.gov/nchs/data/nvsr/nvsr65/nvsr65_06.pdf. [Accessed 5 August 2016].

⁵ National Center for Health Statistics, "ICD-10 cause-of-death lists for tabulating mortality statistics (updated March 2011)." 2011. [Online]. Available: <https://www.cdc.gov/nchs/data/dvs/Part9InstructionManual2011.pdf>. [Accessed 4 August 2017].

Gestational Age: Gestational age is used to calculate whether a birth is preterm, as well as to calculate 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 has changed the variable used to estimate gestation⁶. The current standard, starting in 2014, uses the obstetric estimate of gestation on the birth certificate, and not a combination of last menstrual period and the obstetric estimate, as had been done in the past. This current standard for calculating gestational age is used throughout the report.

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

Perinatal Periods of Risk: A comprehensive approach designed to help communities use data to improve infant and maternal health outcomes. In addition to infant deaths, fetal deaths are also included in the perinatal periods of risk (PPOR) analysis to provide more information. 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 fetio-infant mortality rate (F-IMR) is then calculated for each of these periods, both for the state as a whole and for specific demographic study populations. The reference group for each of these calculations is a state-level reference population of mothers with near-optimal birth outcomes⁷.

Race/Ethnicity: For information obtained from birth records, fetal death records, or from PRAMS, race/ethnicity information shown throughout this report refers to the mother, not the infant. However, infant death data are classified according to infant's race/ethnicity. Women who identified themselves as only White or Black and who did not indicate that they were Hispanic were classified as White or Black,

⁶ J. Martin, M. Osterman, S. Kirmeyer and E. Gregory, "Measuring gestational age in vital statistics data: transitioning to the obstetric estimate," *Natl Vital Stat Rep*, vol. 64, no. 5, 2015.

⁷ M. Peck, W. Sappenfield and J. Skala, "Perinatal periods of risk: a community approach for using data to improve women and infants' health," *Matern Child Health J*, vol. 14, no. 6, pp. 864-874, 2010.

respectively. Women who identified themselves as Hispanic were classified as Hispanic, regardless of their race designation. Women of all other races, including multiracial women, were classified as "Other", if the woman did not self-identify as Hispanic. The "Other" category is not homogeneous, and there have been shifts in the demographics of women within this category. Since 2004, there has been an increase in the number of women identifying themselves as multiracial. Starting in 2016, as a result of 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/ethnicity group definitions.

Maternal Mortality: In this report, the rate of confirmed maternal deaths occurring while pregnant or within 365 days of the end of pregnancy is presented. This maternal death rate is defined as the number of confirmed maternal deaths while pregnant or within 365 days of the end of pregnancy for every 100,000 live births. Maternal deaths were confirmed by matching each woman's death record with a live birth or fetal death event that occurred within 365 days of the date of death.

Severe Maternal Morbidity: Severe maternal morbidity (SMM) is a term used to describe any unintended outcomes of labor and delivery that result in significant consequences for a mother's health⁸. A hospital delivery was considered an SMM case if the mother had one or more of the conditions or procedures indicated on a list of SMM-related medical codes, including conditions such as acute renal failure, cardiac arrest, eclampsia, and sepsis, and including procedures such as blood transfusion and hysterectomy. The CDC SMM definition was used in this report to make ICD-9 more comparable to ICD-10⁹.

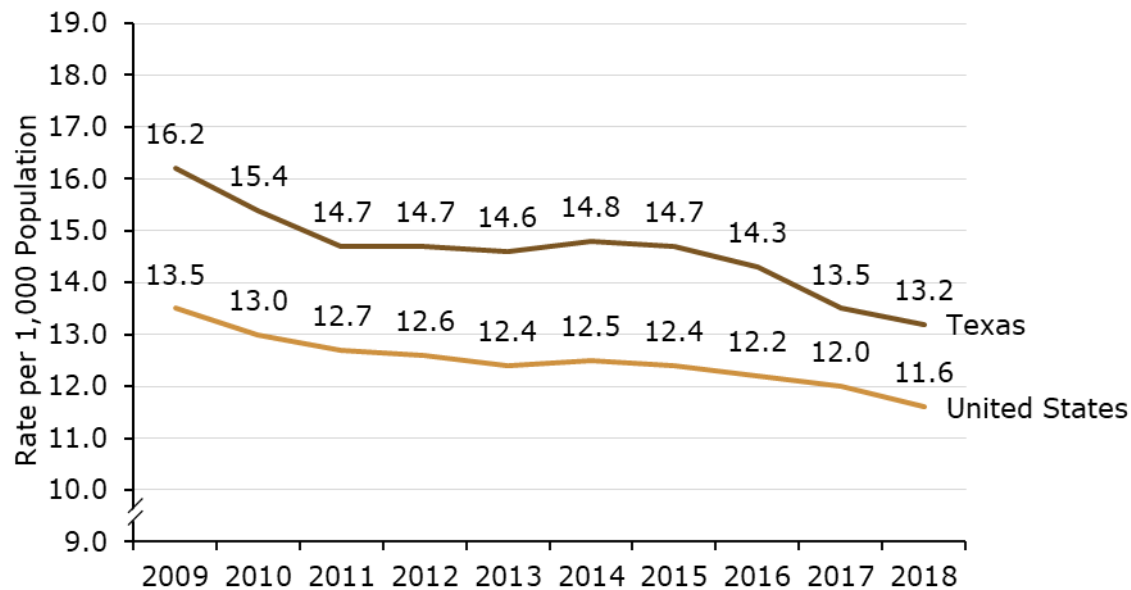
⁸ Centers for Disease Control and Prevention (CDC), "Severe Maternal Morbidity in the United States," November 2017. [Online]. Available: <https://www.cdc.gov/reproductivehealth/maternalinfanthealth/severematernalmorbidity.html>. [Accessed December 2017].

⁹ Centers for Disease Control and Prevention (CDC), "How Does CDC Identify Severe Maternal Morbidity?," September 2019. [Online]. Available: <https://www.cdc.gov/reproductivehealth/maternalinfanthealth/smm/severe-morbidity-ICD.htm>. [Accessed 16 October 2019].

3. Birth Demographics

The birth rate in Texas continued to decrease in 2018, after remaining stable from 2011 to 2015 (see Figure 1). Texas has the fifth highest birth rate in the United States¹⁰. In 2018, almost 390,000 babies were born in the state, and there were nearly 380,000 births to mothers that live in Texas.

Figure 1 Birth Rate in Texas and The United States, 2009-2018



Source: National Center for Health Statistics
Prepared by: Maternal & Child Health Epidemiology Unit
Dec 2019

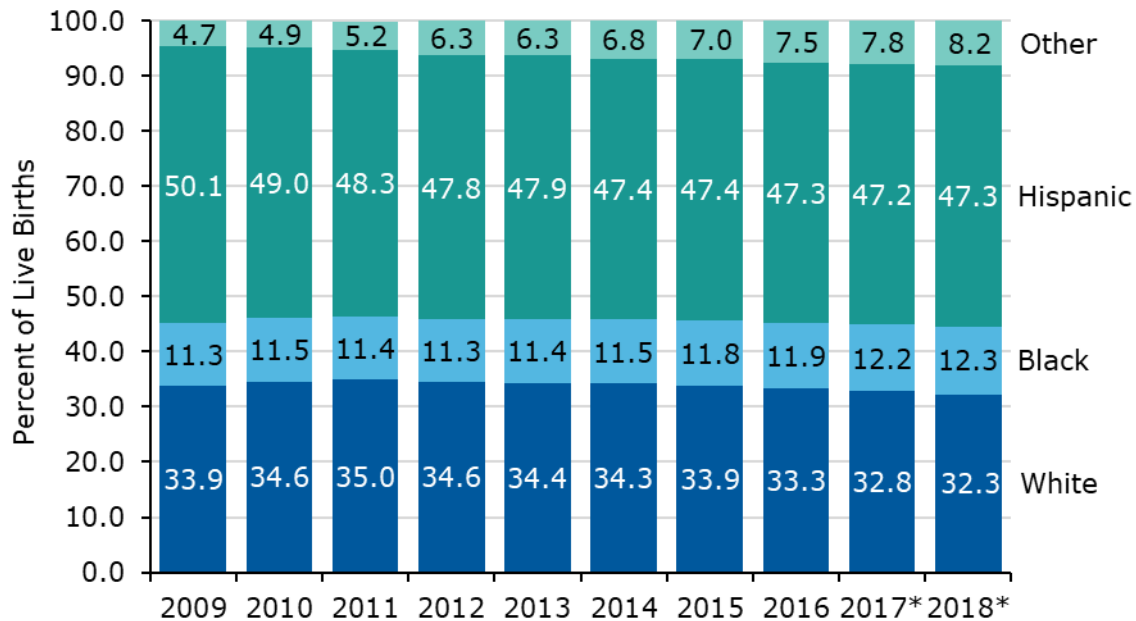
¹⁰ J. Martin, B. Hamilton, M. Osterman, A. Driscoll and P. Drake, "Births: Final Data for 2017," *National Vital Statistics Report*, vol. 67, no. 8, 2018.

Maternal Race/Ethnicity

Births to Hispanic women make up the largest percentage of all births in Texas, followed by births to White women, Black women, and women classified as 'Other' race/ethnicity (see Figure 2).

Although women who are classified as being of 'Other' race/ethnicity make up a small proportion of the total number of Texas births, this race/ethnic group has had the largest increase in the percent of total live births over the past decade in Texas (see Figure 2). More than 30,000 births in 2018 were to mothers who classified themselves as Asian, multiracial, or other race/ethnic designations. However, it is important to keep in mind that this group is quite heterogeneous (encompassing many different races/ethnicities), which often limits the interpretability of results for this particular race/ethnic category.

Figure 2 Distribution of Race/Ethnic Groups Among All Live Births, 2009-2018

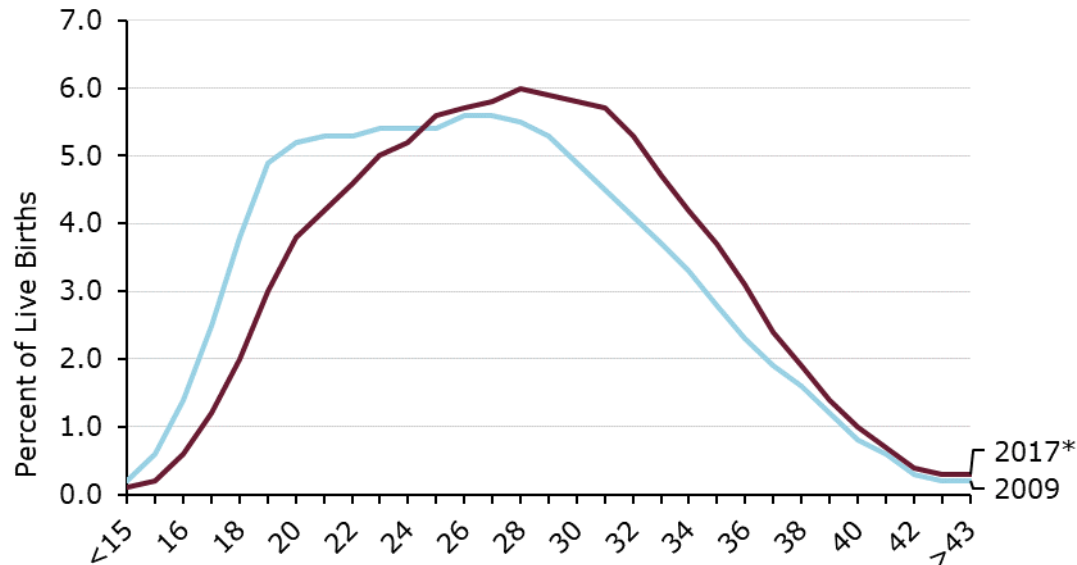


*2017 and 2018 Texas data are provisional
 Source: 2009-2018 Birth Files
 Prepared by: Maternal & Child Health Epidemiology Unit
 Dec 2019

Maternal Age

As in the United States as a whole, Texas has seen a shift in the maternal age of women giving birth over time (see Figure 3)¹¹. The average maternal age at birth in 2017 was 28.1 years of age, a significant increase from an average age of 26.1 years in 2009.

Figure 3 Maternal Age Distribution in 2009 and 2017

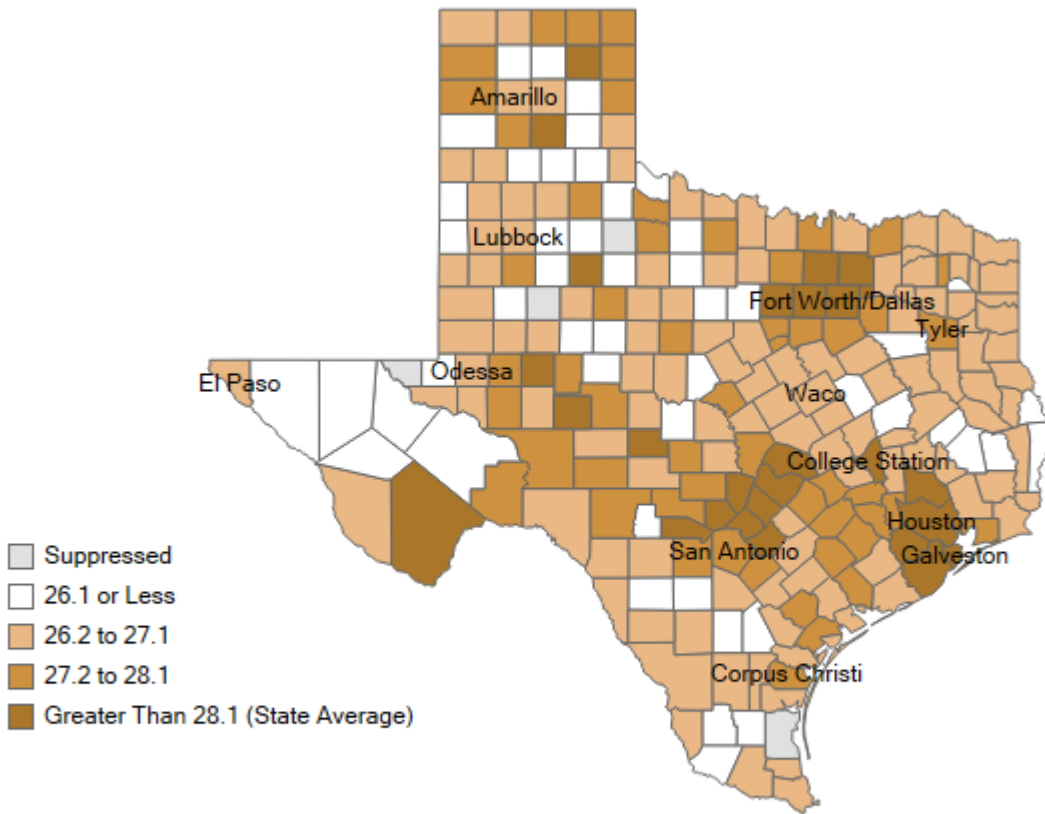


*2017 Texas data are provisional
Source: 2009 and 2017 Birth Files
Prepared by: Maternal & Child Health Epidemiology Unit
Dec 2019

¹¹ T. Mathews and B. Hamilton, "Mean Age of Mothers is on the Rise: United States, 2000–2014," NCHS Data Brief, vol. 232, 2016.

The average age for women with a live birth in 2017 differed by region (see Figure 4). Counties with major urban centers tended to have older average maternal ages.

Figure 4 Average Age of a Woman with a Live Birth, 2017

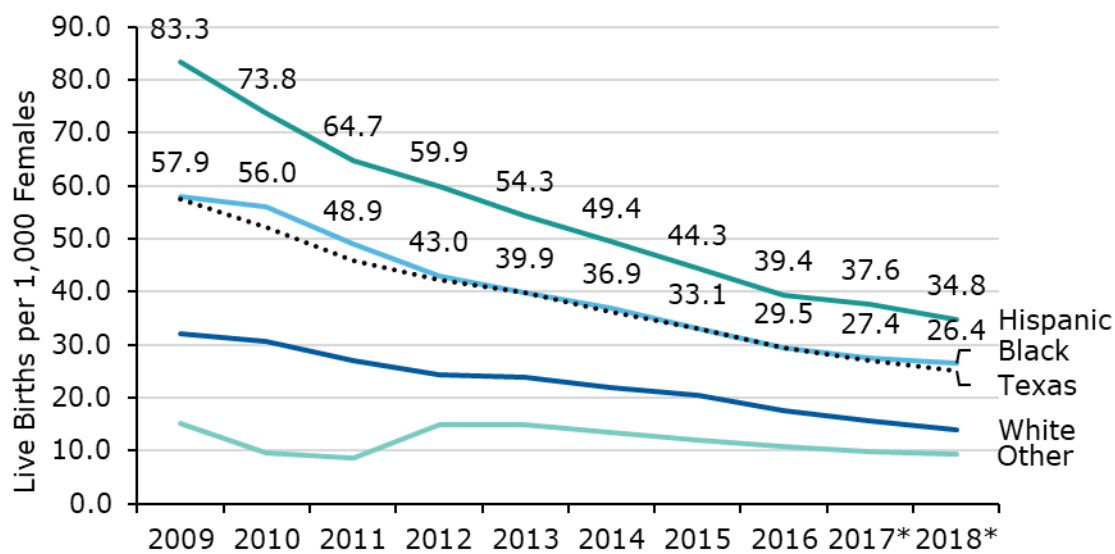


2017 Texas data are provisional
Source: 2017 Birth File
Prepared by: Maternal & Child Health Epidemiology Unit
Dec 2019

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. Texas, like the rest of the country, has reported dramatic decreases in the teen birth rate since 2009¹¹. This drop has been particularly steep for Hispanic and Black youth (see Figure 5). Over the past 10 years, the teen birth rate has declined by 58.2 percent among Hispanic youth and has declined by 54.4 percent among Black youth.

