MATERNAL AND CHILD HEALTH EPIDEMIOLOGY

2020 HEALTHY TEXAS MOTHERS AND BABIES DATA BOOK

Revised February 2022

TEXAS Health and Human Services
Texas Department of State Health Services

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Executive Summary

Community Health Improvement (CHI) is required by Texas Health and Safety Code, Sec. 161.0211, to conduct surveillance and investigations of the factors that increase risk for infant mortality, preterm birth, and other negative outcomes. The Department of State Health Services' Healthy Texas Mothers and Babies (HTMB) Data Book includes this surveillance data and is released annually.

The 2020 HTMB Data Book provides an overview of infant and maternal health in Texas. Provisional 2018 and 2019 birth and death certificate data are presented in the Data Book before they have been finalized by the DSHS Center for Health Statistics. The intention of the HTMB Data Book is to highlight the trends and disparities in infant and maternal health outcomes and to help programs and policymakers make data-driven decisions about how to improve these outcomes in Texas.

Key findings from the 2020 HTMB Data Book include:

- Substantial racial and ethnic disparities exist for infant and maternal health indicators. For example, Non-Hispanic Black mothers and infants have significantly higher rates in infant mortality, preterm birth, low birth weight, pregnancy-related depression, and severe maternal morbidity than do other racial or ethnic groups. This population is also less likely to receive first trimester prenatal care, use safe sleep practices, and engage in optimal breastfeeding practices.
- Geographic and regional differences were observed throughout Texas, especially for teen birth rates, prevalence of smoking during pregnancy, and neonatal abstinence syndrome rates.
- After remaining relatively stable for several years, the Texas birth rate decreased in 2019 for the fourth year in a row and over the past decade, Texas has seen a reduction in the teen birth rate.
- Over the past decade, Texas has seen a reduction in the percentage of women who smoke during pregnancy and Texas has one of the lowest rates of maternal smoking during pregnancy compared to other states.
- Over the past decade, the state has experienced an increase in maternal diabetes and maternal hypertension.
- The infant mortality rate has declined throughout the past decade, reaching an all-time low in 2018 and maintained through 2019.
- In 2019, the percent of preterm births in Texas increased for the fourth consecutive year, reversing some of the steady decline seen from 2008 to 2015.
- Texas has observed a decline in neonatal abstinence syndrome from 2018 to 2019 while national rates continued to rise.
- Texas' teen birth rate and preterm birth rate continued to be higher than national rates, and the percent of mothers receiving early prenatal care in Texas was the third lowest in the nation in 2019.

In December 2021, as part of a routine database review, DSHS epidemiologists identified a calculation error in the 2015 enhanced Maternal Mortality Ratio (MMR) presented in the initial publication of this Data Book (page 54). The Data Book was revised to correct this error and republished in February 2022.

Purpose

The 2020 Department of State Health Services' Healthy Texas Mothers and Babies Data Book (Data Book) provides an overview of infant and maternal health in Texas. The trends and disparities in infant and maternal health outcomes highlighted in this report can help programs and policymakers make data-driven decisions on how to improve these outcomes in Texas. The Data Book is not meant to repeat results found in other places; rather, it is meant to bring different data sources together for analysis and reporting 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 B04MC40164, Maternal and Child Health Services, $34,479,260, 100 percent. 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 is supported, in part, through funding from the Centers for Disease Control and Prevention (CDC) (Grant #5U01DP006204), the State Systems Development Initiative Grant Program (Grant Number H18MC00048), 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.

Data Sources and Terms

Data Sources

The following data sources were compiled and analyzed to create this Healthy Texas Mothers and Babies Data Book (Data Book):

- Vital records data (information from Texas birth, death, fetal death, and linked birth-death files);
- Texas Pregnancy Risk Assessment Monitoring System (PRAMS) survey;
- Texas Health Care Information Collection (THCIC) Inpatient Public Use Data File (PUDF) data; and the
- Texas Department of State Health Services (DSHS)/Texas Health and Human Services Texas Women, Infants, and Children (WIC) Infant Feeding Practices Survey.

The DSHS Vital Statistics Section collects demographic data on all 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. The birth file likely underreports the prevalence of several maternal health indicators, such as diabetes and preeclampsia.[1,2] In addition, 2018 and 2019 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 the Data Book, no geographic information was analyzed or reported using provisional 2019 data except for when several years of data were combined, and 2019 provisional data were not used when presenting maternal and infant death outcomes by race or ethnicity. Since final 2018 data were not available at the time of this report, these outcomes and maps were presented using provisional 2018 data. All data for other years used in the Data Book are final.

Data were suppressed in maps when there were between one and four cases in the numerator to prevent identification of affected individuals, which could be possible 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 implemented 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

[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. Paediatric and perinatal epidemiology, 24(1), 102-112.

of Texas and have given birth to a live infant. The CDC provides Texas with a survey data file that includes survey weights, and the CDC ensures that analyses are representative of women who have given birth to a live infant and are residents of Texas. For example, the 1,588 women who completed the survey in 2018 were representative of all Texas residents who had a live birth in that year. PRAMS data and 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.

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. 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, 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, the schedule of survey mailings begins 61 to 183 days after the birth of the infant to minimize this risk.

To promote breastfeeding, DSHS Maternal and Child Health (MCH), DSHS MCH Epidemiology, and Texas WIC programs regularly collaborate to conduct the Texas WIC Infant Feeding Practices Survey (IFPS) of breastfeeding beliefs, attitudes, and practices among Texas women receiving WIC services.

The most recent survey was conducted in 2018. The bilingual survey questionnaire allowed multiple choice (close-ended) responses. Each clinic that served eight or more infants from May through July 2017 was assigned a specified number of surveys proportionate to the number of participants served in that clinic. The eligible population of women were biological mothers 18 years of age or older that had a baby who was one month through 30 months old 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 in the language of their choice (English or Spanish). Completed surveys were returned by all 65 local WIC agencies operating at the time of the survey. The final sample included 10,076 completed surveys after excluding surveys completed by ineligible respondents. Sampling methods did not include random sampling and survey responses were not weighted or adjusted, therefore, survey findings may not be generalizable to the broader population of women participating in WIC services in Texas. However, 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' reference children ranged from one month through 30 months old without an even distribution of age. For this reason, breastfeeding duration and exclusivity rates for children six months old and older should be interpreted with caution.

THCIC Inpatient PUDF contains data on discharges from Texas hospitals and is managed by the DSHS Center for Health Statistics. Inpatient PUDF data are available by quarter beginning with data for 1999 and have been released through fourth quarter 2019.[3] Using Inpatient PUDF data in this report, respective indicators for severe maternal morbidity (SMM) and neonatal

[3] Texas Inpatient Public Use Data File (PUDF) (released October 14, 2020). **dshs.texas.gov/thcic/hospitals/Inpatientpudf.shtm**. [Accessed December 9, 2020]

abstinence syndrome (NAS) were identified by the presence of International Classification of Diseases (ICD) diagnosis and procedure codes in administrative hospital discharge data.

Despite the few limitations described above, Texas vital records are invaluable sources of data on the status of infant and maternal health. Additionally, PRAMS provides much-needed information about maternal risk and health pre-pregnancy, during pregnancy, and post-pregnancy that is not available elsewhere, and the Texas WIC IFPS provides essential data about infant feeding for the portion of the population that accesses Texas WIC services. Texas vital records, PRAMS, and Texas WIC IFPS 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, as well as understand their emerging health needs. These sources provide an 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: Birthing facilities that meet internationally recognized maternal and infant care standards for best practices in infant feeding care are eligible 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: 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 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: Causes of infant death categories from the NCHS Instruction Manual are used to calculate information regarding the leading causes of infant death in the Data Book.[8]

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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.2020. **babyfriendlyusa.org/wp-content/uploads/2019/12/US-Interim-GEC_191107_CLEAN.pdf** [Accessed November 2020].

[5] Baby-Friendly USA, Inc (2012). Baby-Friendly Hospital Initiative. **babyfriendlyusa.org/about/**. [Accessed November 16, 2018]

[6] World Health Organization (2017, August 29). About Adult BMI. **cdc.gov/healthyweight/assessing/bmi/adult_bmi/index.html**. [Accessed November 16, 2018]

[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. **cdc.gov/nchs/data/nvsr/nvsr65/nvsr65_06.pdf**.

[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). **cdc.gov/nchs/data/dvs/Part9InstructionManual2011.pdf**. [Accessed August 4, 2017]

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: 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 changed the variable used to estimate gestation.[9] 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 Data Book.

Healthy People 2020 Target: Healthy People 2020 (HP 2020) Target is a 10-year target released by U.S. Department of Health and Human services and designed to guide national health promotion and disease prevention efforts to improve the health of people in the U.S. Targets are released each decade and undergo a midcourse review in which targets may be adjusted due to new data.[10,11] While Healthy People 2020 Targets are used throughout the 2020 HTMB Data Book, Health People 2030 Targets were set in August of 2020, and the new benchmarks will be used in following years.[12]

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. The births that comprise this rate are restricted to those women with Texas listed as their state of residence.

Perinatal Periods of Risk: Perinatal Periods of Risk (PPOR) is 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 feto-infant mortality rate (F-IMR) is then calculated for each of these 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]

Race and Ethnicity: For information obtained from birth records, fetal death records, or from 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.

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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 2020. *ODPHP Publication No. B0132*. **healthypeople.gov/sites/default/files/HP2020_brochure_with_LHI_508_FNL.pdf**.

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

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

[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.

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, 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, because 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 or ethnicity group definitions. Notably, PRAMS data are reported with Non-Hispanic White and Other combined.