Although Texas has experienced a steady decrease in the teen birth rate over the past decade, as of 2017, Texas had the sixth highest teen birth rate in the United States (among females 15-19 years old)¹⁰.

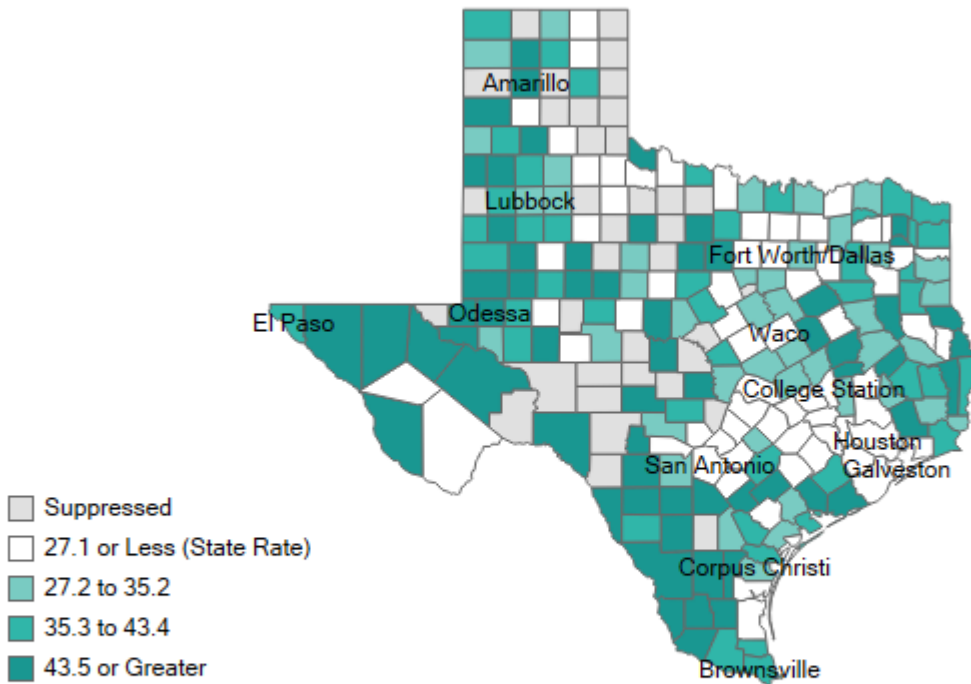
Figure 5: Teen (15 - 19 year old) Birth Rate per 1,000 Females by Race/Ethnicity, 2009-2018



*2017 and 2018 Texas data are provisional
 Source: 2009-2018 Birth Files
 2009-2017 Population Estimates
 2018 Population Projections
 Prepared by: Maternal & Child Health Epidemiology Unit
 Dec 2019

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

Figure 6 Teen Birth Rate per 1,000 Females Age 15-19 Years Old, 2017



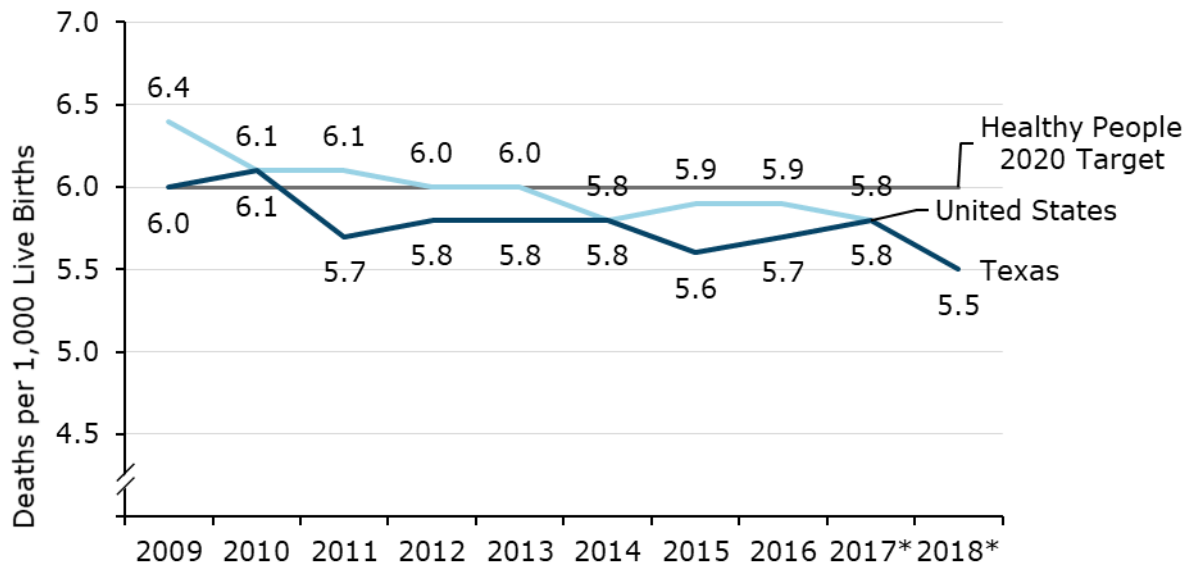
2017 Texas data are provisional
Source: 2017 Birth File
Texas Demographic Center 2017 Population Estimates
Prepared by: Maternal & Child Health Epidemiology Unit
Dec 2019

4. Infant Mortality & Morbidity

Infant Mortality Rate

In 2018, the Texas infant mortality rate (IMR) reached a historic low of 5.5 deaths per 1,000 live births. The IMR in Texas has been at or below the national rate for the past 10 years (see Figure 7). Moreover, since 2011, the state has consistently been below (exceeded) the Healthy People 2020 (HP2020) target of 6.0 deaths per 1,000 live births.

Figure 7 Infant Mortality Rate in Texas and the US, 2009-2018



*2017 and 2018 Texas data are provisional

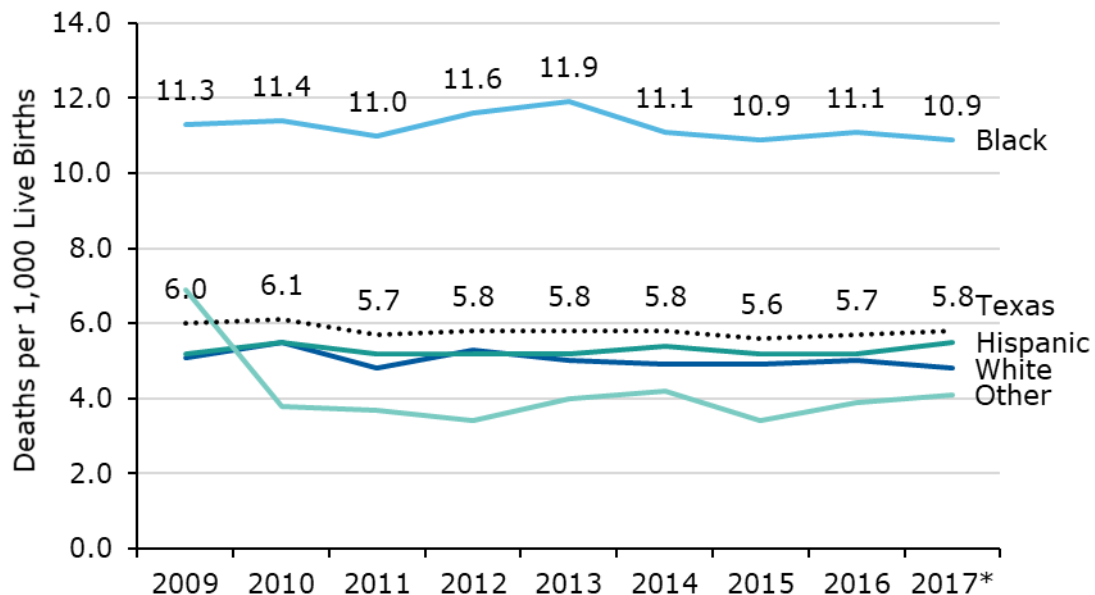
Source: 2009-2018 Texas Birth and Death Files, National Center for Health Statistics

Prepared by: Maternal & Child Health Epidemiology Unit

Dec 2019

However, racial/ethnic disparities in IMR have persisted in Texas, and it is clear that the overall decrease in IMR observed in Texas over the past decade was not equally distributed across all race/ethnic groups (see Figure 8). IMRs for Black mothers have been twice as high as IMRs for White and Hispanic mothers over much of this timeframe.

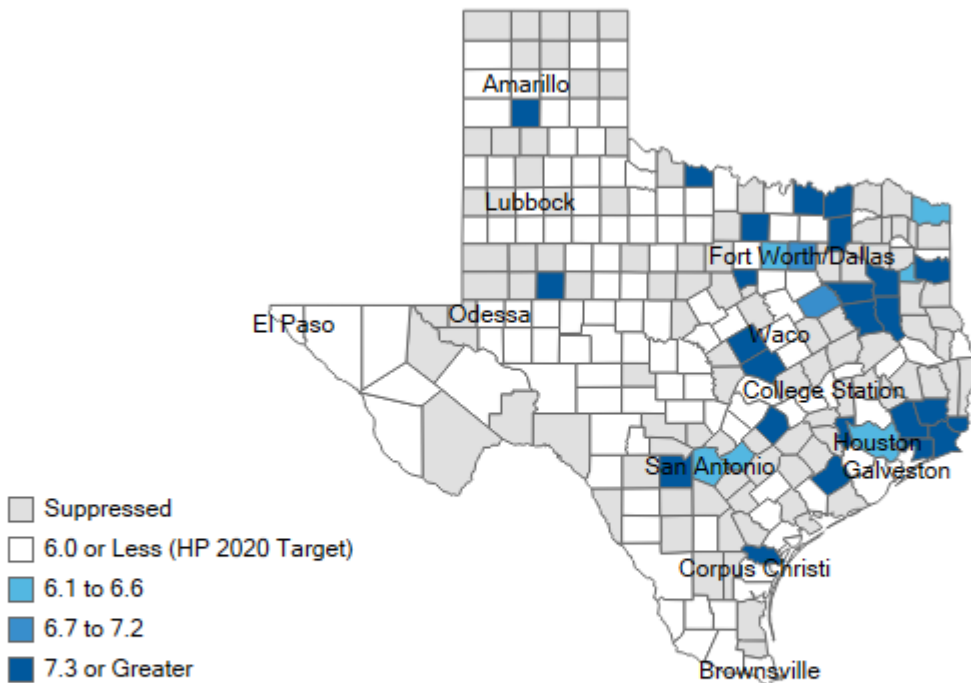
Figure 8 Infant Mortality Rate in Texas by Race/Ethnicity, 2009-2017



*2017 Texas data are provisional
 Source: 2009-2017 Texas Birth and Death Files
 Prepared by: Maternal & Child Health Epidemiology Unit
 Dec 2019

In addition to race/ethnic disparities, substantial regional differences in IMR persist within the state. In 2017, many Texas counties met the HP2020 target of 6 or fewer infant deaths per 1,000 live births (see Figure 9). In contrast, Cherokee County, Fannin County, Wichita County, and Medina County had the highest IMRs; more than 10 deaths per 1,000 live births were reported in these counties in 2017.

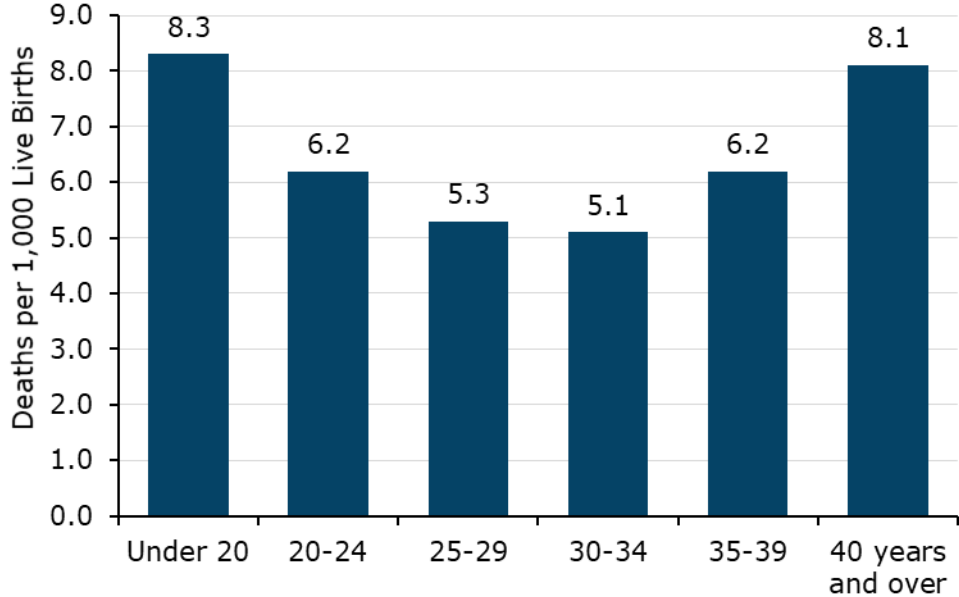
Figure 9 Infant Mortality Rate per 1,000 Live Births, 2017



2017 Texas data are provisional
 Source: 2017 Birth File
 2017 Death File
 Prepared by: Maternal & Child Health Epidemiology Unit
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Differences in IMR also exist by maternal age. In 2017, a higher IMR was observed among young mothers less than 20 years of age than among mothers of any other age group, followed by mothers age 40 years or older (see Figure 10). Mothers in these two age groups comprised 9.9 percent of all Texas resident births in 2017.

Figure 10 Infant Mortality Rate by Age Group, 2017

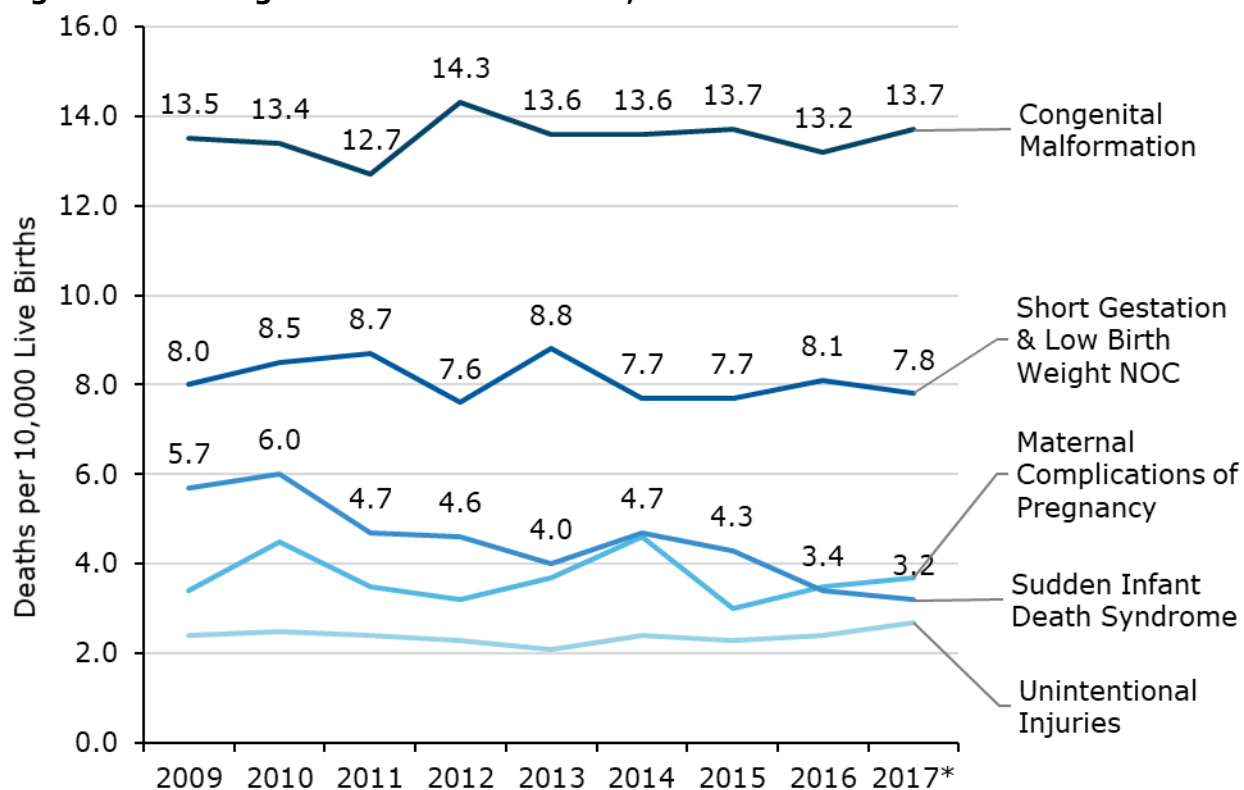


Source: 2017 NCHS Linked Birth-Death Files
Prepared by: Maternal & Child Health Epidemiology Unit
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Causes of Infant Death

Causes of infant death are presented in this 2019 Data Book using provisional 2017 data before they are finalized, because final 2017 data were not available at the time of this report. Overall, the leading cause of death for infants younger than one year in Texas is congenital malformation (birth defects; see Figure 11). Among infants older than 28 days, Sudden Infant Death Syndrome (SIDS) is the second leading cause of death. The provisional 2017 SIDS rate is likely an underestimate of the final 2017 SIDS rate, because deaths due to SIDS have a longer reporting lag time compared to deaths due to other infant causes of death¹².

Figure 11 Leading Causes of Infant Death, 2009-2017

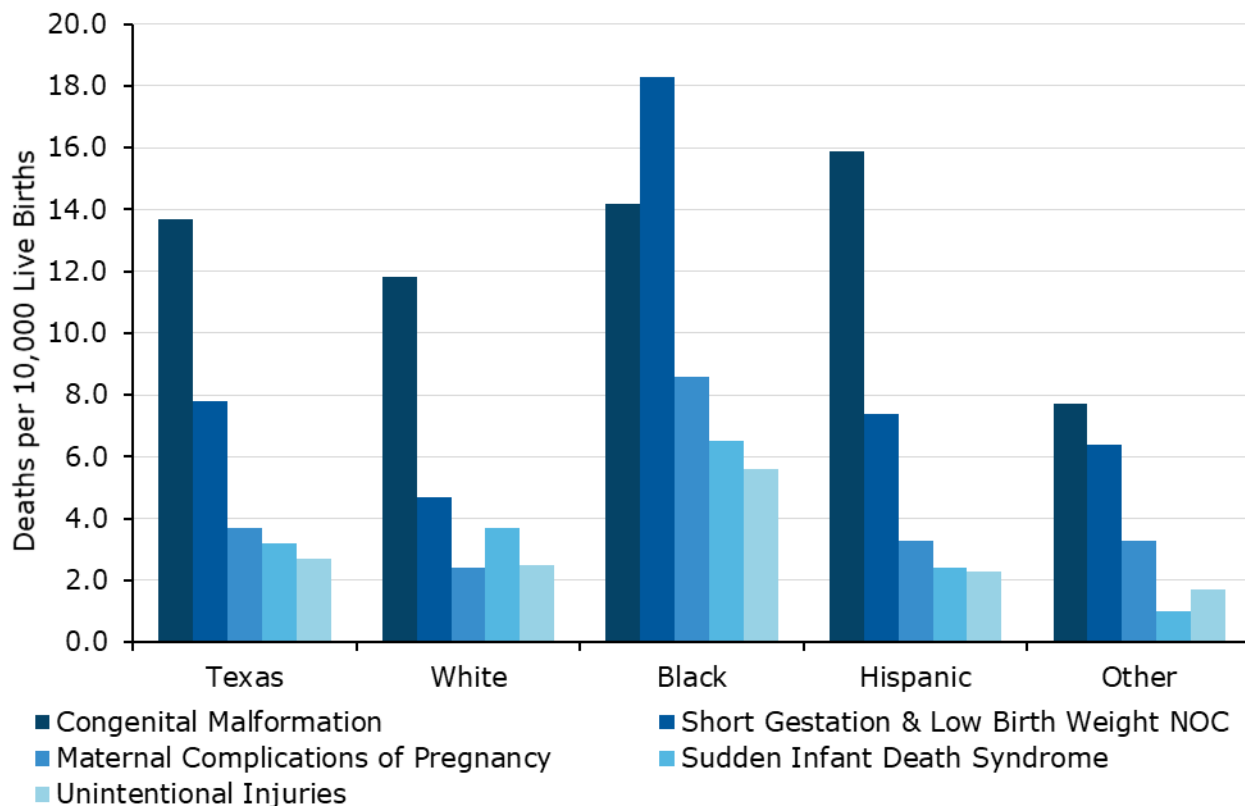


*2017 data are provisional
 NOC: Not otherwise classified
 Source: 2009-2017 Death & Birth Files
 Prepared by: Maternal & Child Health Epidemiology Unit
 Dec 2019

¹² L. Rosen, L. Womack, M. Spencer and F. Ahmad, "Timeliness of Infant Death Data for Infant Mortality Surveillance and Quarterly Provisional Estimates," *Vital Statistics Rapid Release*, no. 5, 2018.

Leading causes of infant death also differ by race/ethnicity. In 2017, the leading cause of death among Black infants was short gestation and low birth weight, whereas congenital malformation was the leading cause of death among infants of all other race/ethnic groups (see Figure 12).

Figure 12 Leading Causes of Death by Race/Ethnicity, 2017

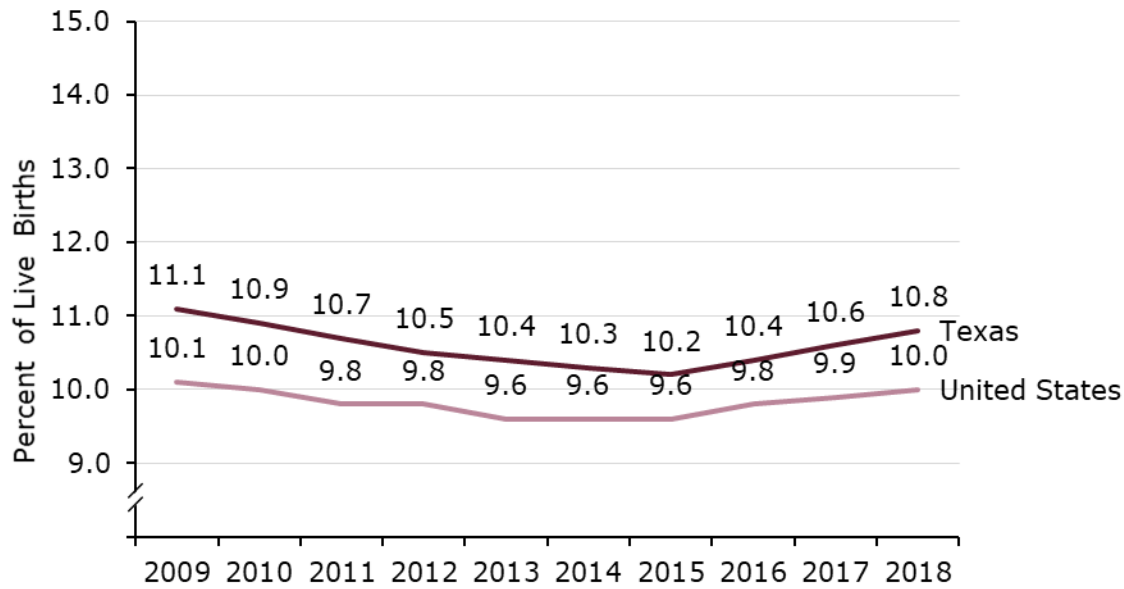


*2017 data are provisional
 NOC: Not otherwise classified
 Source: 2017 Death & Birth Files
 Prepared by: Maternal & Child Health Epidemiology Unit
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Preterm Birth

Preterm births are those that occur prior to 37 weeks of gestation. Preterm birth rates in both Texas and the nation decreased during 2009 to 2015. However, in 2018, the Texas preterm birth rate increased for the third year in a row, as did the national rate of preterm birth. The preterm birth rate in Texas has consistently been higher than the national average over the past 10 years (see Figure 13).

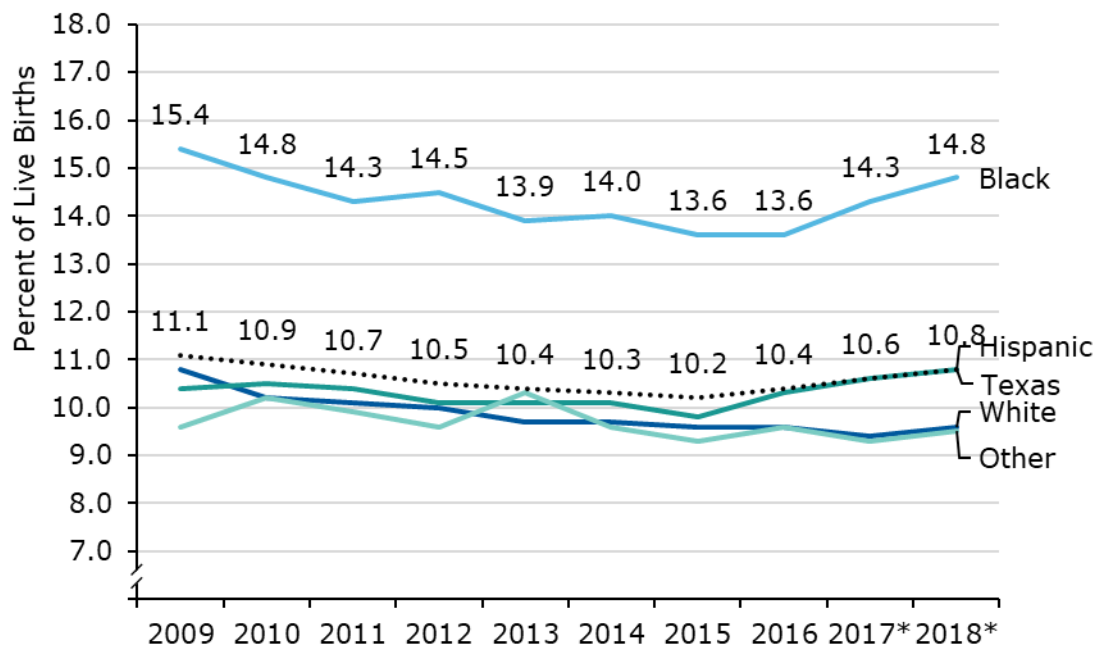
Figure 13 Percent of Live Births Born Preterm (less than 37 weeks) in Texas and United States Using Obstetric Estimate of Gestation, 2009-2018



Source: National Center for Health Statistics
Prepared by: Maternal & Child Health Epidemiology Unit
Dec 2019

As with IMR, there are substantial racial/ethnic disparities in the preterm birth rate (see Figure 14). Black infants have a higher preterm birth rate than do infants of any other race/ethnic group.

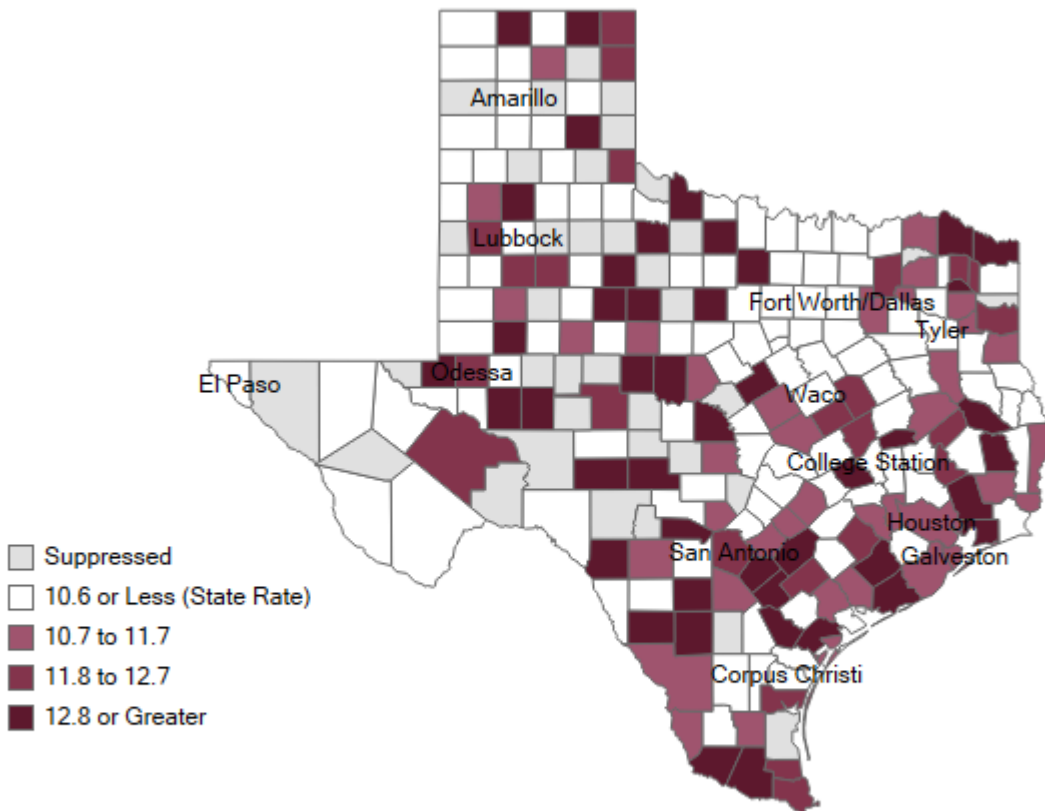
Figure 14 Percent of Live Births Born Preterm (less than 37 weeks) in Texas by Race/Ethnicity Using Obstetric Estimate of Gestation, 2009-2018



*2017 and 2018 Texas data are provisional
 Source: 2009-2018 Texas Birth Files
 Prepared by: Maternal & Child Health Epidemiology Unit
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Figure 15 shows the percentage of preterm births by county in Texas. There were no clear geographic patterns or regional disparities for low birth weight rates within the state.

Figure 15 Percent of Live Births Born Preterm (less than 37 weeks) in Texas Using Obstetric Estimate of Gestation, 2017

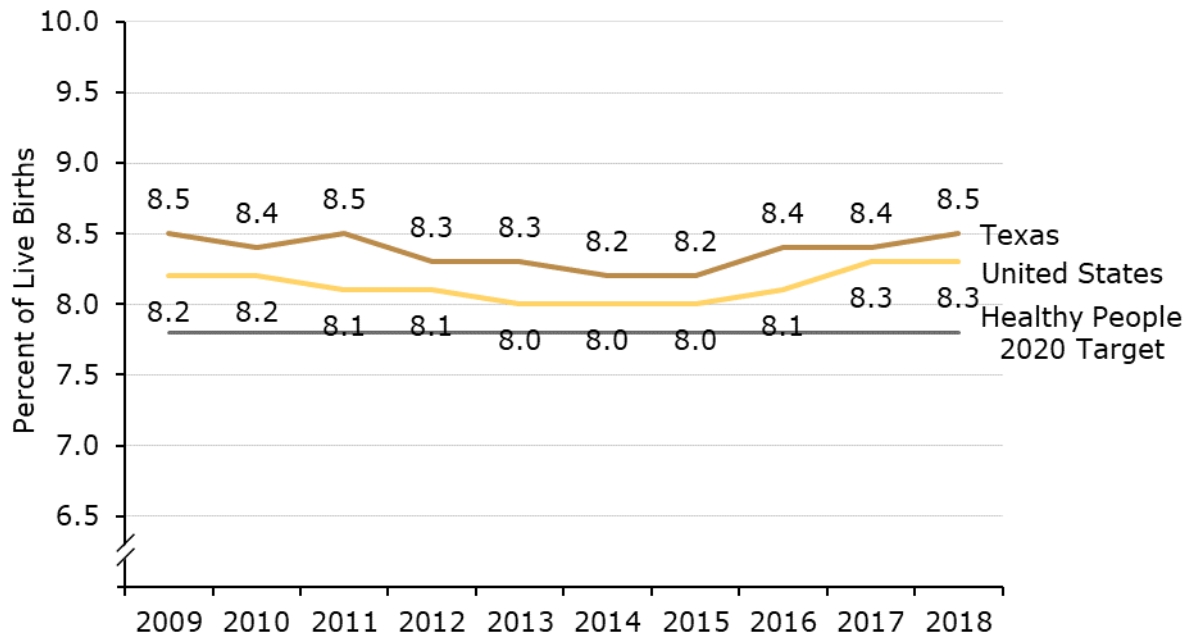


2017 Texas data are provisional
Source: 2017 Birth File
Prepared by: Maternal & Child Health Epidemiology Unit
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Low Birth Weight

The percentage of babies born with a low birth weight in Texas (weighing less than 2500 grams) increased slightly in 2018. The rate of low birth weight infants in Texas is slightly higher than the national rate, and Texas is currently not meeting the HP2020 target of 7.8 percent or fewer of all live births weighing less than 2500 grams (see Figure 16).

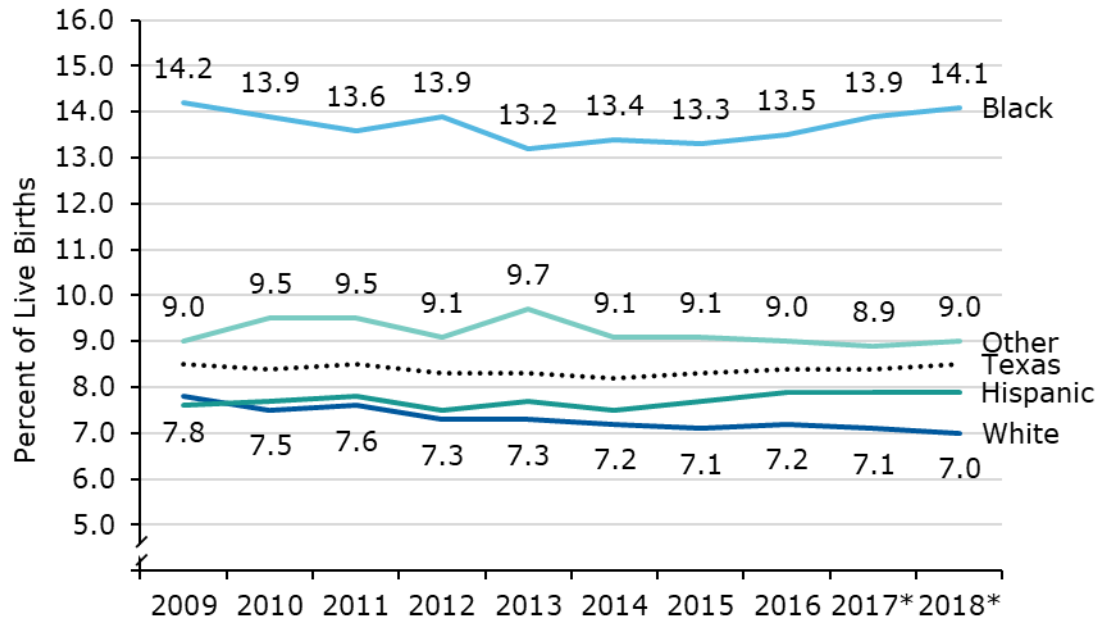
Figure 16 Percent of Births that are Low Birth Weight (less than 2500 g) in Texas and the United States, 2009-2018



Source: National Center for Health Statistics
Prepared by: Maternal & Child Health Epidemiology Unit
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As with IMR and preterm births, Black mothers have a disproportionately high percentage of low birth weight infants (see Figure 17). The rate of low birth weight infants is also higher among mothers in the 'Other' race/ethnic category than among White or Hispanic mothers.