Maternal Mortality: The Data Book presents findings on maternal mortality from both the Texas Maternal Mortality and Morbidity Review Committee's (MMMRC) review of pregnancy-related deaths and Texas DSHS analyses of statewide trends, rates, and disparities. The MMMRC uses standard methods to review cases of pregnancy-associated deaths, defined as the death of a woman occurring while pregnant or within 365 days of the end of pregnancy (excluding cases related to motor vehicle crashes not involving vehicular homicide or suicide). In calculating the maternal mortality ratio, DSHS researchers use an enhanced four step approach and identify 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*: Pregnancy-associated death is defined as 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 undetermined pregnancy-relatedness.
>
> *Pregnancy-Related Death*: Pregnancy-related death is 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*: Pregnancy-associated, but not related death is defined as the death of a woman during pregnancy or within one year of the end of pregnancy from a case that is not related to the pregnancy.
>
> *Pregnancy-Associated, but Unable to Determine Pregnancy-Relatedness Death*: Pregnancy-associated, but unable to determine pregnancy-relatedness is defined as 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*: Maternal death is a vital registration term used for the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and the site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes as indicated by ICD coding.[14]

[14] Texas Department of State Health Services (2020). Maternal Mortality and Morbidity Review Committee and Department of State Health Services Joint Biennial Report.

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 health.[15] A hospital delivery was considered an SMM case if the mother had one or more of the conditions (such as acute renal failure, cardiac arrest, eclampsia, and sepsis) or procedures (such as blood transfusion and hysterectomy) indicated on a list of SMM-related medical codes. The CDC SMM definition was used in this report to make ICD-9 more comparable to ICD-10.[16]

[15] Centers for Disease Control and Prevention (CDC, 2017, November). Severe Maternal Morbidity in the United States. **cdc.gov/reproductivehealth/maternalinfanthealth/severematernalmorbidity.html**. [Accessed December 2017]

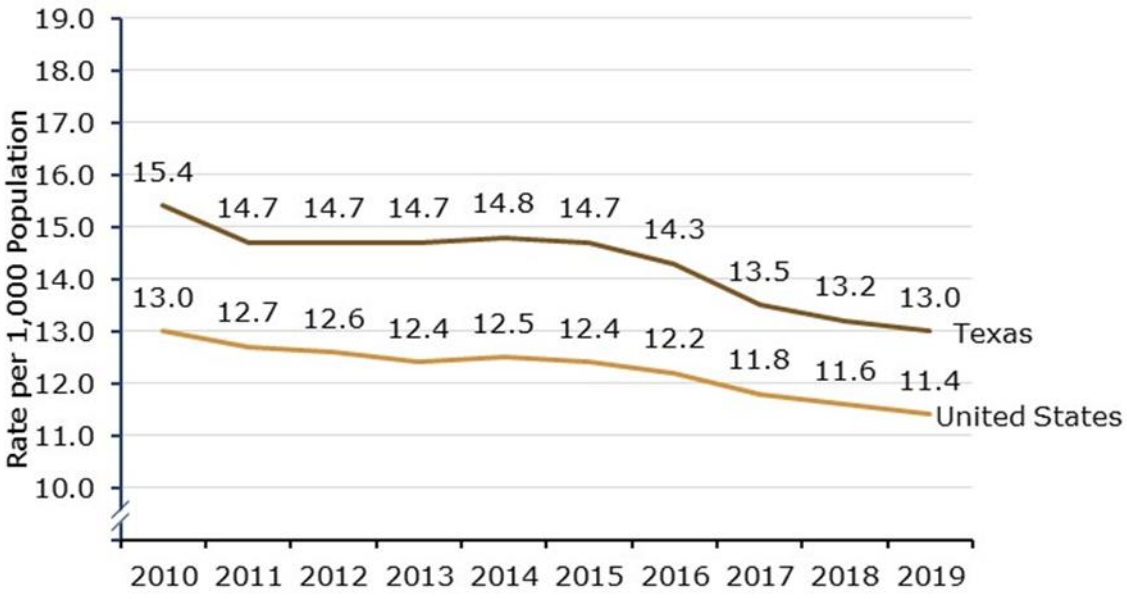
[16] Centers for Disease Control and Prevention (CDC, 2019 September). How Does CDC Identify Severe Maternal Morbidity? **cdc.gov/reproductivehealth/maternalinfanthealth/smm/severe-morbidity-ICD.htm**. [Accessed October 16, 2019]

Birth Demographics

Birth Rate

In 2019, almost 390,000 babies were born in the state, and there were nearly 380,000 births to mothers that were Texas residents. In Texas, the birth rate (defined as number of live births per 1,000 people in the population) has continued to decrease since 2015 after remaining stable from 2011 to 2015 (Figure 1). In 2018, Texas had the fifth highest birth rate in the United States.[17]

Figure 1: Birth Rate in Texas and The United States, 2010-2019



Source: National Center for Health Statistics
Prepared by: Maternal & Child Health Epidemiology Unit
Oct 2020

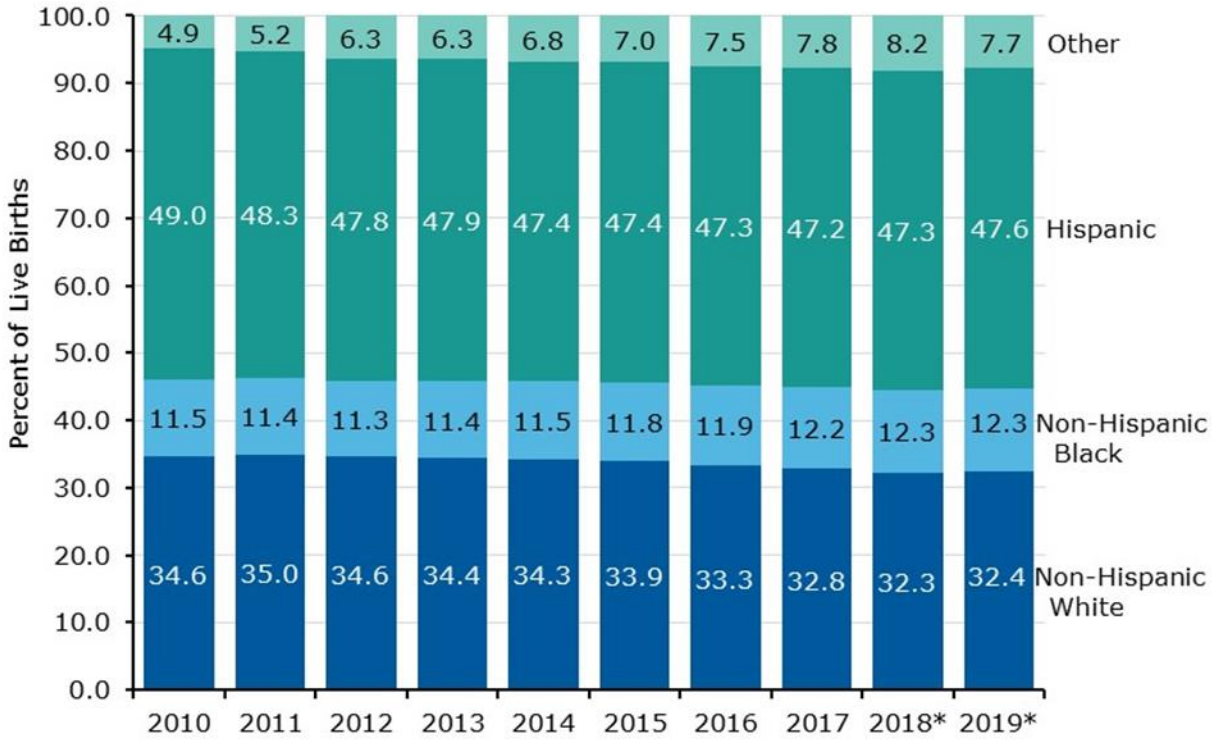
[17] Martin JA, Hamilton BE, Osterman MJK, and Driscoll AK, Division of Vital Statistics, Centers for Disease Control and Prevention (CDC, 2019). Births: Final Data for 2018. National Vital Statistics Report 68(13). Retrieved from cdc.gov/nchs/data/nvsr/nvsr68/nvsr68_13-508.pdf.

Maternal Race and Ethnicity

Births to Hispanic women made up the largest percentage of all births in Texas, nearly half of all births, followed by births to Non-Hispanic White women, Non-Hispanic Black women, and women classified as 'Other' race or ethnicity (Figure 2). The percentage of births to Non-Hispanic Black women has remained consistent over the last 10 years. From 2010 to 2019, the share of infants born to Non-Hispanic White women decreased over time.

The proportion of births to women in the 'Other' category grew from 4.9 to 8.2 percent of all births in 2018. There was a slight decrease in 2019 with 7.7 percent of all births being to women classified as 'Other' race or ethnicity. Although a smaller proportion of Texas births were to women who were categorized as being of 'Other' races or ethnicities, this group had the largest increase in the percent of total live births over the past decade in Texas. More than 30,000 births in 2018 were to mothers who classified themselves as Asian, multiracial, or other racial or ethnic designations. However, it is important to keep in mind that this group encompasses many different races and ethnicities, which often limits the interpretability of results for this racial and ethnic category.

Figure 2: Distribution of Racial and Ethnic Groups Among All Live Births, 2010-2019



*2018 and 2019 Texas data are provisional
Source: 2010-2019 Birth Files
Prepared by: Maternal & Child Health Epidemiology Unit
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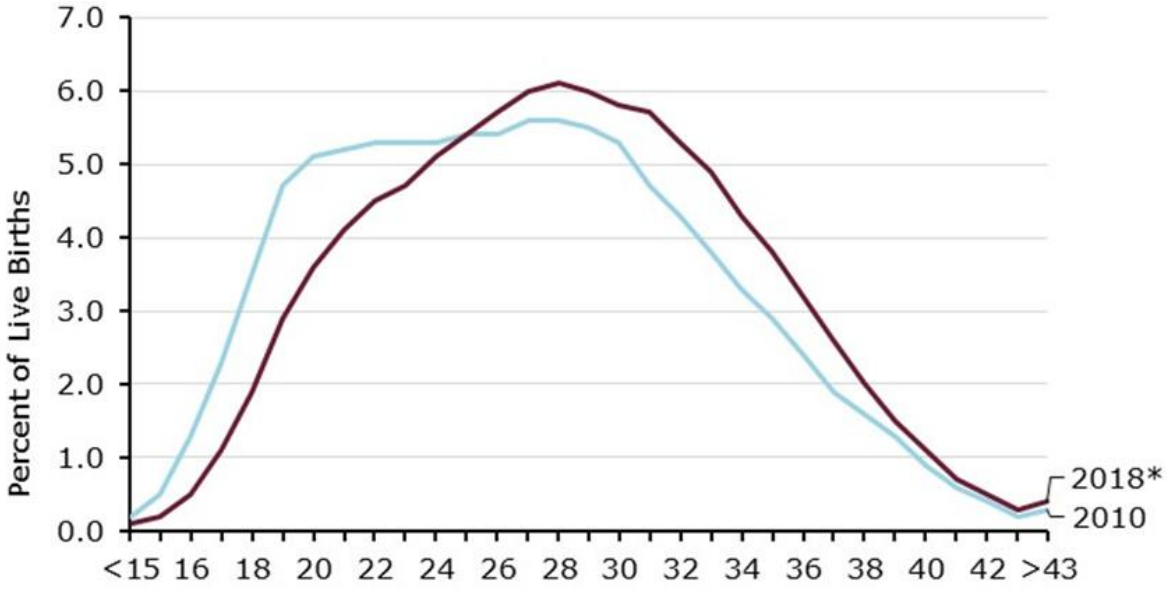
Maternal Age

As in the United States as a whole, over time Texas has seen a shift in the maternal age of women giving birth.[18] The average maternal age at birth in 2018 was 28.3 years of age, a significant increase from an average age of 26.9 years in 2010 (Figure 3).

Figure 3: Maternal Age Distribution in 2010 and 2018

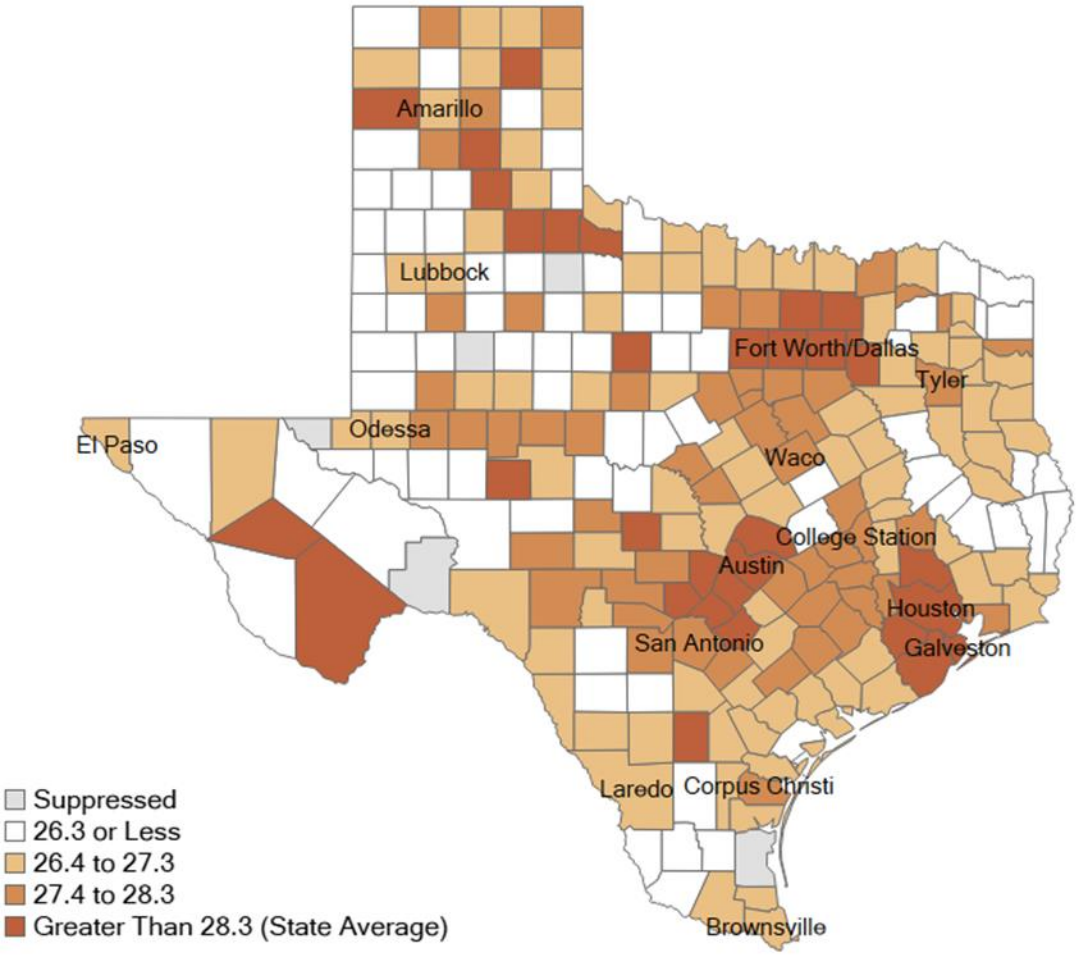


*2018 Texas data are provisional
Source: 2010 and 2018 Birth Files
Prepared by: Maternal & Child Health Epidemiology Unit
Oct 2020

[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 2018 differed by region (Figure 4). Counties with densely populated areas, such as Harris and Dallas, tended to have older average maternal ages (greater than 28.3 years of age) compared to rural locations.

Figure 4: Average Age of a Woman with a Live Birth, 2018



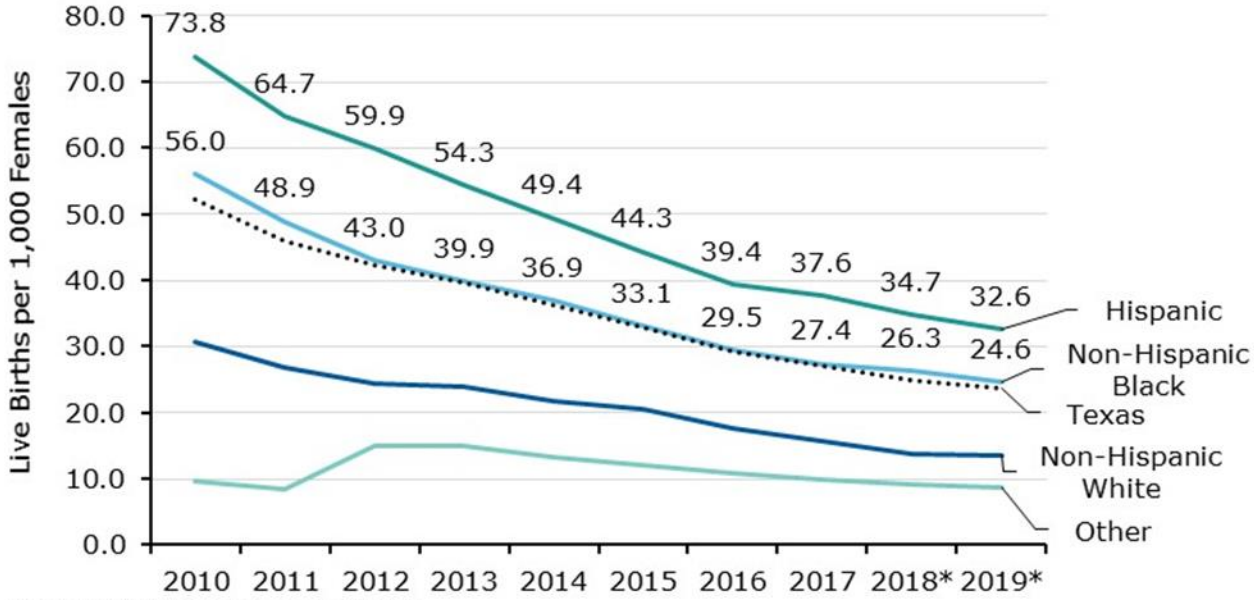
2018 Texas data are provisional
Source: 2018 Birth File
Prepared by: Maternal & Child Health Epidemiology Unit
Oct 2020

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 2009.[18] This drop has been particularly steep for Hispanic and Non-Hispanic Black youth (Figure 5). Over the past 10 years, the teen birth rate has declined by 55.8 percent among Hispanic youth and by 56.0 percent among Non-Hispanic Black youth.