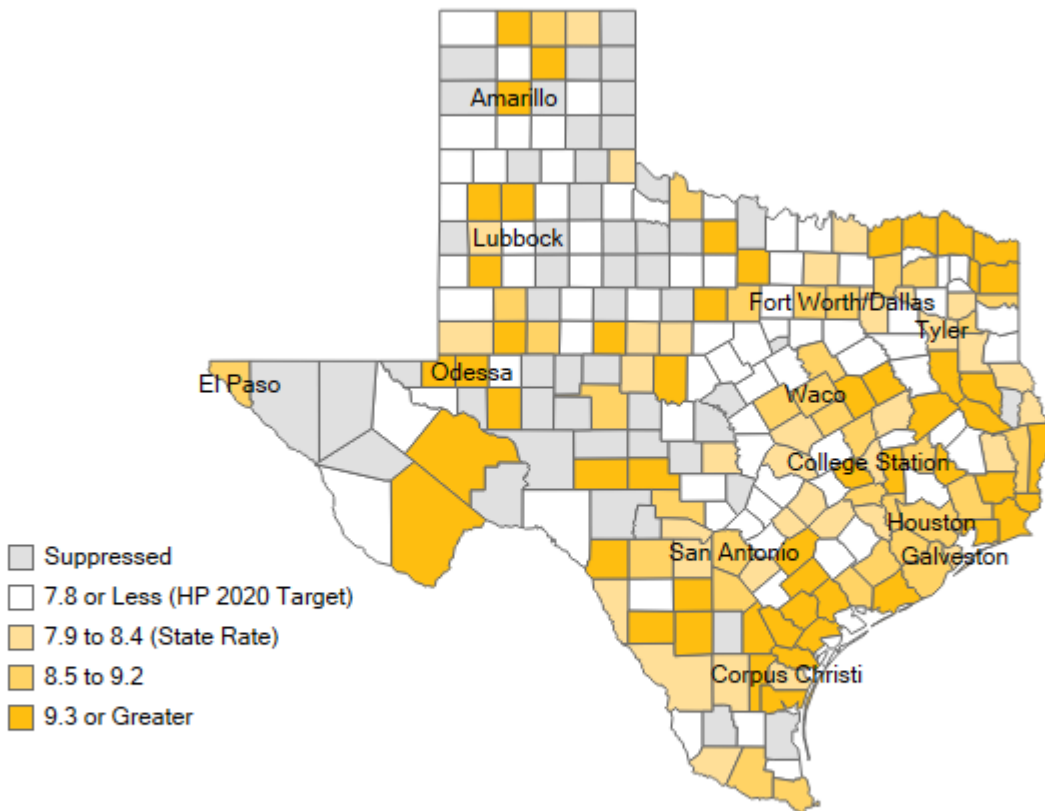
Figure 17 Percent of Births that are Low Birth Weight (less than 2500 g) in Texas by Race/Ethnicity, 2009-2018



*2017 and 2018 Texas data are provisional
 Source: 2009-2018 Birth Files
 Prepared by: Maternal & Child Health Epidemiology Unit
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Although some counties in Texas met the HP2020 target for percentage of low birth weight infants in 2017, many counties did not (see Figure 18). Regional differences were observed; many counties in south and east Texas had higher percentages of low birth weight infants than the state as a whole.

Figure 18 Percent of Infants born Low Birth Weight (less than 2500g), 2017



2017 Texas data are provisional
Source: 2017 Birth File
Prepared by: Maternal & Child Health Epidemiology Unit
Dec 2019

Perinatal Periods of Risk

Although Texas has made significant progress in reducing infant mortality, data show continued disparities in infant mortality and feto-infant mortality among different racial/ethnic groups, especially between Black and White women. To better understand these disparities, a perinatal periods of risk analysis (PPOR) was undertaken, which examines the risk of feto-infant mortality during different perinatal periods. Based on birth weight and age at death, fetal and infant deaths were partitioned into four corresponding risk periods (see Figure 19)⁷.

Figure 19 Perinatal Periods of Risk (PPOR) Risk Periods: Points of Intervention

Birthweight	Age at Death	Risk Period	Intervention Points
500-1499 g	Fetal through Post-neonatal	Maternal Health/Prematurity (MPH)	Preconception Health Health Behaviors Perinatal Care
	Fetal Death	Maternal Care (MC)	Prenatal Care High Risk Referral Obstetric Care
1500+ g	Neonatal	Newborn Care (NC)	Perinatal Management Neonatal Care Pediatric Surgery
	Post-neonatal	Infant Health (IH)	Sleep Position Smoking Breast Feeding

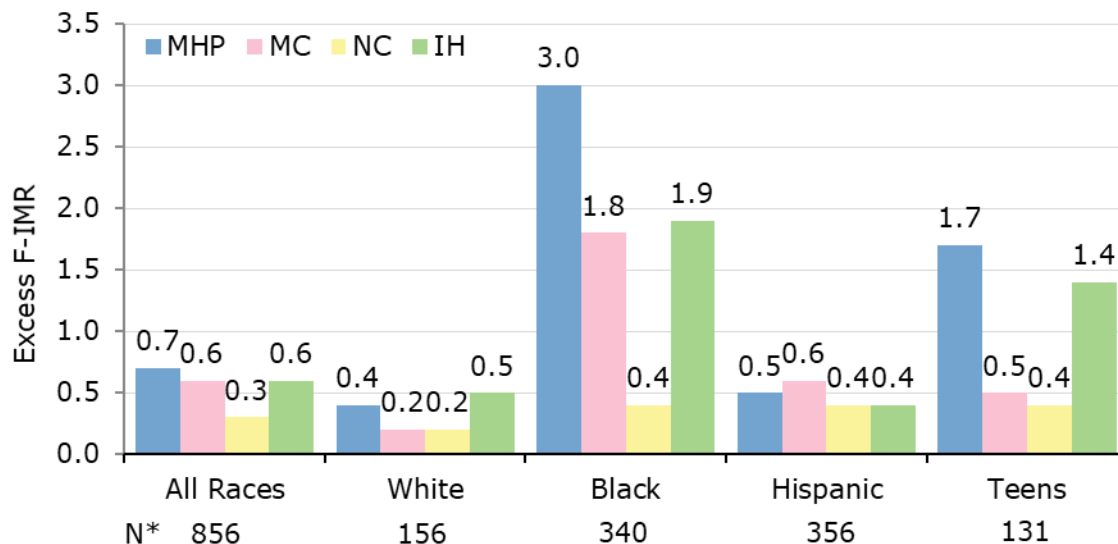
Each of these periods has different risk factors and causes of death, and hence, different opportunities for prevention; therefore, the four risk periods represent distinct points of intervention in the health care continuum (see Figure 19)⁷.

Phase I Analysis

Texas and specific study populations (i.e., Black, White, Hispanic, or teens) were compared to a state-level reference group generally known to have better feto-infant mortality outcomes (i.e., non-Hispanic White women who are at least 20 years of age and have 13+ years of education). In the following analysis, these study populations are not mutually exclusive. The feto-infant mortality rate (F-IMR) is calculated as the number of fetal and infant deaths per 1,000 live births and fetal deaths. The 2015 F-IMRs were 6.2 per 1,000 for White mothers, 12.2 per 1,000 for Black mothers, 6.9 per 1,000 for Hispanic mothers, and 9.0 per 1,000 for teen mothers. The excess F-IMR is the difference in F-IMR between the study population and the reference group. In 2015, Black mothers experienced a total of 7.1 excess

fetal and infant deaths per 1,000 live births and fetal deaths. Total excess F-IMRs for White mothers, Hispanic mothers, and teen mothers were 1.1 per 1,000, 1.9 per 1,000, and 4.0 per 1,000, respectively (see Figure 20).

Figure 20 Excess Feto-Infant Mortality Rates (F-IMR), 2015



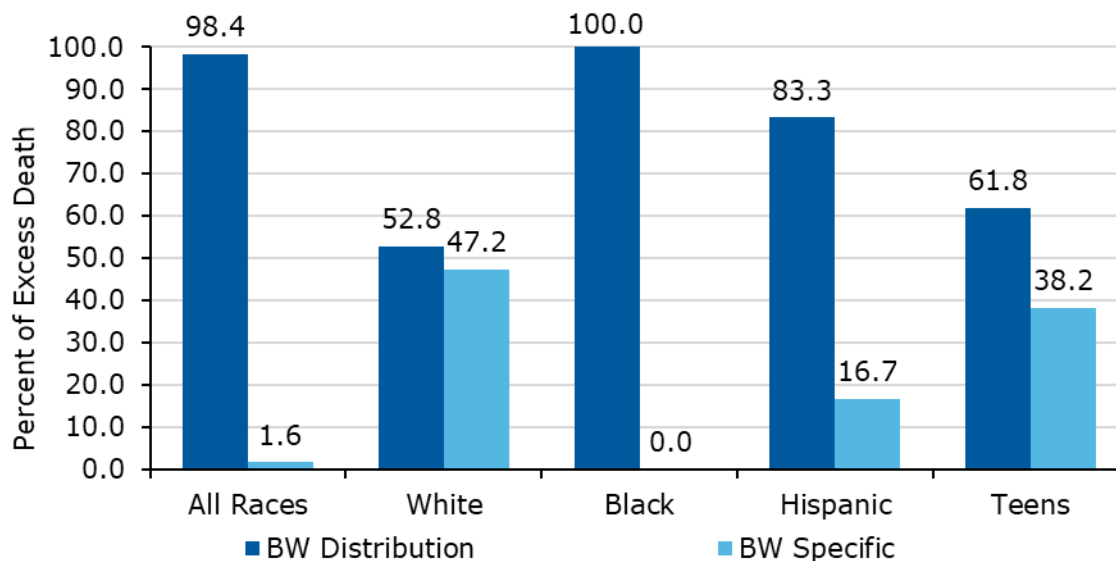
*N is the number of excess fetal and infant deaths for each of the groups shown.
 Source: 2014 Birth Cohort Linked Birth Infant Death Files
 Prepared by: Maternal & Child Health Epidemiology Unit
 Oct 2017

Black women had the highest excess F-IMR for all four risk periods (see Figure 20), with 59 percent of all Black fetal and infant deaths being potentially preventable deaths (i.e. excess fetal and infant deaths). Moreover, 42 percent of the overall excess Black fetal and infant deaths occurred in the Maternal Health/Prematurity risk period. For teen mothers, 77 percent of excess feto-infant deaths occurred in the Maternal Health and Infant Health risk periods.

Phase II Analysis

For fetal and infant deaths in the Maternal Health/Prematurity risk period, a Kitagawa analysis was conducted for each study population to examine whether excess fetoinfant mortality was primarily due to a greater number of very low birth weight (VLBW) births in the study population compared to the reference population (a difference in *birth weight distribution*), or to a higher mortality rate among VLBW infants than seen in the reference population (a difference in *birth weight specific mortality*)¹³. In other words, did the excess fetoinfant mortality emerge 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? The percentage of excess deaths attributable to a difference in birth weight distribution compared with the percentage attributable to a difference in birth weight specific mortality rates are shown in Figure 21 for each study population.

Figure 21 Percent of Excess Death Attributable to Birth Weight (BW) Distribution vs. Birth Weight (BW) Specific Mortality, 2015



Source: 2014 Linked Birth Infant Death Files
Prepared by: Maternal & Child Health Epidemiology Unit
Oct 2017

¹³ C. Stampfel, C. Kroelinger, M. Dudgeon, D. Goodman, L. Ramos and W. Barfield, "Developing a standard approach to examine infant mortality: findings from the State Infant Mortality Collaborative (SIMC)," *Matern Child Health J*, vol. 16, pp. 360-369, 2012.

For all subpopulations examined, the majority of excess Maternal Health/Prematurity risk period deaths were attributable to a greater number of VLBW births in these groups when compared to the reference population. Notably, Black infants (0 percent) had lower mortality rates among VLBW births than the reference population; for this subgroup, all excess deaths (100 percent) were potentially attributable to a greater number of VLBW births (see Figure 21). For all of these study populations, and especially for infants born to Black mothers, interventions aimed at reducing the number of VLBW births are likely to be most effective at closing the gap in fetoinfant mortality. For infants born to White mothers, Hispanic mothers, and teen mothers, some proportion of excess fetoinfant death was also attributable to a higher mortality rate among VLBW births than the reference population.

To examine differences in *birth weight distribution* during the Maternal Health/Prematurity risk period, a multivariable logistic regression analysis was conducted to identify factors associated with risk of delivering a VLBW baby. Factors examined included maternal demographic factors (race/ethnicity, age, and education), multiple gestations, smoking during pregnancy, high parity, previous preterm birth, infections, maternal weight gain during pregnancy, adequacy of prenatal care, trimester prenatal care began, and payment source for the delivery.

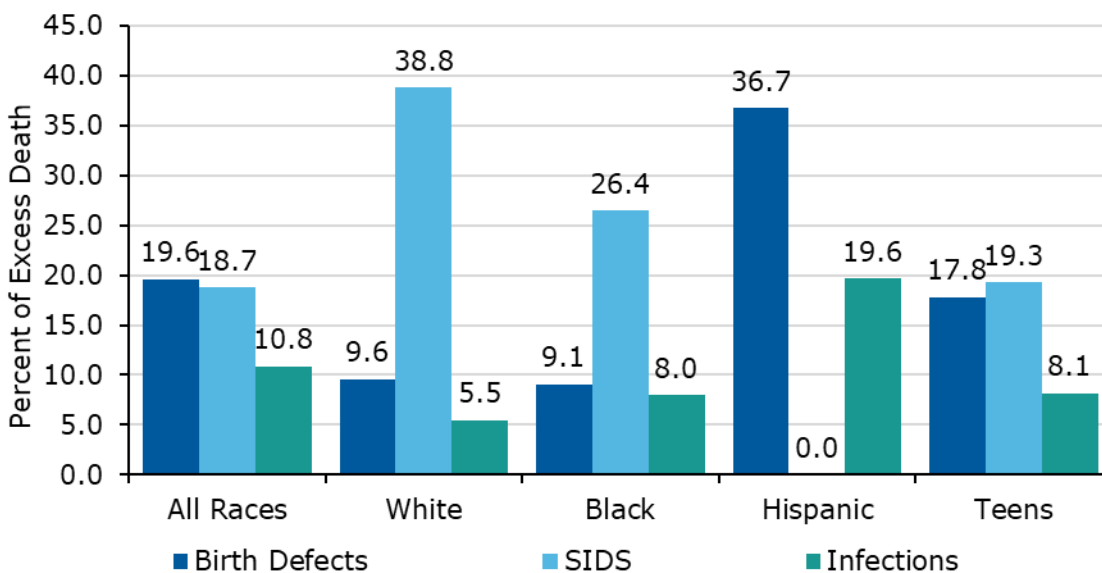
Factors that contributed the most to risk of a VLBW birth included weight gain less than 15 pounds, inadequate prenatal care, and previous preterm birth. Approximately 20 percent of all VLBW births were attributable to weight gain less than 15 pounds. Five percent and 3 percent of all VLBW births could be attributed to inadequate prenatal care and previous preterm birth, respectively. All study populations were more likely to gain less than 15 pounds or receive inadequate prenatal care compared to the reference population. Black, Hispanic, and White mothers had increased prevalence of having a previous preterm birth.

To identify factors related to *birth weight specific mortality* in the Maternal Health/Prematurity risk period, an analysis was also performed to assess risk of infant death among VLBW births. Factors examined in this analysis included maternal demographics, congenital anomalies, inadequate prenatal care, maternal diabetes, maternal hypertension, infant transfer, maternal transfer, respiratory care, ruptured membranes, and prenatal steroids. Inadequate prenatal care contributed the most to infant mortality among VLBW births. Specifically, four percent of infant deaths to this group were attributable to inadequate prenatal care. Among VLBW births, infants whose mothers received prenatal steroids had a 24

percent *reduced* risk of infant death. Compared to the reference population, teen mothers were more likely to deliver an infant with congenital anomalies and were less likely to receive prenatal steroids.

Among all infant deaths in the Infant Health risk period, birth defects were the primary cause of death, accounting for 20 percent of excess deaths (see Figure 22). Of the subgroups examined, Blacks and teens had the greatest excess infant mortality in this risk period, with SIDS accounting for a large proportion of excess infant deaths. Infections contributed to 20 percent of excess mortality among Hispanic infants, and SIDS accounted for 39 percent of excess deaths among infants born to white mothers.

Figure 22 Excess Infant Health-Related Death by Race/Ethnicity and Cause, 2015



Source: 2014 Linked Birth Infant Death Files
 Prepared by: Maternal & Child Health Epidemiology Unit
 Oct 2017

To further examine excess mortality in the Infant Health risk period, an analysis was conducted to determine risk factors associated with infant death among infants 28 days and older. Maternal demographic factors, smoking during pregnancy, adequacy of prenatal care, breastfeeding status at hospital discharge, and trimester prenatal care began were all examined. Early prenatal care, breastfeeding, and smoking had the greatest impact on overall risk of infant death during this time period. Among infants 28 days and older, infants whose mothers received prenatal care in the first trimester had a 25 percent *reduced* risk of infant death, and infants

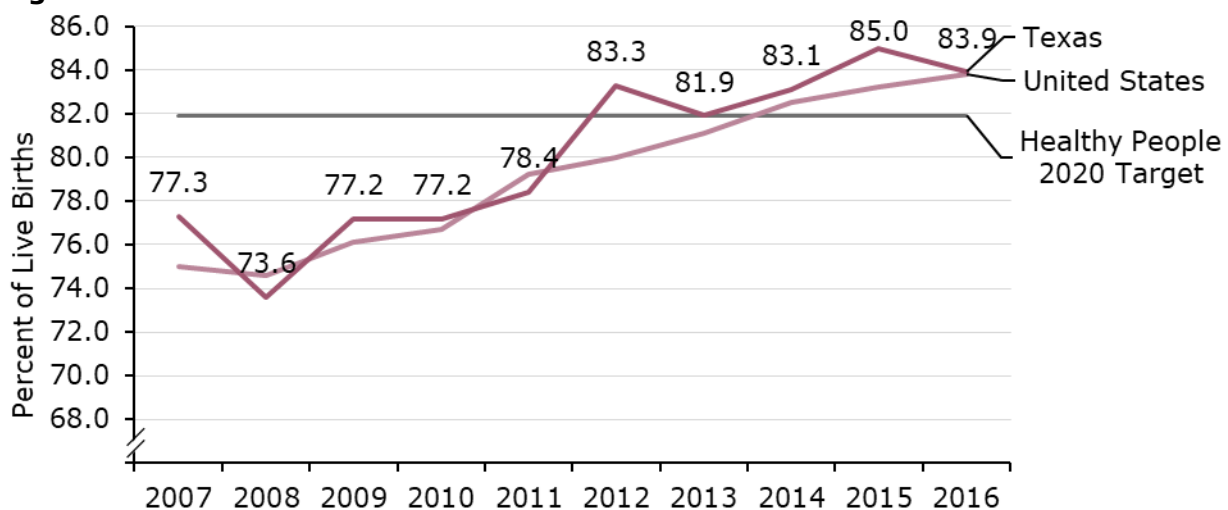
who were breastfed had a 40 percent lower risk of death. Maternal smoking during pregnancy potentially contributed to five percent of infant deaths in the Infant Health risk period.