The Centers for Disease Control and Prevention (CDC) defines the teen birth rate as the number of live births per 1,000 females aged 15-19 years.[17] Although Texas has experienced a steady decrease in the teen birth rate over the past decade, Texas' 2018 teen birth rate of 25.3 per 1,000 females tied for the seventh highest teen birth rate in the United States with Tennessee and New Mexico.[19]

Comparatively, the national teen birth rate was 17.4 per 1,000 females. The percent of repeat births among teen mothers ages 15-19 was highest in Texas compared to other states at 18.7 percent in 2018. Nationally, the percent of teen mothers with repeat births in 2018 was 15.6 percent.[20]

Figure 5: Teen (15 - 19 Years of Age) Birth Rate per 1,000 Females by Race and Ethnicity, 2010-2019



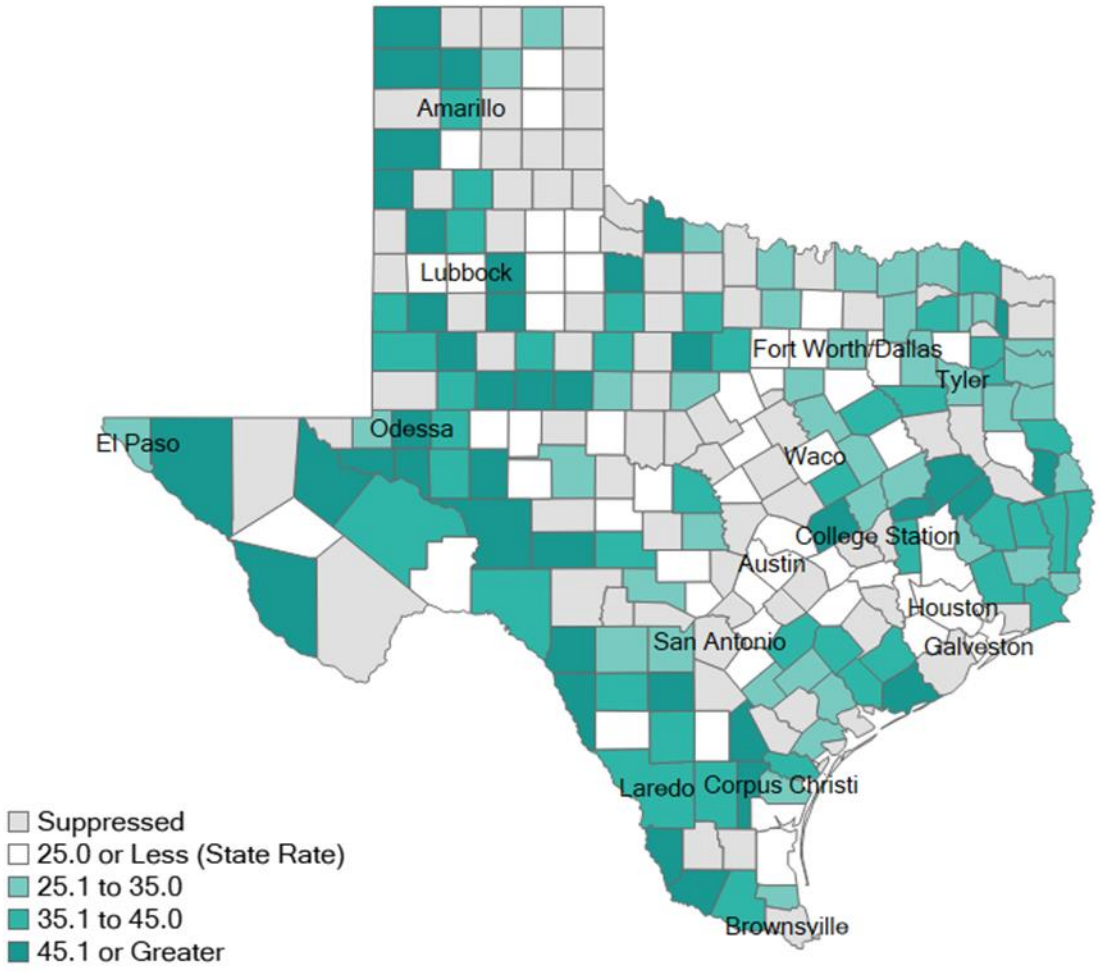
*2018 and 2019 Texas data are provisional
Source: 2010-2019 Birth Files
2010-2018 Population Estimates
2019 Population Projections
Prepared by: Maternal & Child Health Epidemiology Unit
Dec 2020

[19] Centers for Disease Control and Prevention (CDC, January 2020). National Center for Health Statistics: Teen Birth Rate by State. **cdc.gov/nchs/pressroom/sosmap/teen-births/teenbirths.htm**.[Accessed February 2020]

[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 (2019, September). Natality public-use data 2016-2019, on CDC WONDER Online Database. **wonder.cdc.gov/natality-expanded-current.html**. [Accessed November 2020]

Additionally, several areas in Texas had high teen birth rates when compared to the rest of the state (Figure 6). Many counties in the border regions and rural counties of the state and in the Texas Panhandle had high teen birth rates in 2018.

Figure 6: Teen Birth Rate per 1,000 Females Age 15-19 Years Old, 2018



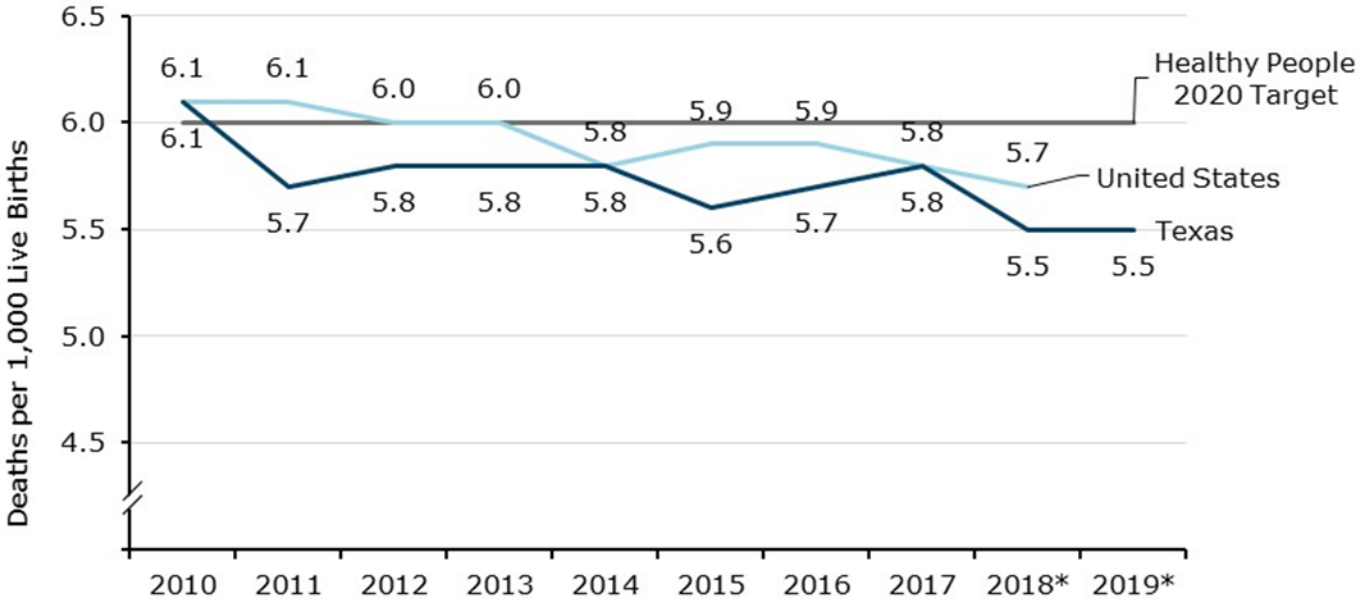
2018 Texas data are provisional
Source: 2018 Birth File
Texas Demographic Center 2018 Population Estimates
Prepared by: Maternal & Child Health Epidemiology Unit
Oct 2020

Infant Mortality and 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, which kept level through 2019. The IMR in Texas has been at or below the national rate for the past 10 years (Figure 7). Moreover, since 2011, the state has consistently been below (exceeded) the Healthy People 2020 (HP 2020) target of 6.0 deaths per 1,000 live births.

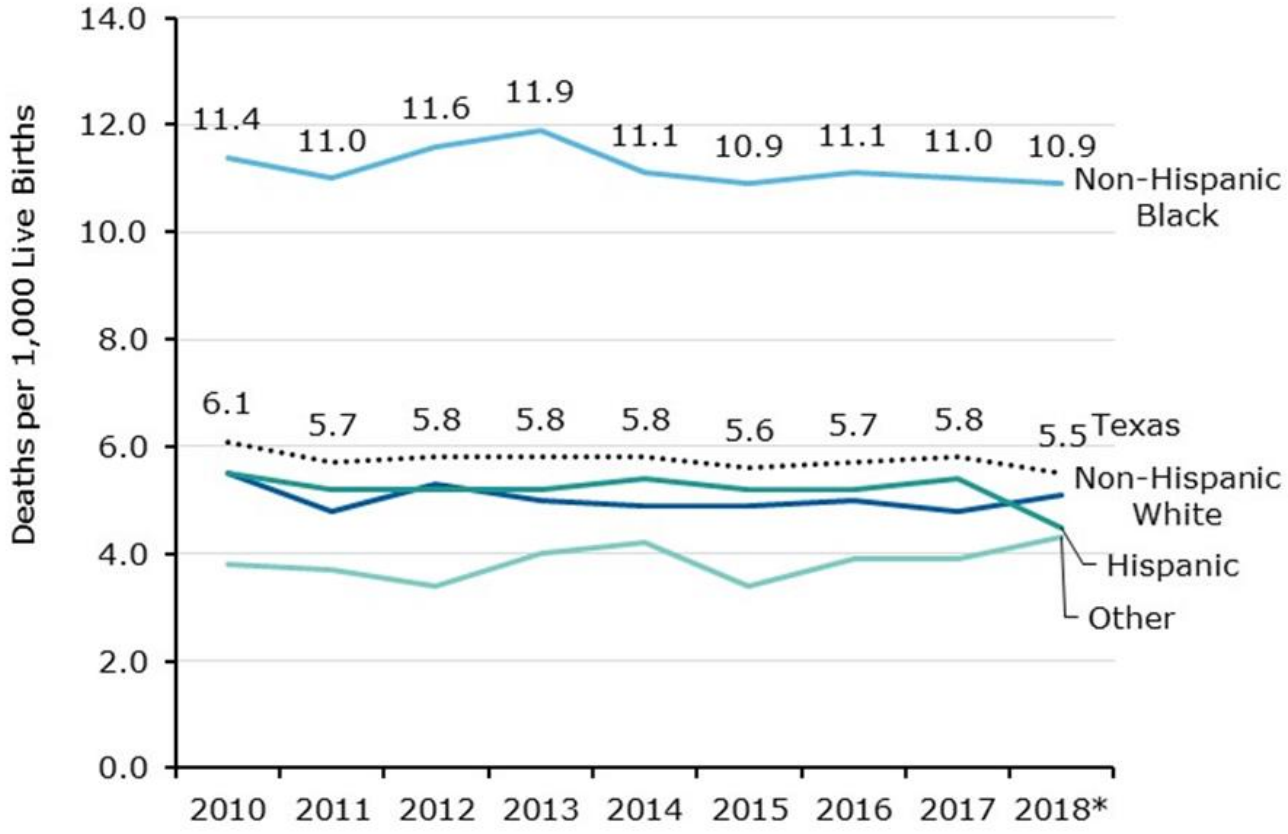
Figure 7: Infant Mortality Rate in Texas and the U.S., 2010-2019



*2018 and 2019 Texas data are provisional
Source: 2010-2019 Texas Birth and Death Files, 2010-2018 National Center for Health Statistics
Prepared by: Maternal & Child Health Epidemiology Unit
Oct 2020

However, racial and ethnic disparities in IMR have persisted 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 mothers have been twice as high as IMRs for Non-Hispanic White and Hispanic mothers over much of this timeframe.

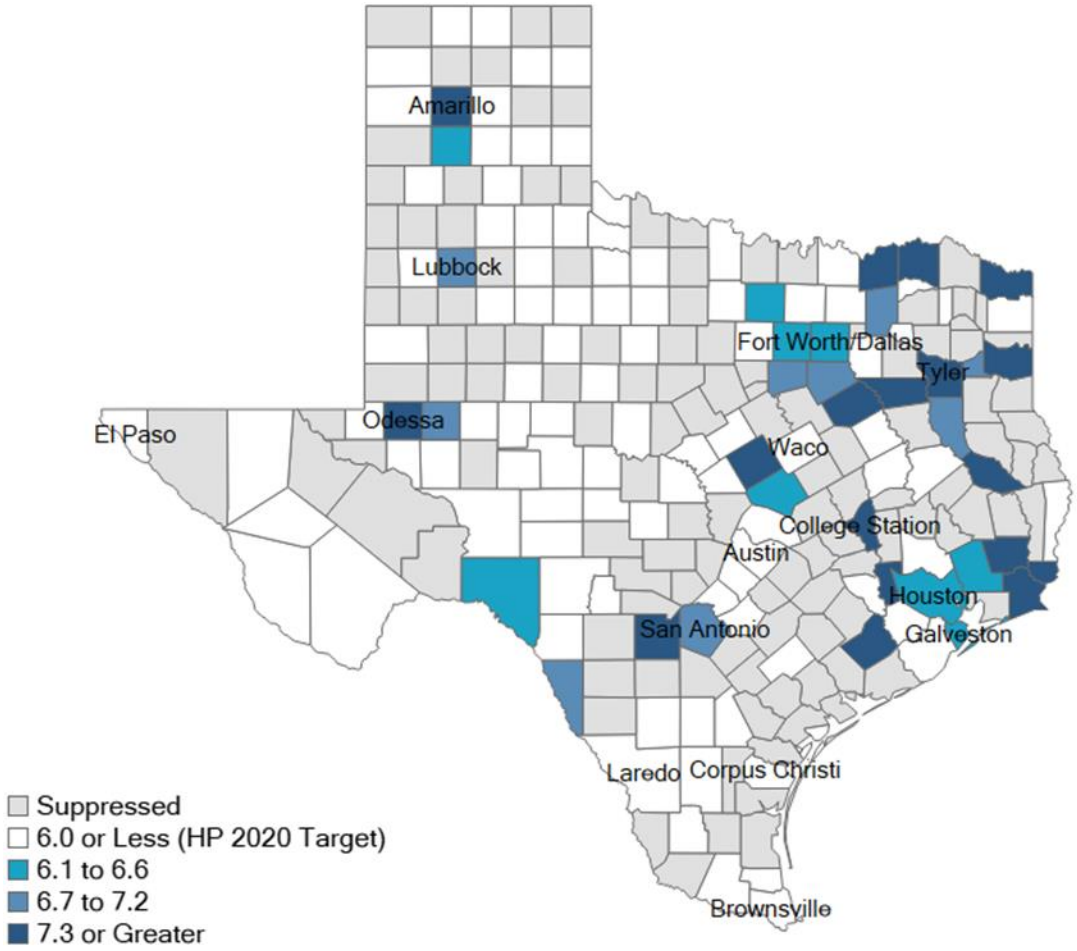
Figure 8: Infant Mortality Rate in Texas by Race and Ethnicity, 2010-2018



*2018 Texas data are provisional
Source: 2010-2018 Texas Birth and Death Files
Prepared by: Maternal & Child Health Epidemiology Unit
Oct 2020

In addition to racial and ethnic disparities, substantial regional differences in IMR persist within the state. In 2018, many Texas counties met the HP 2020 target of 6.0 or fewer infant deaths per 1,000 live births (Figure 9). In contrast, Fannin County, Angelina County, Potter County, Medina County, Jefferson County, and Wharton County had the highest IMRs; at least ten deaths per 1,000 live births were reported in these counties in 2018.

Figure 9: Infant Mortality Rate per 1,000 Live Births, 2018



2018 Texas data are provisional
Source: 2018 Birth File
2018 Death File
Prepared by: Maternal & Child Health Epidemiology Unit
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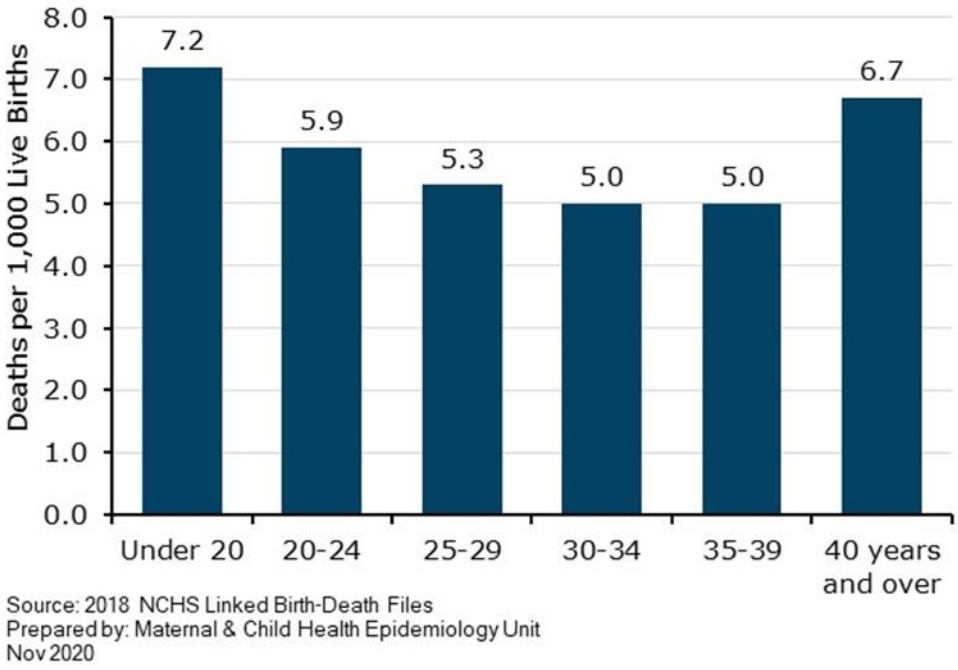
Differences in IMR also exist by maternal age. In 2018, a higher IMR was observed among young mothers less than 20 years of age than among mothers of any other age group. The age group with the next highest IMR were mothers 40 years of age or older (Figure 10). Mothers in these two age groups comprised 9.6 percent of all Texas resident births in 2018.