5. Infant Health Practices

Breastfeeding

Breast milk contains essential nutrients and antibodies necessary to best nourish infants and protect them from disease. Formula-fed babies are at higher risk of necrotizing enterocolitis, lower respiratory infections, and chronic diseases such as asthma, obesity, and type 2 diabetes¹⁴. According to the National Immunization Survey, 83.9 percent (Confidence Interval (CI): 81.3-86.5) of infants born in Texas in 2016 were ever breastfed (see Figure 23)¹⁵. This rate was similar to the 2016 national rate (83.8 percent; CI: 82.6-85.0). Since 2012, Texas has met the Healthy People 2020 (HP2020) target for proportion of infants having ever breastfed (81.9 percent).

Figure 23 Percent of Infants Ever Breastfed in Texas and the United States



Breastfeeding rates through 2008 births are based on the landline sampling frame.

Starting with 2009 births, rates are based on a dual-frame sample.

Source: National Immunization Survey

Prepared by: Maternal & Child Health Epidemiology Unit

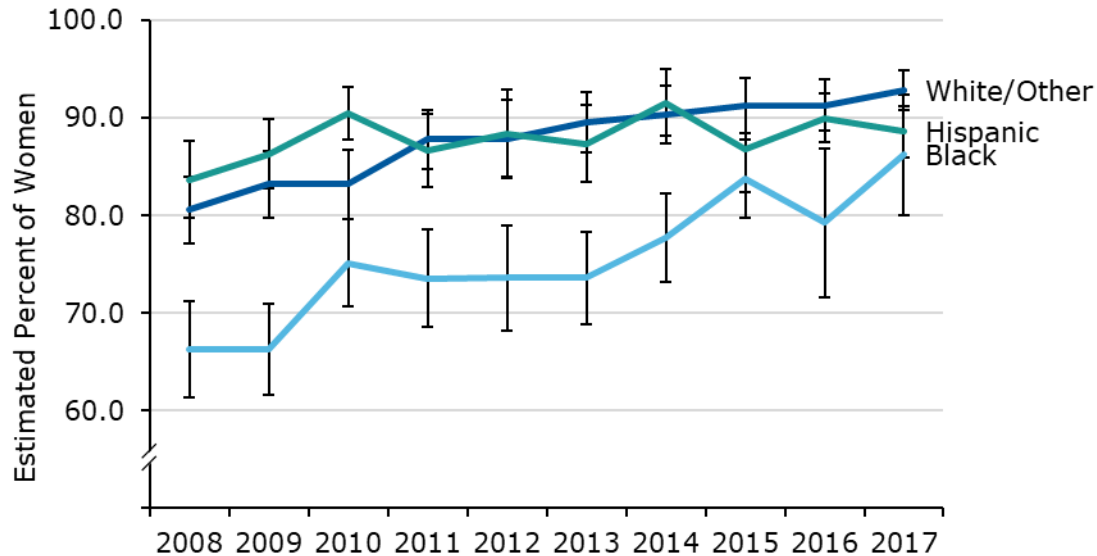
Dec 2019

¹⁴ M. Bartick and A. Reinhold, "The burden of suboptimal breastfeeding in the United States: A pediatric cost analysis," *Pediatrics*, vol. 125, no. 5, pp. e1048-e1056, 2010.

¹⁵ Centers for Disease Control and Prevention, "Rates of Any and Exclusive Breastfeeding by State among Children Born in 2016," 2019. [Online]. Available: https://www.cdc.gov/breastfeeding/data/nis_data/rates-any-exclusive-bf-state-2016.htm.

However, significant race/ethnic disparities exist in the rate of women who have ever breastfed their infant. Black mothers report lower rates of ever breastfeeding than both White and Hispanic mothers (see Figure 24).

Figure 24 Women Who Ever Breastfed Their Baby by Race/Ethnicity, Texas Pregnancy Risk Assessment Monitoring System (PRAMS) 2008-2017



Error Bars: 95% Confidence Interval
 Source: 2008-2017 Texas PRAMS
 Prepared by: Maternal & Child Health Epidemiology Unit
 Dec 2019

While a relatively large proportion of Texas mothers report having ever breastfed, rates of exclusive breastfeeding are significantly lower. Research has shown that the benefits of breastfeeding are greatest when the baby is exclusively fed breast milk for the first 6 months after birth. According to the National Immunization Survey, 24.1 percent (CI: 21.2-27.0) of Texas mothers reported breastfeeding exclusively at 6 months in 2016¹⁵. According to the Texas WIC Infant Feeding Practices Survey, among mothers enrolled in Texas WIC in 2018, only 4.4 percent reported exclusively breastfeeding at 6 months of age.

It has been shown that initiating breastfeeding in the hospital is an important first step towards exclusive breastfeeding. In Texas, only 20.1 percent of births in 2018

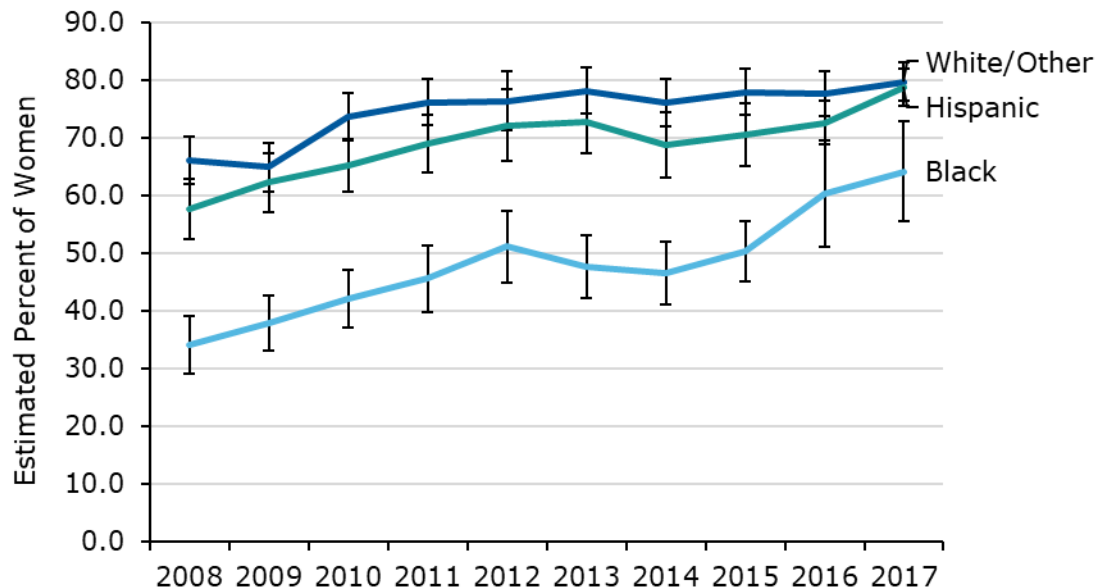
occurred in a Baby-Friendly Hospital, according to 2018 Baby-Friendly USA and 2017 National Center for Health Statistics data¹⁶.

¹⁶ Centers for Disease Control and Prevention. National Center for Chronic Disease Prevention and Health Promotion, Division of Nutrition, Physical Activity, and Obesity, "Breastfeeding Report Card," 2018. [Online]. Available: <https://www.cdc.gov/breastfeeding/data/reportcard.htm>. [Accessed 15 October 2018]

Placing Infants on their Back to Sleep

Placing an infant on his/her back to sleep, rather than on the stomach or side, is an important strategy to reduce sleep-related deaths¹⁷. According to Texas PRAMS data, 77.7 percent of mothers reported placing their infant on their back to sleep in 2017. This percentage has increased by over 30 percent since 2008. Despite this significant increase, substantial race/ethnic differences still exist. In particular, although the proportion of Black mothers placing their infant on their back to sleep increased by 88 percent between 2008 and 2017, this proportion was still significantly lower among Black mothers than among White mothers and Hispanic mothers in 2017 (see Figure 25).

Figure 25 Women Who Reported Placing Infant on Back to Sleep by Race/Ethnicity, Texas PRAMS 2008-2017



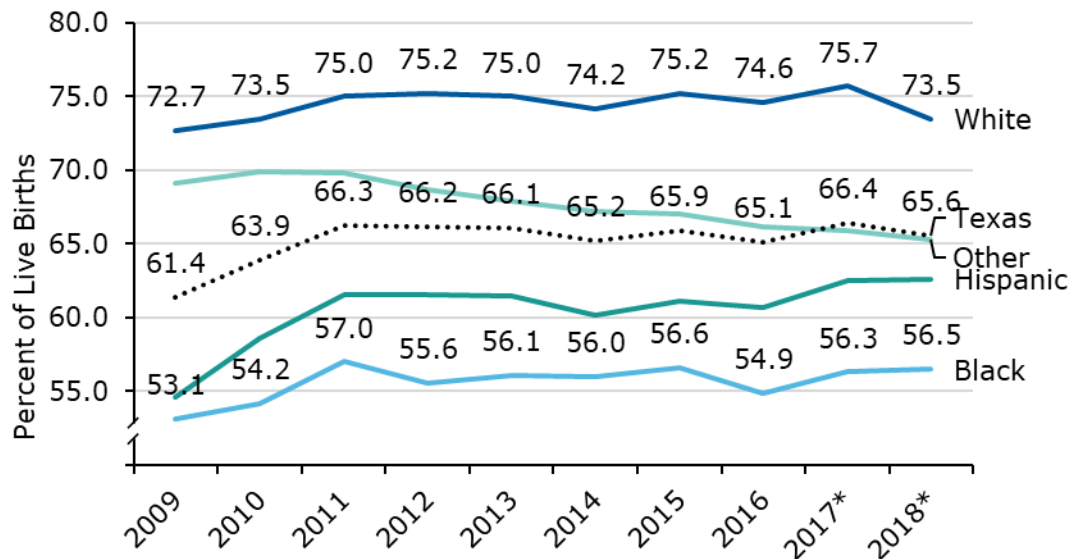
Error Bars: 95% Confidence Interval
 Source: 2008-2017 Texas PRAMS
 Prepared by: Maternal & Child Health Epidemiology Unit
 Dec 2019

¹⁷ American Academy of Pediatrics, "SIDS and other sleep-related infant deaths: Expansion of recommendations for a safe infant sleeping environment," *Pediatrics*, vol. 128, no. 5, pp. 1030-1039, 2011.

6. Prenatal Care

The Healthy People 2020 (HP 2020) target is to increase the proportion of pregnant women who begin prenatal care in the first trimester of pregnancy to 77.9 percent. Texas, as a whole, is not meeting this target percentage; in 2018, 65.6 percent of mothers entered prenatal care within the first trimester (see Figure 26). In 2018, Texas had a lower proportion of women receiving first trimester care than any other state¹⁸. Nationally, 77.5 percent of mothers entered prenatal care during the first trimester in 2018.

Figure 26 Percent of Live Births Where Mother Received Prenatal Care in the First Trimester, 2009-2018



*2017 and 2018 Texas data are provisional
 Source: 2009-2018 Birth Files
 Prepared by: Maternal & Child Health Epidemiology Unit
 Dec 2019

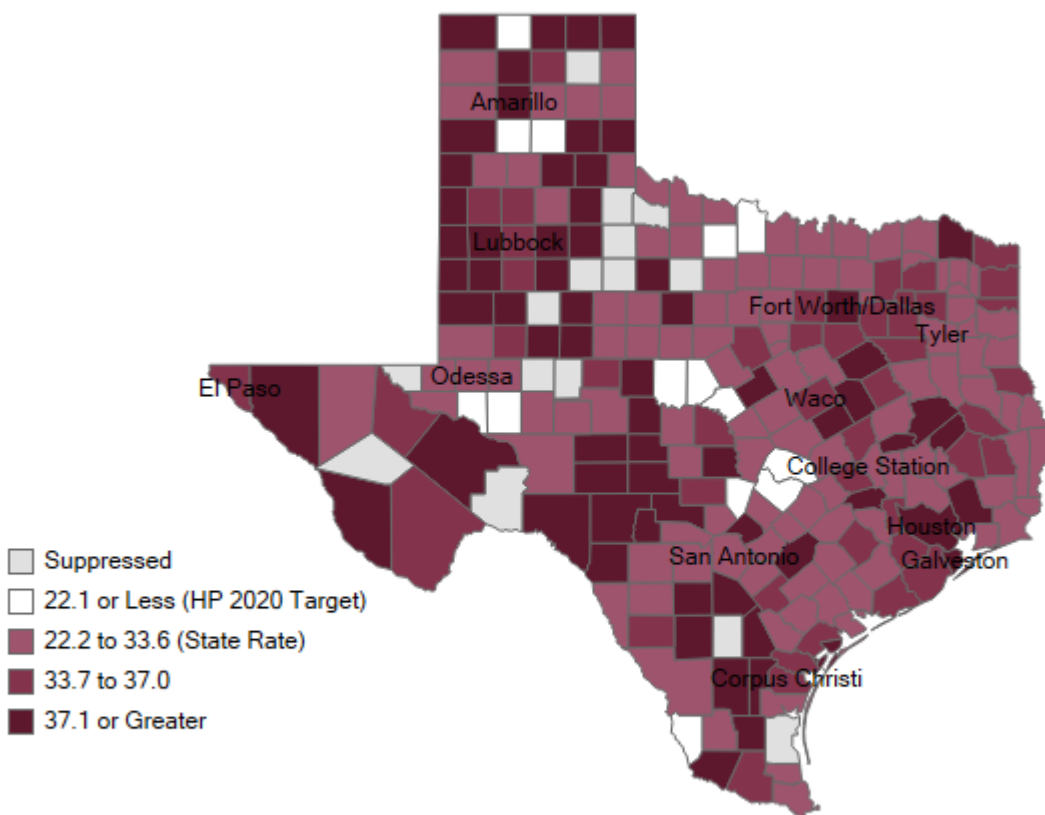
Timely access to prenatal care increased in Texas from 2009-2011 but appears to have plateaued since then. Disparities in timely prenatal care access exist between

¹⁸ 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 2016-2018, on CDC WONDER Online Database," September 2019. [Online]. Available: <http://wonder.cdc.gov/natality-expanded-current.html>. [Accessed 9 October 2019].

different race/ethnic groups. A larger proportion of White women begin receiving prenatal care in the first trimester of pregnancy, compared to all other race/ethnic groups. Conversely, a smaller proportion of Black women receive prenatal care in the first trimester than any other race/ethnic group. Only a little more than half of Black mothers begin prenatal care in the first trimester of pregnancy. While a relatively high proportion of women of 'Other' race/ethnicity receive timely access to prenatal care, the proportion of women in this race/ethnic group who receive prenatal care in the first trimester has steadily decreased over the past decade.

Late entry into prenatal care is a statewide problem. In 2016, only 14 Texas counties met the HP2020 target percentage of women entering prenatal care in the first trimester (see Figure 27).

Figure 27 Percent of Live Births Not Receiving Prenatal Care in the First Trimester (Obstetric Estimate), 2017



2017 Texas data are provisional
Source: 2017 Birth File
Prepared by: Maternal & Child Health Epidemiology Unit
Dec 2019

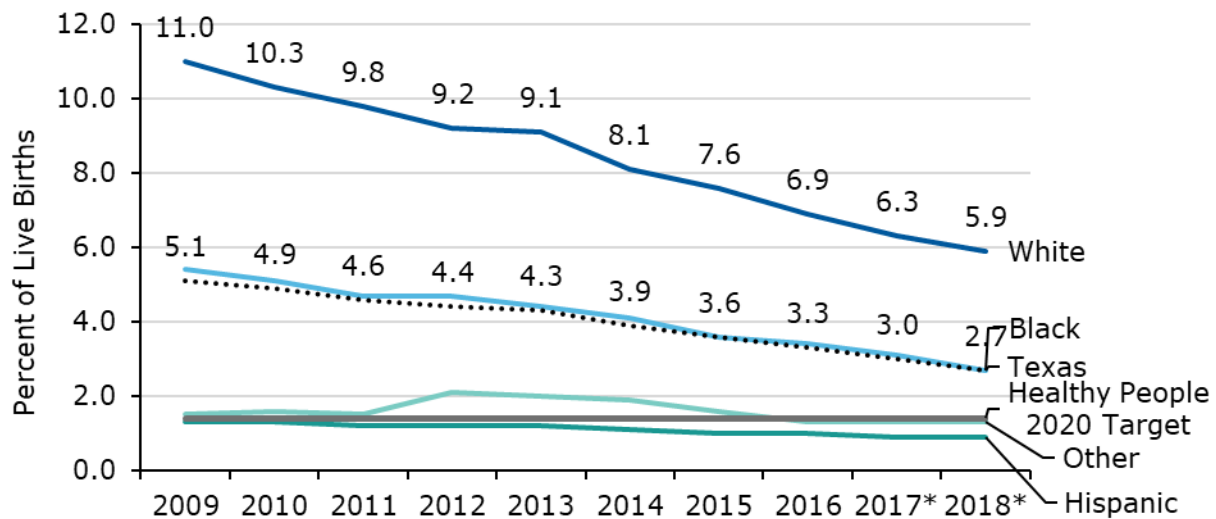
Using PRAMS 2017 survey data, among mothers who reported that they did not receive care in the first trimester of their pregnancy, 45.9 (Confidence Interval: 39.5-52.4) percent still reported that they had received prenatal care as early as they had wanted. These findings indicate a need for increased education and awareness of the importance of obtaining prenatal care starting in the first trimester.