Figure 10: Infant Mortality Rate by Mother's Age Group, 2018



Source: 2018 NCHS Linked Birth-Death Files
Prepared by: Maternal & Child Health Epidemiology Unit
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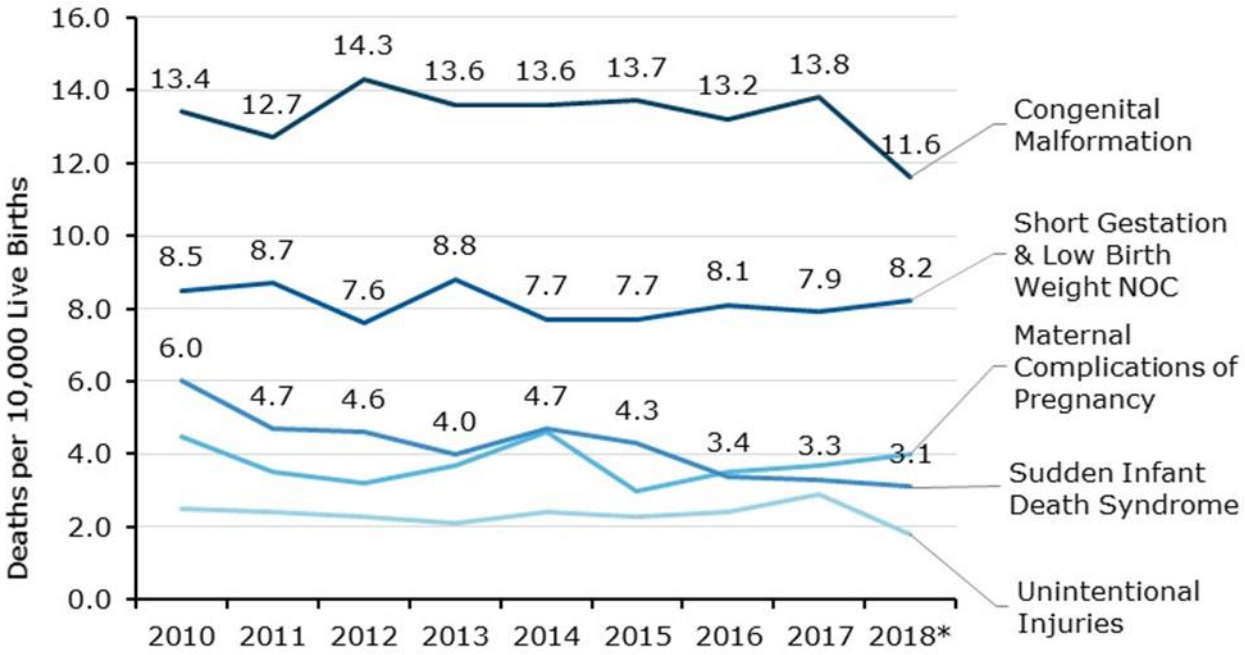
Causes of Infant Death

Causes of infant death presented in the 2020 Healthy Texas Mothers and Babies Data Book (Data Book) used provisional 2018 data before they were finalized because final 2018 data were not available at the time of this report. Overall, the leading cause of death for infants younger than one year in Texas was congenital malformation (birth defects; Figure 11).

Congenital malformations (data not shown) were also the leading cause of death among infants older than 28 days, followed by Sudden Infant Death Syndrome (SIDS). The provisional 2018 SIDS rate is likely an underestimate of the final 2018 SIDS rate because deaths due to SIDS have a longer reporting lag time compared to deaths due to other infant causes of death.[21]

Figure 11: Leading Causes of Infant Death, 2010-2018



*2018 data are provisional
NOC: Not otherwise classified
Source: 2010-2018 Death & Birth Files
Prepared by: Maternal & Child Health Epidemiology Unit
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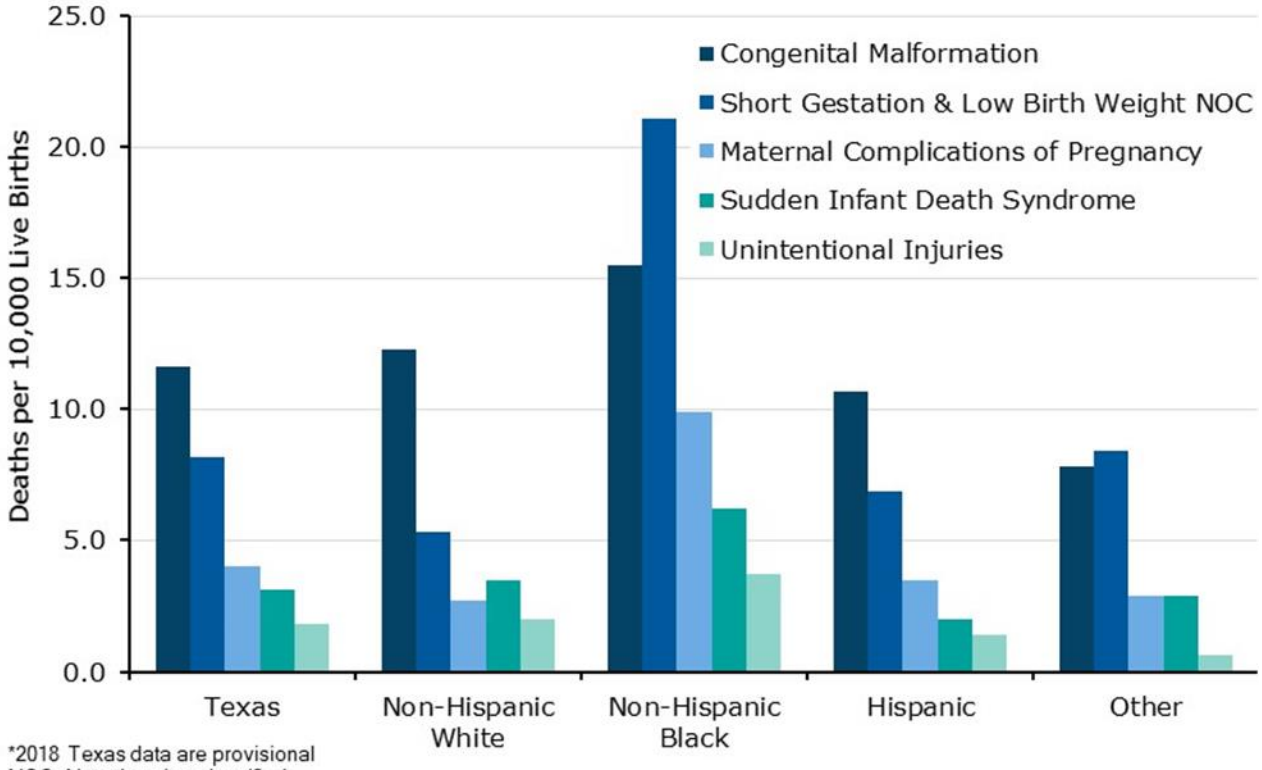
[21] Rosen L., Womack L., Spencer M. and Ahmad F. (2018). Timeliness of Infant Death Data for Infant Mortality Surveillance and Quarterly Provisional Estimates. *Vital Statistics Rapid Release,* no. 5.

Leading causes of infant death also differ by race or ethnicity. In 2018, the leading cause of death among Non-Hispanic Black infants was short gestation and low birth weight (LBW). LBW is defined as weighing less than 2,500 grams at birth with 21.1 deaths per 10,000 live births, higher than those for any other cause of death. Congenital malformation was the leading cause of death among Non-Hispanic White and Hispanic infants. The highest rate of deaths due to congenital malformation was among Non-Hispanic Black infants (Figure 12).

Figure 12: Leading Causes of Death by Race and Ethnicity, 2018



*2018 Texas data are provisional
NOC: Not otherwise classified
Source: 2018 Birth and Death Files
Prepared by: Maternal & Child Health Epidemiology Unit
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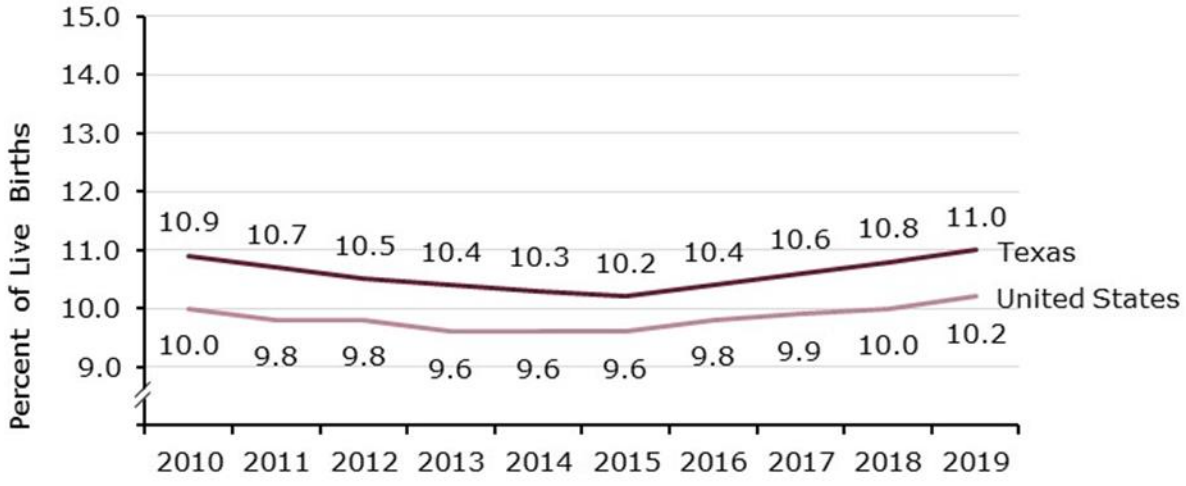
Preterm Birth

Preterm births are those that occur prior to 37 weeks of gestation. Preterm birth rates in both Texas and the nation decreased during 2010 to 2015. However, in 2019, the Texas preterm birth rate increased for the fourth 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 (Figure 13).