7. Maternal Health

Smoking

Texas is one of the better performing states when it comes to smoking during pregnancy¹⁹. Hispanic women and women of 'Other' race/ethnicity have the lowest prevalence of smoking during pregnancy, both in Texas and in the nation. Currently, only Hispanic women and women of 'Other' race/ethnicity are meeting the Healthy People 2020 (HP2020) target of at least 98.6 percent abstinence from smoking during pregnancy in Texas. While the overall proportion of women who smoke during pregnancy has decreased 45.8 percent in Texas over the past decade, there is still room for improvement, especially among White women (see Figure 28).

Figure 28 Percent of Live Births Where Mother Smoked Cigarettes During Pregnancy, 2009-2018

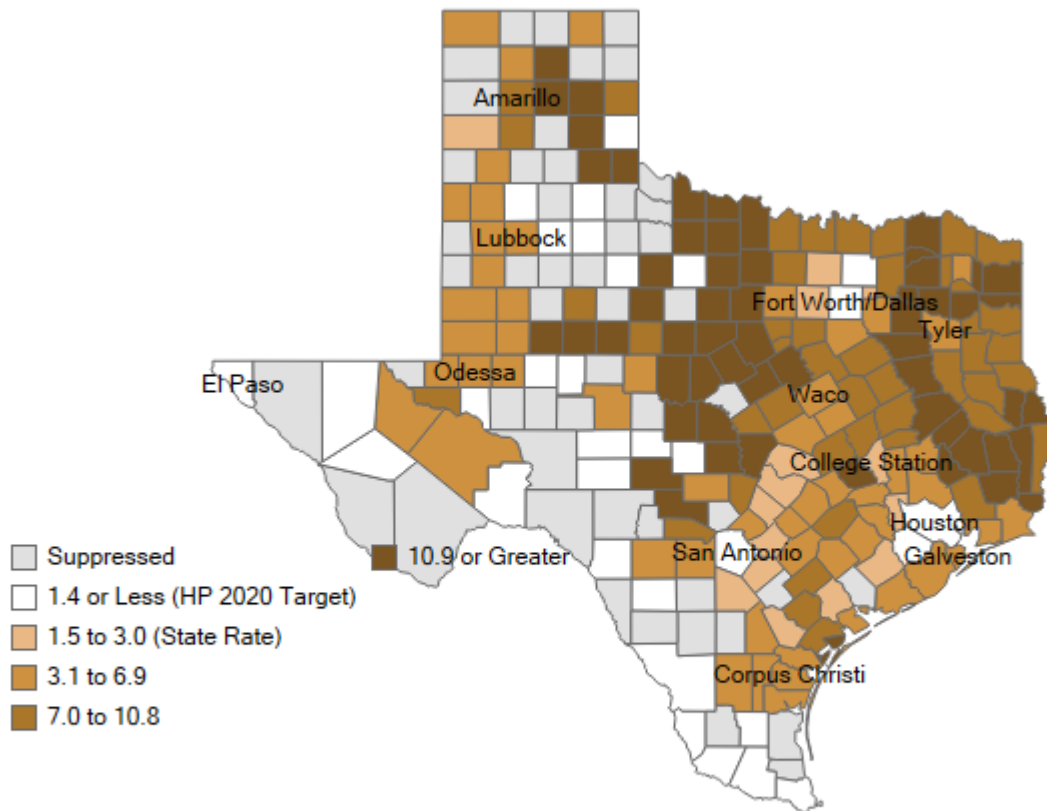


*2017 and 2018 Texas data are provisional
 Source: 2009-2018 Birth Files
 Prepared by: Maternal & Child Health Epidemiology Unit
 Dec 2019

¹⁹ P. Drake, A. Driscoll and T. Mathews, "Cigarette Smoking During Pregnancy: United States, 2016," *NCHS Data Brief*, no. 305, 10 February 2018.

Regional differences in the prevalence of smoking during pregnancy exist throughout Texas (see Figure 29). In 2017, counties near the Texas-Mexico border generally 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 29 Percent of Live Births Where Mother Smoked During Pregnancy, 2017

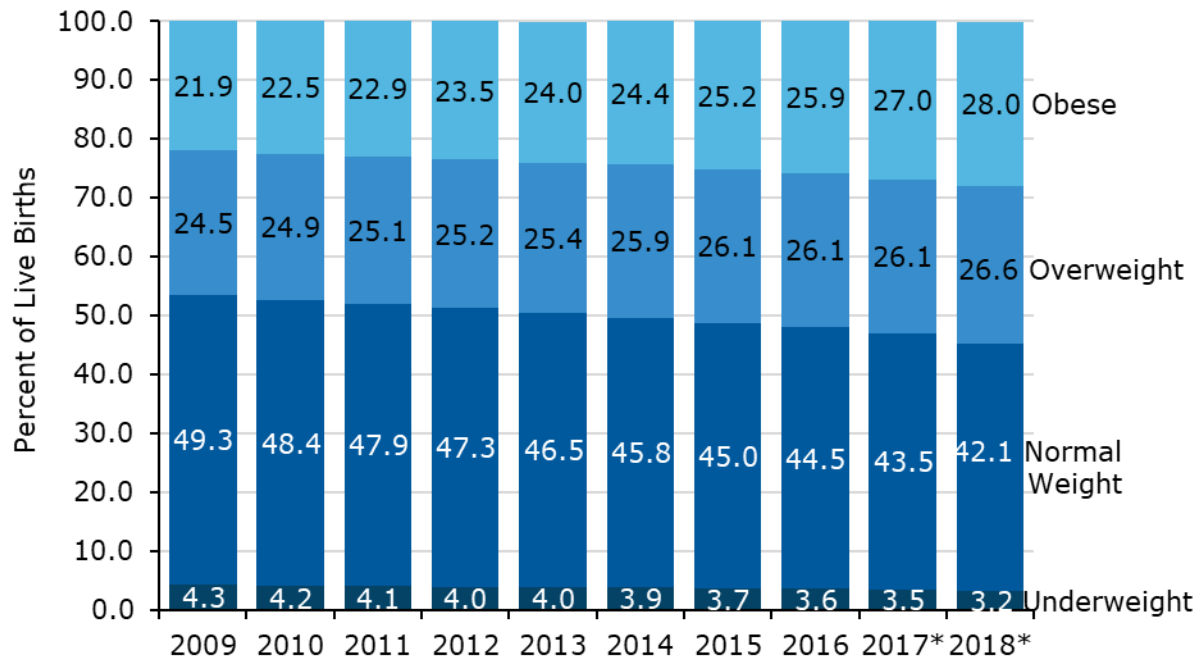


2017 Texas data are provisional
Source: 2017 Birth File
Prepared by: Maternal & Child Health Epidemiology Unit
Dec 2019

Pre-Pregnancy Obesity

Obesity is a well-known risk factor for developing hypertension, diabetes, and a variety of other medical problems during pregnancy²⁰. A rise in pre-pregnancy obesity has been observed over the past decade, both in Texas and in other states²¹. The proportion of mothers with a pre-pregnancy body mass index (BMI) in the obese range has increased 28.2 percent in Texas since 2009 (see Figure 30).

Figure 30 Maternal Pre-pregnancy Body Mass Index Distribution for All Live Births, 2009-2018



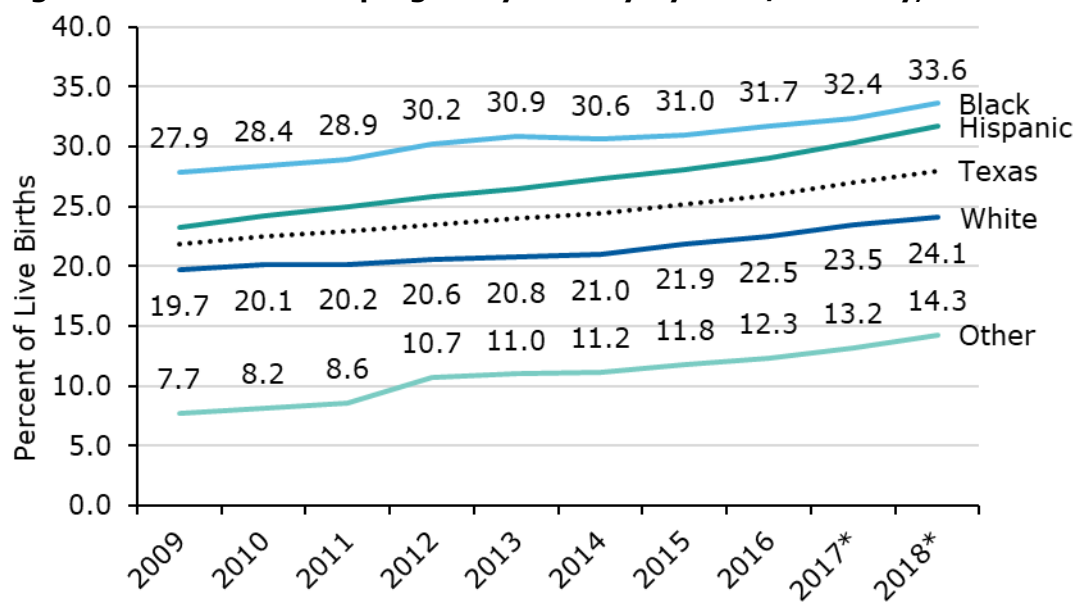
*2017 and 2018 Texas data are provisional
 Source: 2009-2018 Birth Files
 Prepared by: Maternal & Child Health Epidemiology Unit
 Dec 2019

²⁰ R. Gaillard, B. Durmus, A. Hofman, J. Mackenbach, E. Steegers and V. Jaddoe, "Risk factors and outcomes of maternal obesity and excessive weight gain during pregnancy," *Obesity (Silver Spring)*, vol. 21, no. 5, pp. 1046-1055, 2013.

²¹ A. M. Branum, S. E. Kirmeyer and E. C. Gregory, "Prepregnancy Body Mass Index by Maternal Characteristics and State: Data From the Birth Certificate, 2014," 5 August 2016. [Online]. Available: https://www.cdc.gov/nchs/data/nvsr/nvsr65/nvsr65_06.pdf. [Accessed 5 August 2016].

Pre-pregnancy obesity is more prevalent among Black and Hispanic mothers than among White mothers or mothers of 'Other' race/ethnicity (see Figure 31). However, over the past decade, the rate of pre-pregnancy obesity has risen most steeply among mothers of 'Other' race/ethnicity; an 84.8 percent increase in pre-pregnancy obesity has been observed among mothers of this group since 2009. Hispanic mothers have also seen a relatively large increase in pre-pregnancy obesity between 2009 and 2018 (a 36.0 percent increase among Hispanic mothers, compared with increases of 20.4 and 22.2 percent among Black and White mothers, respectively).

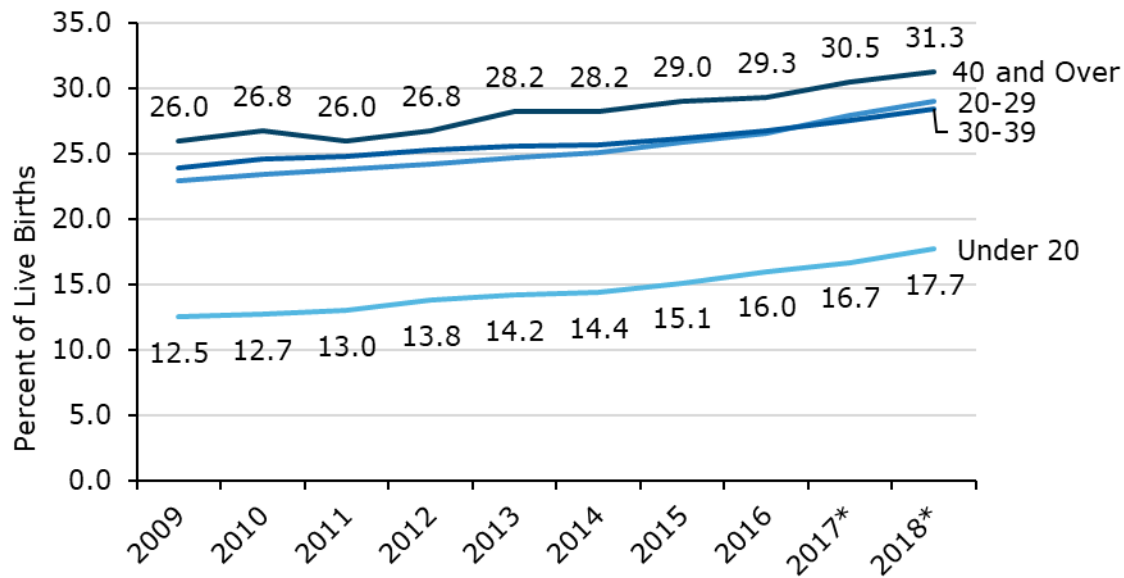
Figure 31 Maternal Pre-pregnancy Obesity by Race/Ethnicity, 2009-2018



*2017 and 2018 Texas data are provisional
 Source: 2009-2018 Birth Files
 Prepared by: Maternal & Child Health Epidemiology Unit
 Dec 2019

Prevalence of pre-pregnancy obesity also differs by maternal age. In 2018, a much lower proportion 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 proportion of pre-pregnancy obesity. The rise in obesity rates over time has also differed by maternal age. Over the past decade, the largest percent increase in the prevalence of pre-pregnancy obesity has been observed for mothers younger than 20 years old, followed by mothers 20-29 years old (see Figure 32).

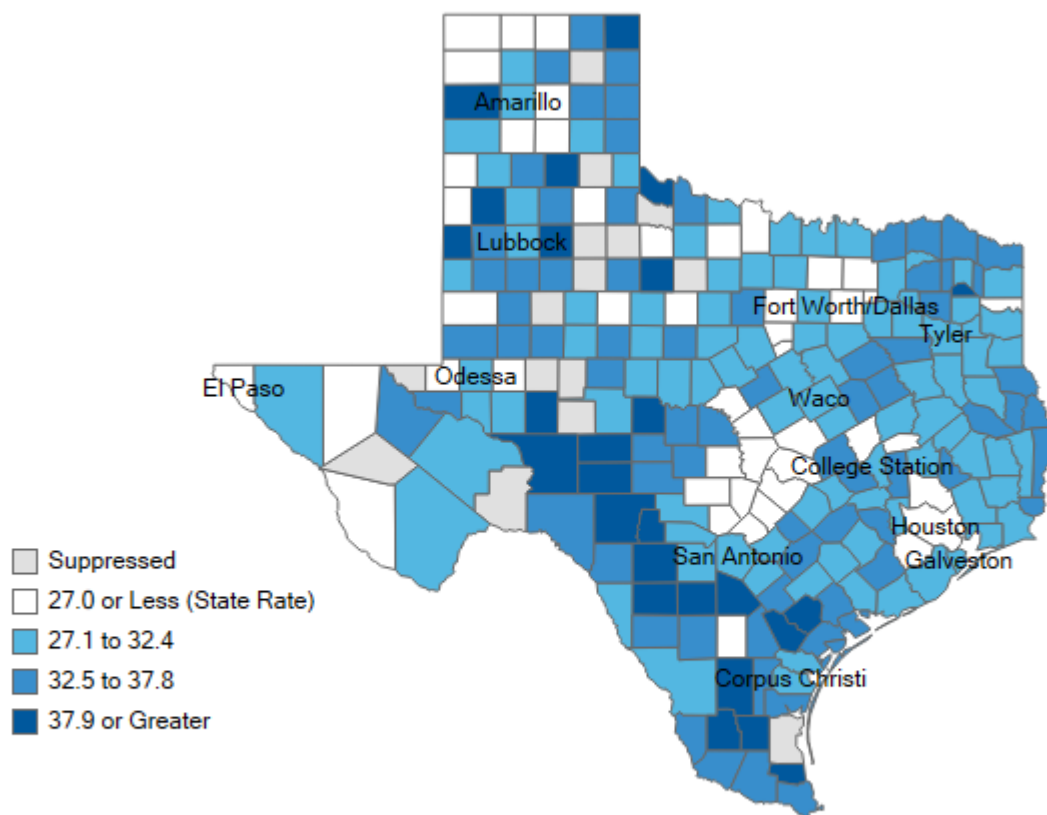
Figure 32 Maternal Pre-pregnancy Obesity by Age Group, 2009-2018



*2017 and 2018 Texas data are provisional
 Source: 2009-2018 Birth Files
 Prepared by: Maternal & Child Health Epidemiology Unit
 Dec 2019

Many rural and suburban counties in Texas have higher pre-pregnancy obesity rates than the state as a whole (see Figure 33). In addition to pre-pregnancy obesity rate differences observed between Texas counties, it is likely that within-county differences could also exist, since neighborhood environments (walkability, access to parks/sidewalks, access to healthy food choices) can vary widely even within the same county²².

Figure 33 Percent of Births to an Obese Mother, 2017



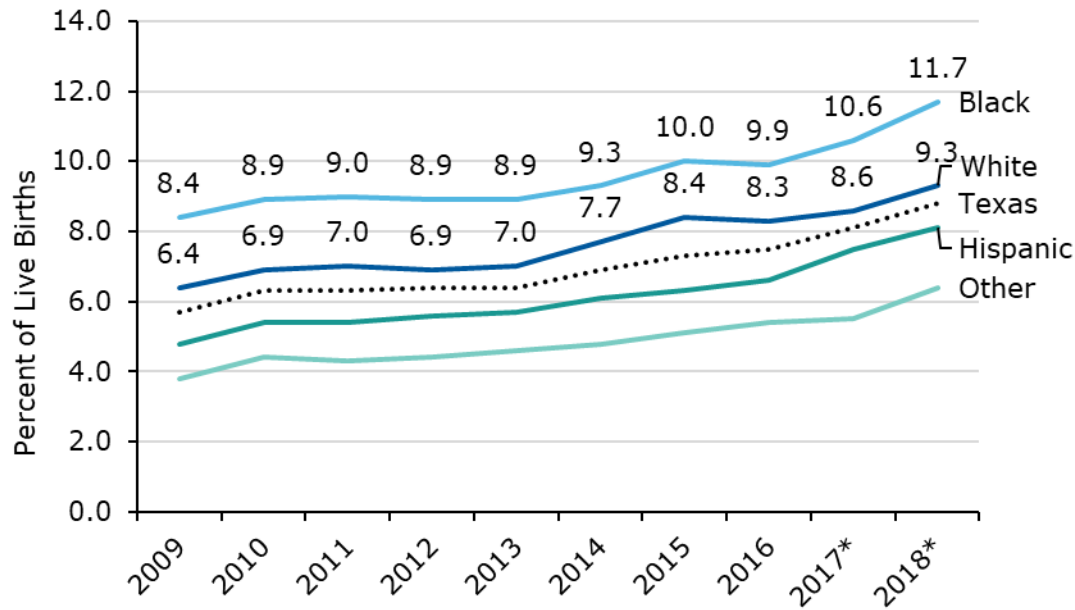
2017 Texas data are provisional
 Source: 2017 Birth File
 Prepared by: Maternal & Child Health Epidemiology Unit
 Dec 2019

²² M. Mujahid, A. Roux, M. Shen, D. Gowda, B. Sanchez, S. Shea, D. J. Jacobs and S. Jackson, "Relation between neighborhood environments and obesity in the Multi-Ethnic Study of Atherosclerosis," *Am J Epidemiol*, vol. 167, pp. 1349-1357, 2008.

Hypertension & Diabetes

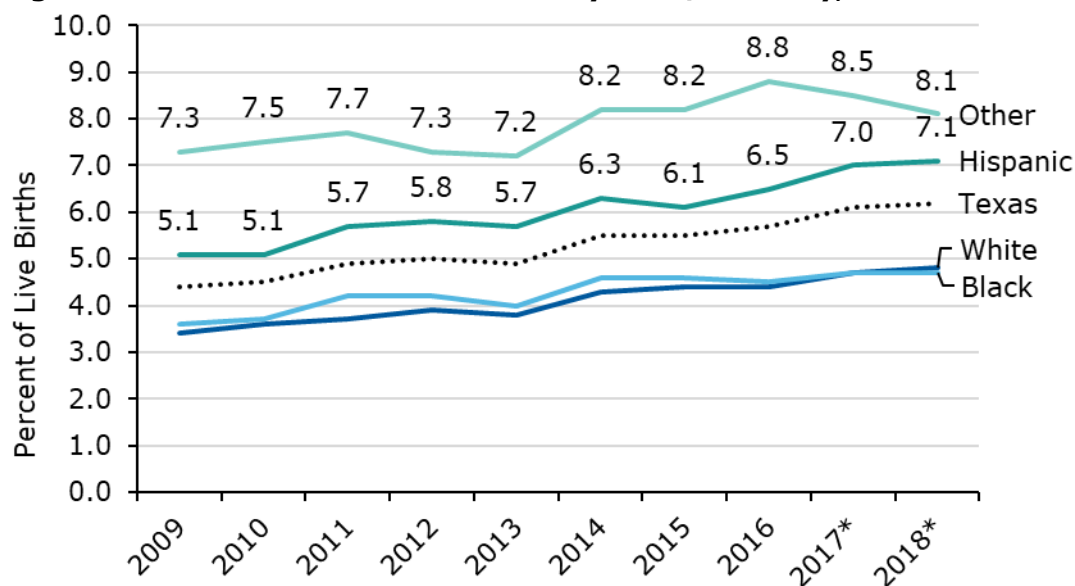
According to 2018 birth certificate data, 8.8 percent of all live births were to mothers with some form of hypertension, and 6.2 percent of all live births were to mothers who had diabetes (these mothers either had diabetes or hypertension pre-pregnancy or developed the condition over the course of the pregnancy). Rates of both hypertension and diabetes among mothers are slowly rising in Texas (see Figure 34 & Figure 35). As with many health outcomes, both hypertension and diabetes rates differ by race/ethnicity. Of all race/ethnic groups, Black women and White women have the highest percentages of maternal hypertension (see Figure 34), while women in the 'Other' race/ethnicity category and Hispanic women have the highest percentages of maternal diabetes (see Figure 35).

Figure 34 Rates of Maternal Hypertension by Race/Ethnicity, 2009-2018



*2017 and 2018 Texas data are provisional
 Source: 2009-2018 Birth Files
 Prepared by: Maternal & Child Health Epidemiology Unit
 Dec 2019

Figure 35 Rates of Maternal Diabetes by Race/Ethnicity, 2009-2018



*2017 and 2018 Texas data are provisional
 Source: 2009-2018 Birth Files
 Prepared by: Maternal & Child Health Epidemiology Unit
 Dec 2019

Pre-pregnancy obesity is associated with both hypertension and diabetes in the Texas data, as is seen in the literature²⁰. In 2018, 21.9 percent of all mothers with pre-pregnancy obesity also had hypertension, diabetes, or both conditions. In contrast, only 9.2 percent of mothers with normal pre-pregnancy BMI were hypertensive, diabetic, or had both conditions.

Women with diabetes and their infants are at increased risk for a variety of complications, including infant or fetal death. While a relatively small proportion (fewer than eight percent) of women who deliver in Texas each year have some form of hypertension, these women experience about 11 percent of all fetal and infant deaths. Additionally, these women experience a high rate of severe maternal morbidity. Hypertension/eclampsia is both a leading diagnosis of severe maternal morbidity and a leading cause of maternal death for Black women²³.

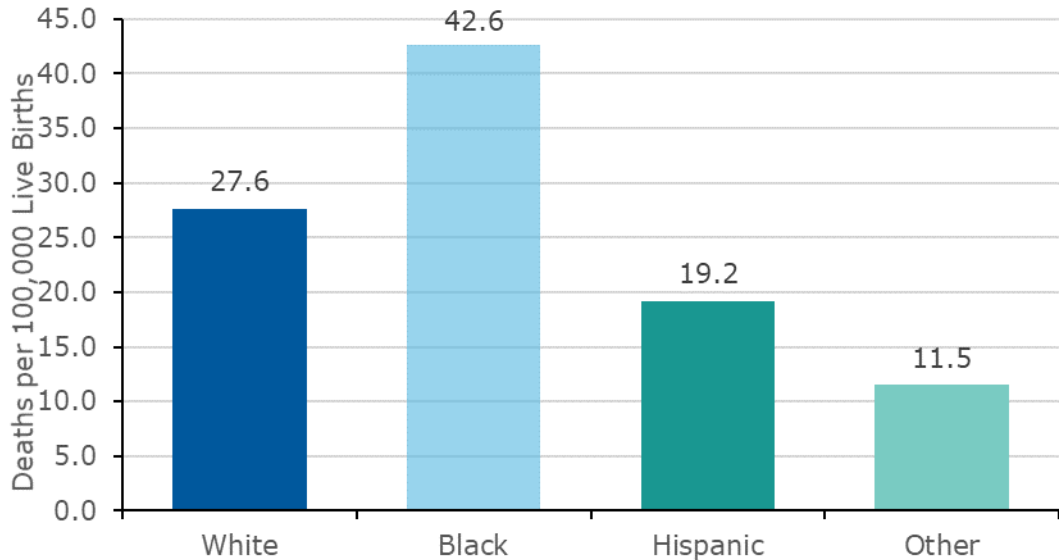
²³ Texas Department of State Health Services, "Maternal Mortality and Morbidity Task Force and Department of State Health Services Joint Biennial Report," Austin, 2018.

Maternal Mortality

The death of a mother is an immeasurable loss for her children and family. In this report, maternal death is defined as the death of a woman while pregnant or within 365 days of the end of a pregnancy.

Maternal death statistics shown in this report focus on numbers and corresponding rates of confirmed maternal death while pregnant or within 365 days of the end of pregnancy. A maternal death was considered confirmed if a woman’s death record matched either a live birth or fetal death event that occurred within 365 days of the woman’s death. In Texas, there were 382 confirmed maternal deaths in the four-year period from 2012 to 2015. For the combined years 2012-2015, the rate of confirmed maternal death among Black mothers (42.6 per 100,000 live births) was 1.5 times as high as the rate among White mothers (27.6 per 100,000 live births) and 2.2 times as high as the rate among Hispanic mothers (19.2 per 100,000 live births) (see Figure 36).

Figure 36 Rate of Confirmed Maternal Death in Texas by Race/Ethnicity, 2012-2015



Source: 2012-2015 Linked Birth, Fetal Death, and Maternal Death Files
Prepared by: Maternal & Child Health Epidemiology Unit
Dec 2018

Mothers aged 40 years and older had the highest rate of confirmed maternal death of all age groups, at 55.0 maternal deaths per 100,000 live births. Higher rates of confirmed maternal death were also observed among women with diabetes (39.9

per 100,000 live births), hypertension (56.3 per 100,000 live births), and pre-pregnancy obesity (29.2 per 100,000 live births), as well as among women who smoked during pregnancy (86.0 per 100,000 live births).

Between 2012 and 2015, the most common specific causes of death for mothers during pregnancy or within 365 days postpartum were drug overdose (16.8 percent), cardiac event (14.4 percent), homicide (11.0 percent), suicide (8.6 percent), and infection/sepsis (8.4 percent). The top causes of maternal death during pregnancy or within 7 days postpartum were hemorrhage (19.0 percent), cardiac event (17.7 percent), and amniotic embolism (12.7 percent).

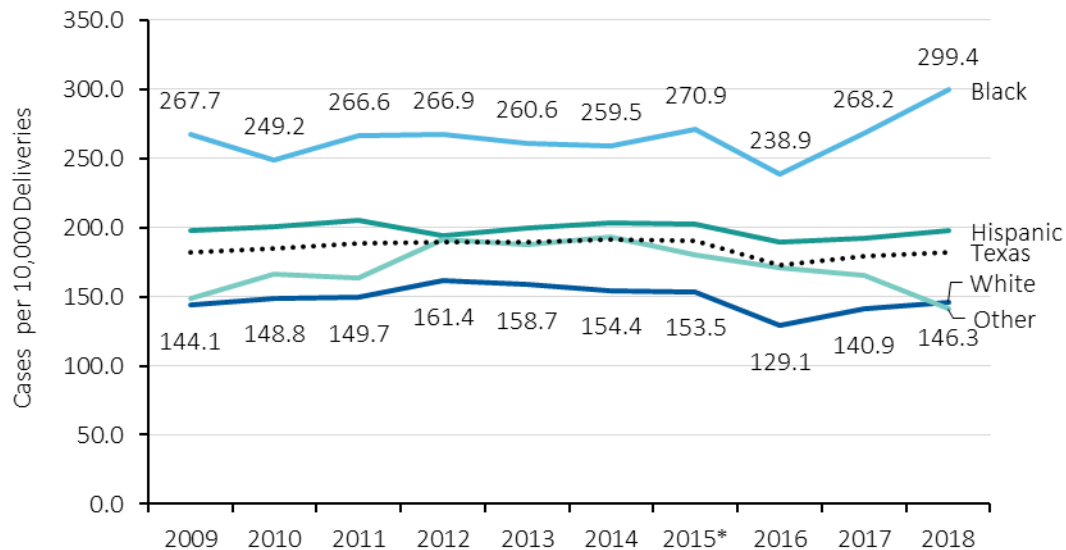
The relatively large proportion of maternal deaths in Texas due to drug overdose is particularly concerning in light of the current opioid epidemic and recent increases in maternal opioid use during pregnancy²⁴. The risk of maternal death due to drug overdose was higher for White mothers and for mothers aged 40 years or older. Opioids were involved in 58 percent of maternal deaths from drug overdose, and almost 80 percent of drug overdose deaths occurred after 60 days postpartum.

²⁴ National Institute on Drug Abuse, "Dramatic Increases in Maternal Opioid Use and Neonatal Abstinence Syndrome," [Online]. Available: <https://www.drugabuse.gov/related-topics/trends-statistics/infographics/dramatic-increases-in-maternal-opioid-use-neonatal-abstinence-syndrome>. [Accessed November 2017].

Severe Maternal Morbidity

Severe maternal morbidity (SMM) is closely related to maternal mortality, because it involves conditions that, if left untreated, could result in maternal death. SMM rates in the United States have been rising in the past decade⁸. According to data from Texas Hospital Inpatient Discharge Public Use Data Files, the SMM rate in Texas remained relatively stable from 2009 to 2018 (see Figure 37).

Figure 37 Rate of Severe Maternal Morbidity (SMM) in Texas, 2009-2018



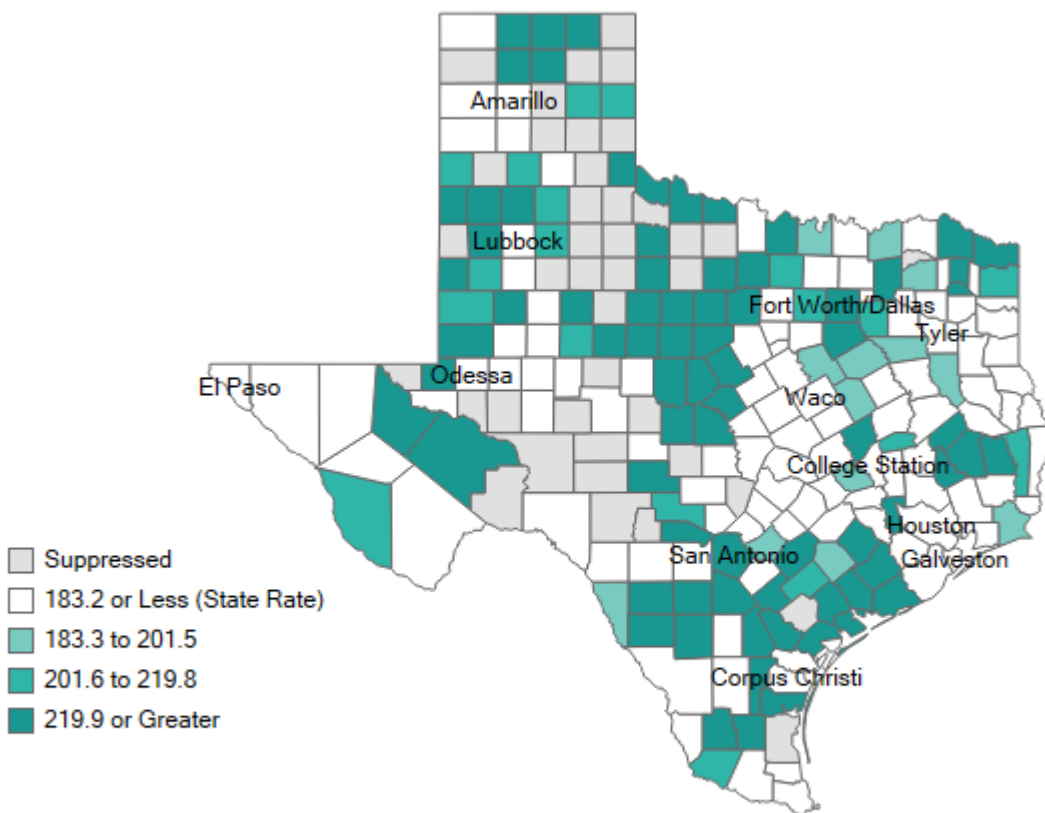
*Data transitioned to ICD-10-CM in the last quarter of 2015.
 Source: 2009-2018 Texas Hospital Inpatient Public Use Data Files
 Prepared by: Maternal & Child Health Epidemiology Unit
 Dec 2019

Mirroring the trends observed for maternal deaths, there are substantial racial/ethnic disparities in the rates of mothers with serious pregnancy complications (see Figure 37). Over the past ten years, Black mothers had higher rates of SMM than mothers of any other race/ethnic group. Although White mothers had higher maternal death rates than did Hispanic mothers, the opposite was true for SMM – higher SMM rates were observed among Hispanic mothers than among White mothers.

Blood transfusions were the most common SMM condition during 2018. Other common SMM conditions observed in Texas included disseminated intravascular coagulation (DIC), acute renal failure, hysterectomy, adult respiratory distress syndrome, and eclampsia.

When looking at combined 2014-2018 SMM data, there are clear geographic differences in the rate of SMM. Many counties in south Texas and north Texas had a higher SMM rate than the state average.