Figure 13: Percent of Live Births Born Preterm (less than 37 weeks) in Texas and United States Using Obstetric Estimate of Gestation, 2010-2019



Source: National Center for Health Statistics
Prepared by: Maternal & Child Health Epidemiology Unit
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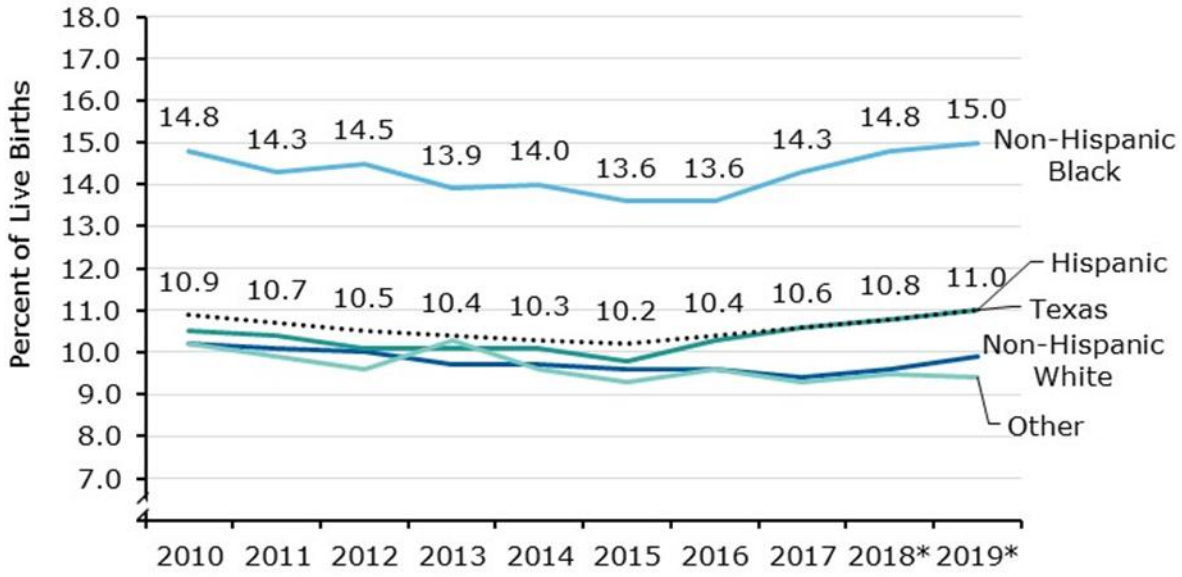
As with IMR, substantial racial and ethnic disparities in the preterm birth rate existed (Figure 14). Non-Hispanic Black infants had a higher preterm birth rate than infants of any other racial or ethnic group.

Figure 14: Percent of Live Births Born Preterm (less than 37 weeks) in Texas by Race and Ethnicity Using Obstetric Estimate of Gestation, 2010-2019



*2018 and 2019 Texas data are provisional
Source: 2010-2019 Texas Birth Files
Prepared by: Maternal & Child Health Epidemiology Unit
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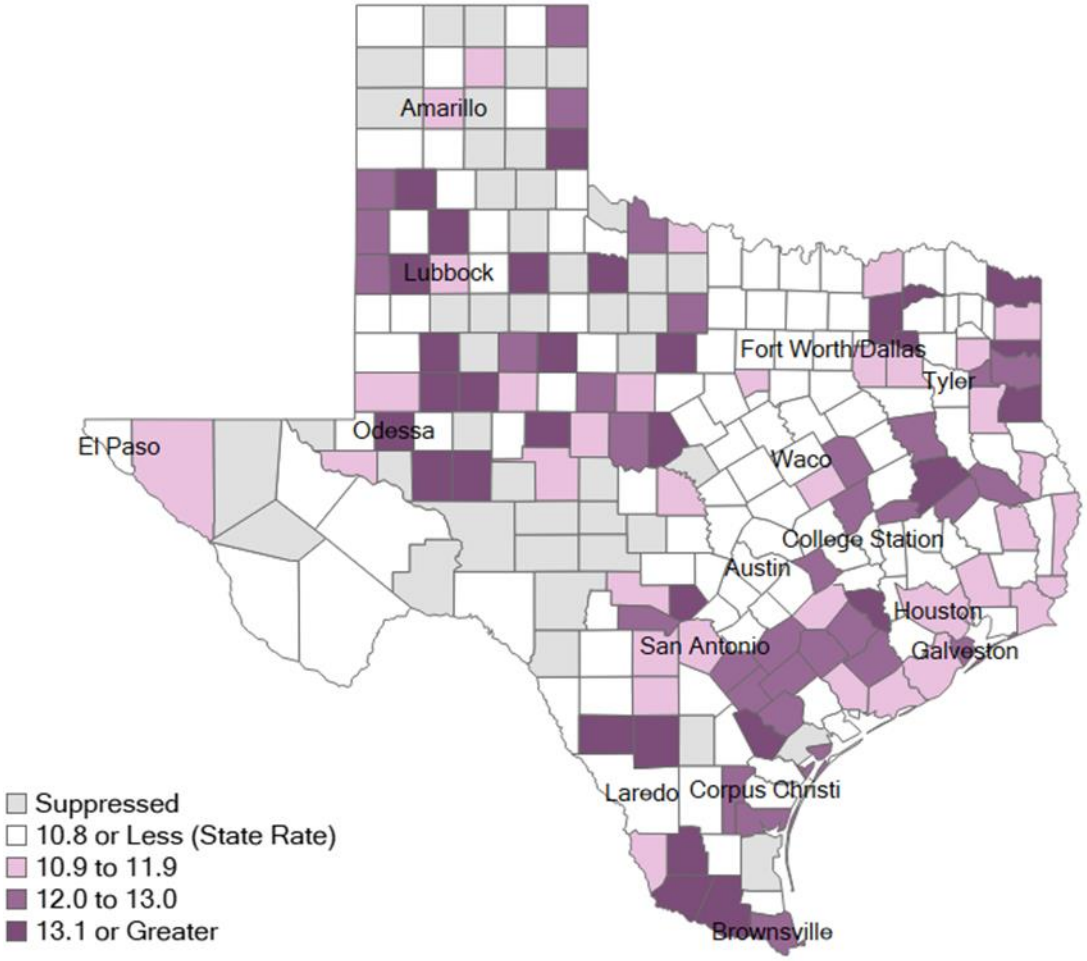
Figure 15 shows the percentage of preterm births by county in Texas. There were no clear geographic patterns or regional disparities for low birth weight rates within the state.

Figure 15: Percent of Live Births Born Preterm (less than 37 weeks) in Texas Using Obstetric Estimate of Gestation, 2018



2018 Texas data are provisional
Source: 2018 Birth File
Prepared by: Maternal & Child Health Epidemiology Unit
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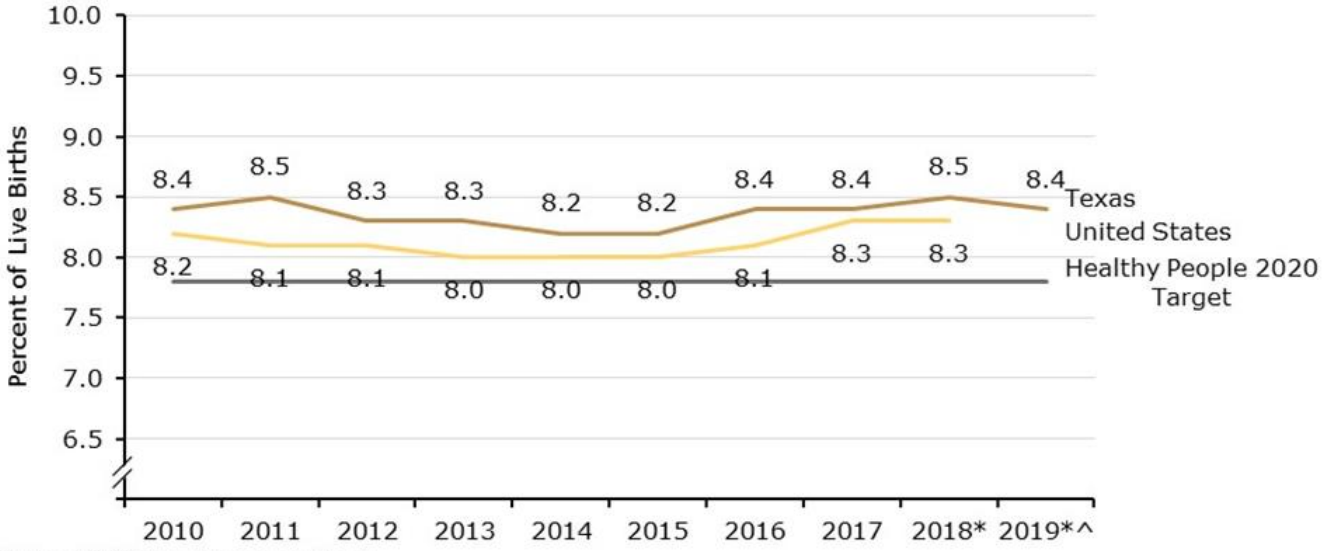
Low Birth Weight

The percentage of babies born with a low birth weight in Texas (weighing less than 2,500 grams) decreased slightly from 2018 to 2019, but overall, the rate has remained relatively stable since 2016. The rate of low birth weight infants in Texas has been slightly higher than the national rate, and Texas is currently not meeting the HP 2020 target of 7.8 percent or fewer of all live births weighing less than 2,500 grams (Figure 16).