Figure 38 Rate of Severe Maternal Morbidity per 10,000 Deliveries, 2014-2018



Data transitioned to ICD-10-CM in the last quarter of 2015
 Source: 2014-2018 Texas Hospital Inpatient Public Use Data Files
 Prepared by: Maternal & Child Health Epidemiology Unit
 Dec 2019

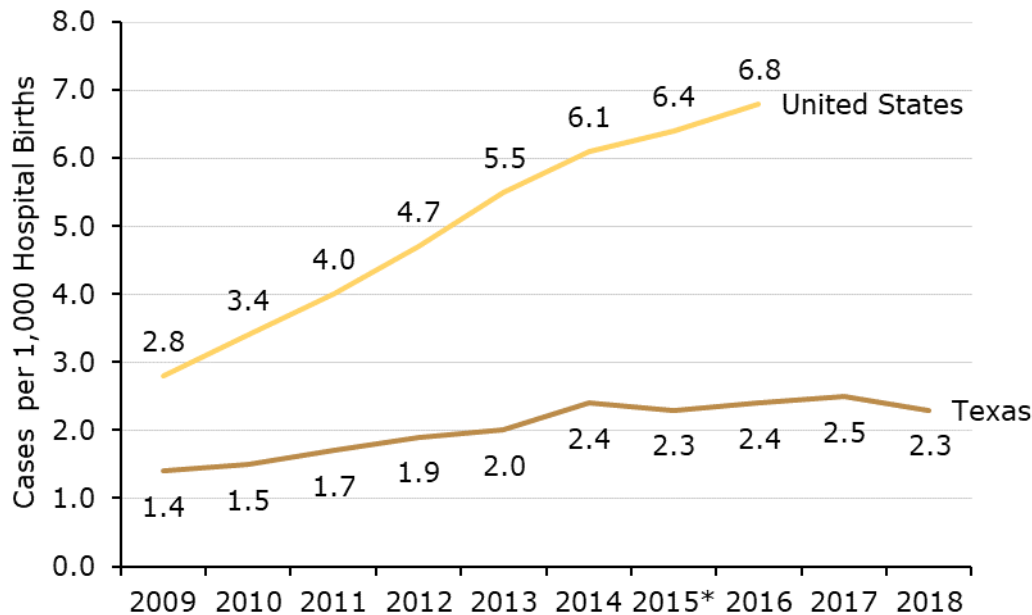
Neonatal Abstinence Syndrome

The use of opioids or certain other drugs during pregnancy can result in a drug withdrawal syndrome in newborns called neonatal abstinence syndrome (NAS). Newborns with NAS are more likely than other infants to have low birthweight, respiratory and feeding problems, and other complications²⁴. Mothers who use drugs such as opioids during pregnancy are more likely to have complications, such as prolonged hospital stay and death before hospital discharge²⁵. Since drug overdose is a frequent cause of maternal death in Texas, it is important to monitor the rate of maternal drug use during pregnancy. Because not all newborns whose mothers use drugs will develop NAS, the true incidence of drug use during pregnancy can be expected to be higher than the observed rate of NAS²⁴.

²⁵ V. Whiteman, J. Salemi, M. Mogos, M. Cain, M. Aliyu and H. Salihu, "Maternal opioid drug use during pregnancy and its impact on perinatal morbidity, mortality, and costs of medical care in the United States," *Journal of Pregnancy*, 2014.

Data from the Texas Hospital Inpatient Discharge Public Use Data File indicate that the rate of infants born each year experiencing NAS has almost doubled since 2008 (see Figure 39). This was less than the increase observed in the rest of the United States, in which NAS rates more than doubled from 2009 to 2016. Texas has had lower rates of NAS than the national average over the past decade²⁶.

Figure 39 Rate of Neonatal Abstinence Syndrome (NAS) in Texas and the United States, 2009-2018

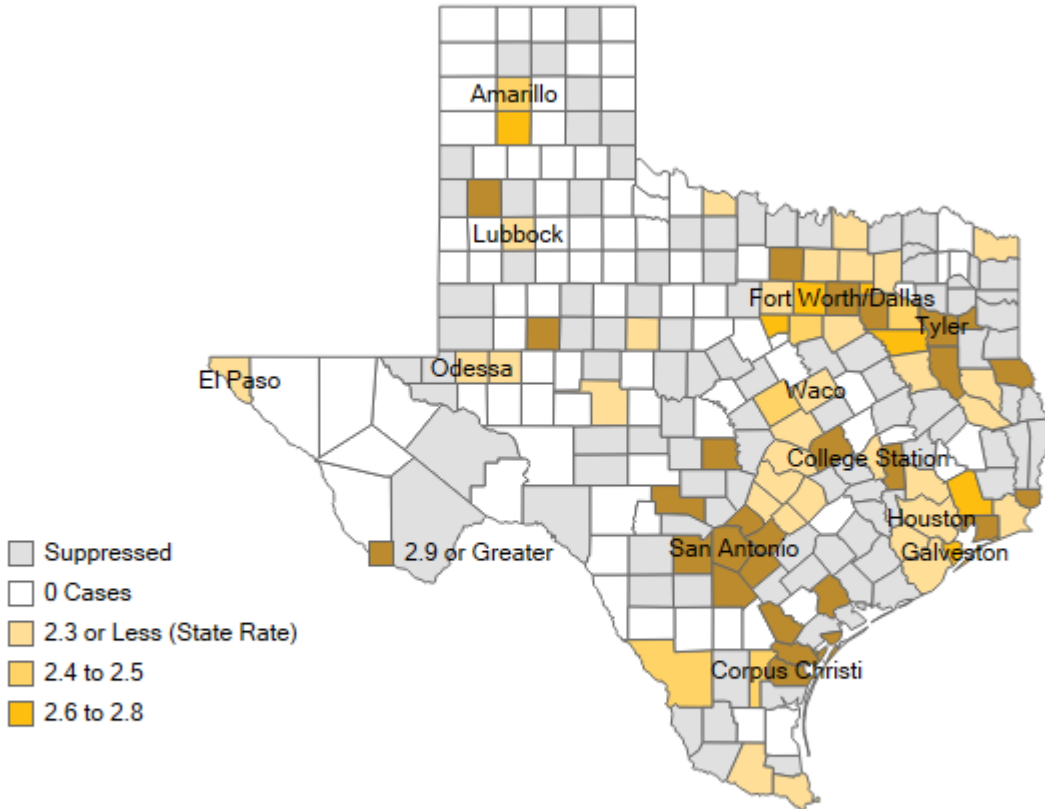


*Data transitioned to ICD-10-CM in the last quarter of 2015.
 Sources: 2009-2018 Texas Hospital Inpatient Public Use Data Files
 2009-2016 Health Care Utilization Project
 Prepared by: Maternal & Child Health Epidemiology Unit
 Dec 2019

²⁶ U.S. Department of Health and Human Services, Health Resources and Services Administration, Maternal and Child Health Bureau, Division of State and Community Health, "Federally Available Data (FAD) Resource Document," 1 April 2019. [Online]. Available: <https://mchb.tvisdata.hrsa.gov/Home/Resources>. [Accessed 11 October 2019].

Based on combined data from 2014 to 2018, the county with the highest NAS rate in the state was Bexar County (9.9 per 1,000). Bexar County accounted for more than 25 percent of Texas' total NAS cases during 2014 to 2018.

Figure 40 Neonatal Abstinence Syndrome Rate per 1,000 Hospital Births, 2014-2018

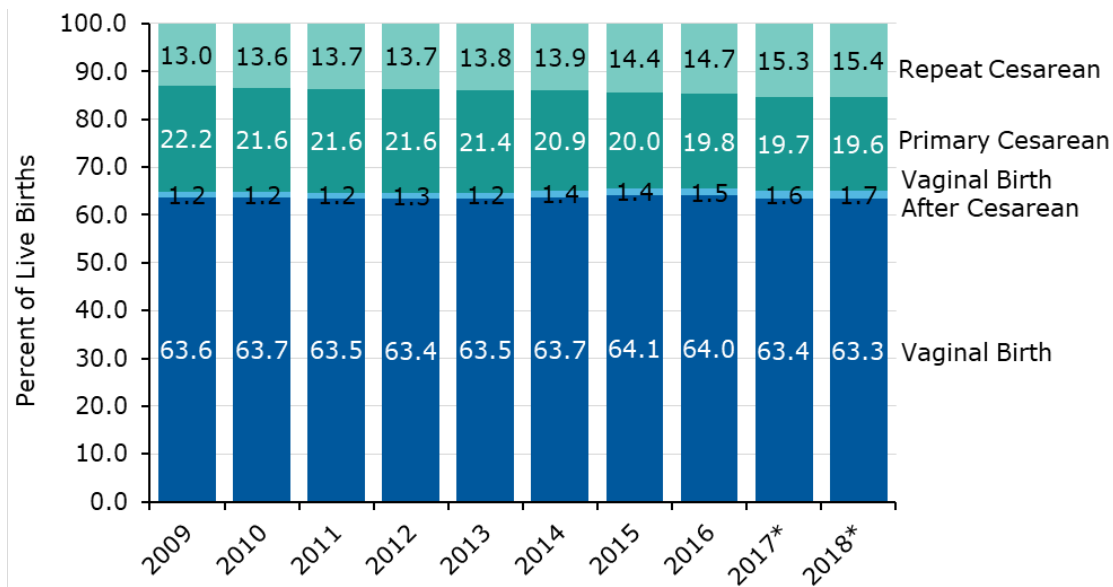


Data transitioned to ICD-10-CM in the last quarter of 2015
Source: 2014-2018 Texas Hospital Inpatient Public Use Data Files
Prepared by: Maternal & Child Health Epidemiology Unit
Dec 2019

8. Delivery

The method of delivery for live births in Texas has remained relatively stable from 2009 to 2018 (see Figure 41). In 2018, 65.0 percent of all Texas deliveries were vaginal births, and 35.0 percent of deliveries were by cesarean section. The percent of infants born via primary cesarean section has decreased since 2009; however, the proportion of infants born via repeat cesarean has increased. In 2018, the cesarean delivery rate in Texas (35.0 percent) was higher than the national rate (31.9 percent)²⁷. The vaginal birth after cesarean rate in Texas (9.8 percent) was also lower than the national rate (13.3 percent) in 2018²⁷.

Figure 41 Percent of All Births by Delivery Method, 2009-2018



*2017 and 2018 Texas data are provisional
 Source: 2009-2018 Birth Files
 Prepared by: Maternal & Child Health Epidemiology Unit
 Dec 2019

²⁷ National Center for Health Statistics (NCHS), "Natality public-use data 2016-2018, on CDC WONDER Online Database," September 2019. [Online]. Available: <http://wonder.cdc.gov/natality-expanded-current.html>. [Accessed 9 October 2019].

9. Conclusion

This report provides an overview of a variety of infant health indicators, as well as several indicators of maternal health during pregnancy. Over the past decade, Texas has seen a reduction in the teen birth rate and the percentage of women who smoke during pregnancy. However, during this same time period, the state has experienced an increase in maternal diabetes, maternal hypertension, and neonatal abstinence syndrome.

Provisional 2017 and 2018 birth and death certificate data are presented in this report before they have been finalized by the DSHS Center for Health Statistics. After remaining relatively stable for several years, the Texas birth rate decreased in 2018 for the third year in a row. Also in 2018, the percent of births born preterm in Texas increased for the third consecutive year, reversing some of the steady decline seen from 2008 to 2015.

Substantial race/ethnic disparities exist for infant and maternal health indicators, including rates of infant mortality, preterm birth, maternal mortality, and severe maternal morbidity. Black mothers and infants have significantly higher rates of each of these adverse health outcomes than do other race/ethnic groups. Infant health practices and maternal health indicators also differ by race/ethnicity in Texas. In addition, geographic and regional differences were observed throughout Texas, especially for teen birth rates, prevalence of smoking during pregnancy, and neonatal abstinence syndrome rates.

Compared with other states, Texas has one of the lowest rates of maternal smoking during pregnancy. However, Texas's teen birth rate and preterm birth rate continue to be higher than national rates, and the percent of mothers receiving early prenatal care in Texas was the lowest in the nation during 2016.

It is hoped that the information presented in this report can help public health workers, researchers, and policymakers identify trends and disparities in infant and maternal health outcomes in Texas, so that they are better able to make data-driven decisions on where best to allocate resources and efforts to improve these outcomes.

Appendix A. More Information on Infant & Maternal Health in Texas

Gestational Diabetes in Medicaid: Prevalence, Outcomes, and Costs

hhs.texas.gov/sites/default/files/sb1-gestational-diabetes.pdf

Report released in 2014 focusing on the rates and costs of gestational diabetes in the Texas Medicaid population. This study shows that the rate of diabetes among pregnant women enrolled in Medicaid is underestimated on the birth certificate and provides a clearer estimate of the impact of gestational diabetes on this population.

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

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

Contains vital statistics tables and reports providing basic health-related data at the state and county level.

Texas Health Data

healthdata.dshs.texas.gov/Home

This online query tool from DSHS allows you 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

dshs.texas.gov/mch/

Contains the PRAMS annual reports as well as links to other information about maternal and child health and community-based initiatives.

March of Dimes PeriStats

marchofdimes.org/peristats/Peristats.aspx

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

Maternal Mortality and Morbidity in Texas

dshs.texas.gov/mch/Maternal-Mortality-and-Morbidity-in-Texas/.aspx

Contains information about the Maternal Mortality and Morbidity Task Force, as well as a number of reports and presentations on maternal mortality and morbidity in Texas.

Appendix B. Tables for Select Figures

Table 1. Teen (15-19 years old) Birth Rate by Race/Ethnicity (see Figure 5)^a

Year	White	Black	Hispanic	Other	Texas
2009	32.0	57.9	83.3	15.1	57.4
2010	30.7	56.0	73.8	9.6	52.2
2011	26.9	48.9	64.7	8.5	45.9
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^b	15.7	27.4	37.6	9.8	27.1
2018^c	14.0	26.4	34.8	9.3	25.1

^a Rate per 1,000 population. Source: 2009-2018 Texas Birth Files

^b 2017 data are provisional and subject to change.

^c 2018 data are provisional and subject to change.

Table 2. Infant Mortality Rate in Texas by Race/Ethnicity (see Figure 8)^a

Year	White	Black	Hispanic	Other	Texas
2009	5.1	11.3	5.2	6.9	6.0
2010	5.5	11.4	5.5	3.8	6.1
2011	4.8	11.0	5.2	3.7	5.7
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^b	4.8	10.9	5.5	4.1	5.8

^a Rate per 1,000 live births. Source: 2009-2017 Texas Birth and Death Files

^b 2017 data are provisional and subject to change.

Table 3. Percent of Live Births Born Preterm (Obstetric Estimate) by Race/Ethnicity (see Figure 14)^a

Year	White	Black	Hispanic	Other	Texas
2009	10.8	15.4	10.4	9.6	11.1
2010	10.2	14.8	10.5	10.2	10.9
2011	10.1	14.3	10.4	9.9	10.7
2012	10.0	14.5	10.1	9.6	10.5
2013	9.7	13.9	10.1	10.3	10.4
2014	9.7	14.0	10.1	9.6	10.3
2015	9.6	13.6	9.8	9.3	10.2
2016	9.6	13.6	10.3	9.6	10.4
2017^b	9.4	14.3	10.6	9.3	10.6
2018^c	9.6	14.8	10.8	9.5	10.8

^a Computed using the obstetric estimate of gestation. Source: 2009-2018 Texas Birth Files

^b 2017 data are provisional and subject to change.

^c 2018 data are provisional and subject to change.

Table 4. Percent of Births that are Low Birth Weight by Race/Ethnicity (see Figure 17)^a

Year	White	Black	Hispanic	Other	Texas
2009	7.8	14.2	7.6	9.0	8.5
2010	7.5	13.9	7.7	9.5	8.4
2011	7.6	13.6	7.8	9.5	8.5
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^b	7.1	13.9	7.9	8.9	8.4
2018^c	7.0	14.1	7.9	9.0	8.5

^a Source: 2009-2018 Texas Birth Files

^b 2017 data are provisional and subject to change.

^c 2018 data are provisional and subject to change.

Table 5. Percent of Live Births Where Mother Received Prenatal Care in the First Trimester (see Figure 26)^a

Year	White	Black	Hispanic	Other	Texas
2009	72.7	53.1	54.6	69.1	61.4
2010	73.5	54.2	58.6	69.9	63.9
2011	75.0	57.0	61.6	69.8	66.3
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^b	75.7	56.3	62.5	65.9	66.4
2018^c	73.5	56.5	62.6	65.3	65.6

^a Computed using the obstetric estimate of gestation. Source: 2009-2018 Texas Birth Files

^b 2017 data are provisional and subject to change.

^c 2018 data are provisional and subject to change.

Table 6. Percent of Live Births Where Mother Smoked During Pregnancy (see Figure 28)^a

Year	White	Black	Hispanic	Other	Texas
2009	11.0	5.4	1.3	1.5	5.10
2010	10.3	5.1	1.3	1.6	4.9
2011	9.8	4.7	1.2	1.5	4.6
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^b	6.3	3.1	0.9	1.3	3.0
2018^c	5.9	2.7	0.9	1.3	2.7

^a Source: 2009-2018 Texas Birth Files

^b 2017 data are provisional and subject to change.

^c 2018 data are provisional and subject to change.

Table 7. Maternal Hypertension by Race/Ethnicity (see Figure 34)^a

Year	White	Black	Hispanic	Other	Texas
2009	6.4	8.4	4.8	3.8	5.7
2010	6.9	8.9	5.4	4.4	6.3
2011	7.0	9.0	5.4	4.3	6.3
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^b	8.6	10.6	7.5	5.5	8.1
2018^c	9.3	11.7	8.1	6.4	8.8

^a Source: 2009-2018 Texas Birth Files

^b 2017 data are provisional and subject to change.

^c 2018 data are provisional and subject to change.

Table 8. Maternal Diabetes by Race/Ethnicity (see Figure 35)^a

Year	White	Black	Hispanic	Other	Texas
2009	3.4	3.6	5.1	7.3	4.4
2010	3.6	3.7	5.1	7.5	4.5
2011	3.7	4.2	5.7	7.7	4.9
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^b	4.7	4.7	7.0	8.5	6.1
2018^c	4.8	4.7	7.1	8.1	6.2

^a Source: 2009-2018 Texas Birth Files

^b 2017 data are provisional and subject to change.

^c 2018 data are provisional and subject to change.