Figure 16: Percent of Births that are Low Birth Weight (less than 2,500 grams) in Texas and the United States, 2010-2019



*2018 and 2019 Texas data are provisional
^2019 national data not yet available
Source: National Center for Health Statistics
Prepared by: Maternal & Child Health Epidemiology Unit
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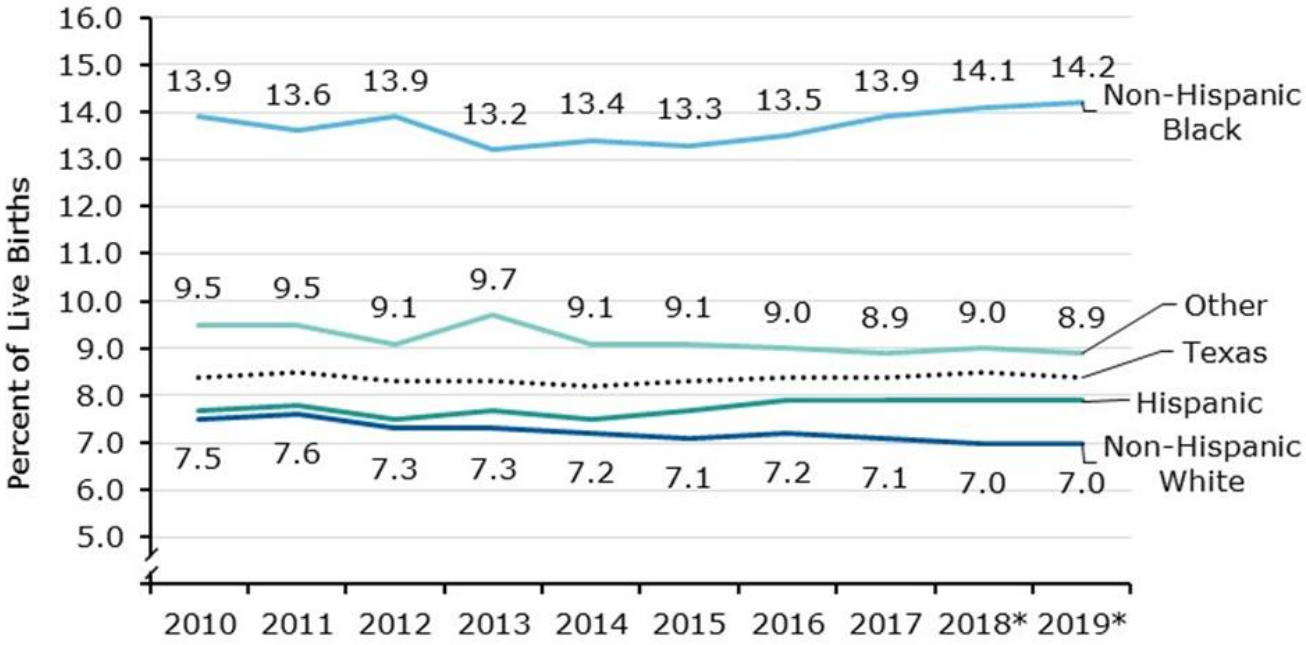
As with IMR and preterm births, Non-Hispanic Black mothers had a disproportionately high percentage of low birth weight infants (Figure 17), and the gap between Non-Hispanic Black mothers and Non-Hispanic White mothers is slowly widening. The rate of low birth weight infants is also higher among mothers in the 'Other' racial or ethnic category than among Non-Hispanic White or Hispanic mothers.

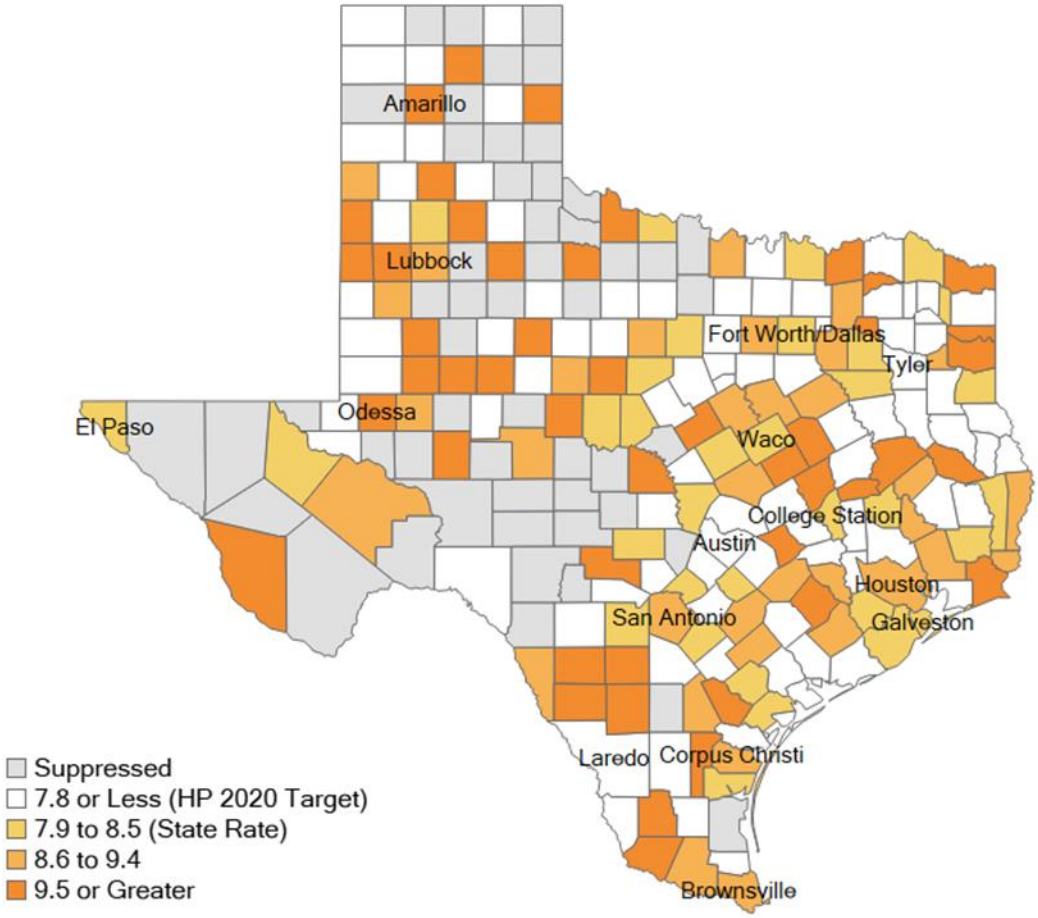
Figure 17: Percent of Births that are Low Birth Weight (less than 2,500 grams) in Texas by Race and Ethnicity, 2010-2019



*2018 and 2019 Texas data are provisional
Source: 2010-2019 Birth Files
Prepared by: Maternal & Child Health Epidemiology Unit
Nov 2020

Although some counties across Texas had high percentages of low birth weight infants in 2018, many counties did not (Figure 18). Regional differences were observed where many counties in south and east Texas had met the HP 2020 target or had lower percentages of low birth weight infants compared to the state as a whole.

Figure 18: Percent of Infants born Low Birth Weight (less than 2,500 grams), 2018



2018 Texas data are provisional
Source: 2018 Birth File
Prepared by: Maternal & Child Health Epidemiology Unit
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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, the Texas Department of State Health Services (DSHS) Maternal and Child Health Epidemiology Unit conducted a Perinatal Periods of Risk (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. The findings of PPOR analyses are intended to help create targeted, impactful interventions that reduce infant mortality.[22]

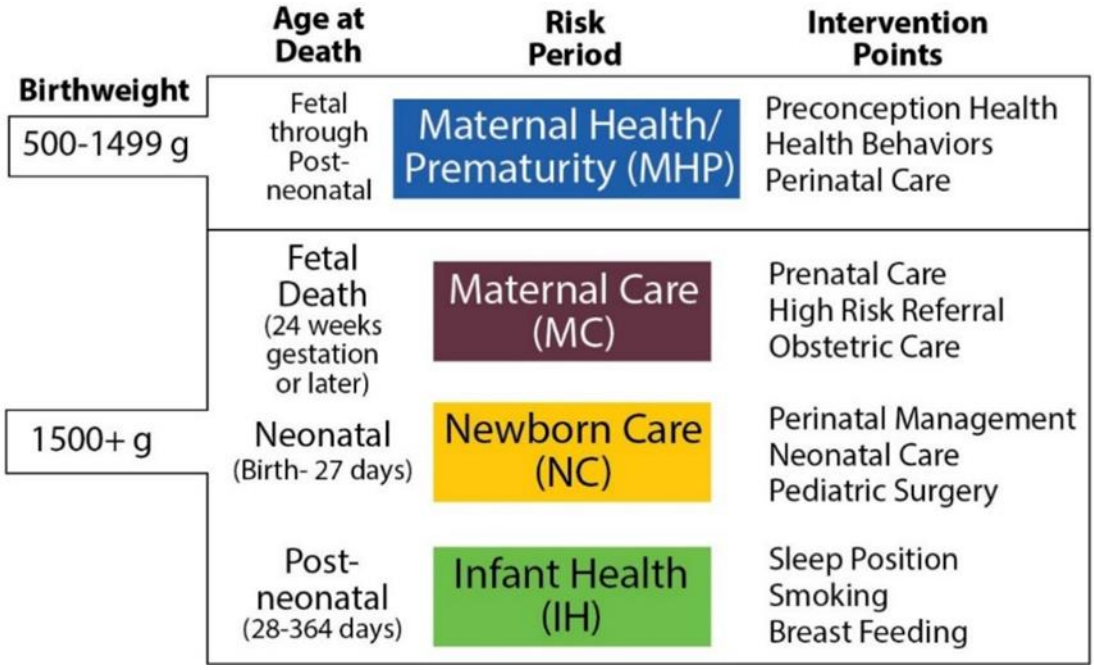
Fetal and infant deaths are categorized into four risk groups based on birth weight and when the death occurred (Figure 19):[13,22,23]

1. The Maternal Health/Prematurity (MHP) 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 birthweight between 500-1,499 grams.
2. The Maternal Care (MC) 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) period of risk: deaths occurring between birth and 27 days postpartum with a birthweight over 1,500 grams.
4. The Infant Health (IH) period: deaths occurring 28-364 days postpartum with a birthweight 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 hence, different opportunities for prevention; therefore, the four risk periods represent distinct points of intervention in the health care continuum.[13] Figure 19 shows the criteria for each of these four categories and examples of interventions that might be indicated for each period.

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



PPOR analysis was divided into two phases. Phase I Analysis was used to identify whether excessive feto-infant mortality occurs for each of the four risk periods. This analysis compared the feto-infant mortality rate (F-IMR) of Texas 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 allowed for an estimation of preventable (excess) deaths for each period of risk and provided a realistic benchmark for reducing infant mortality in a community.

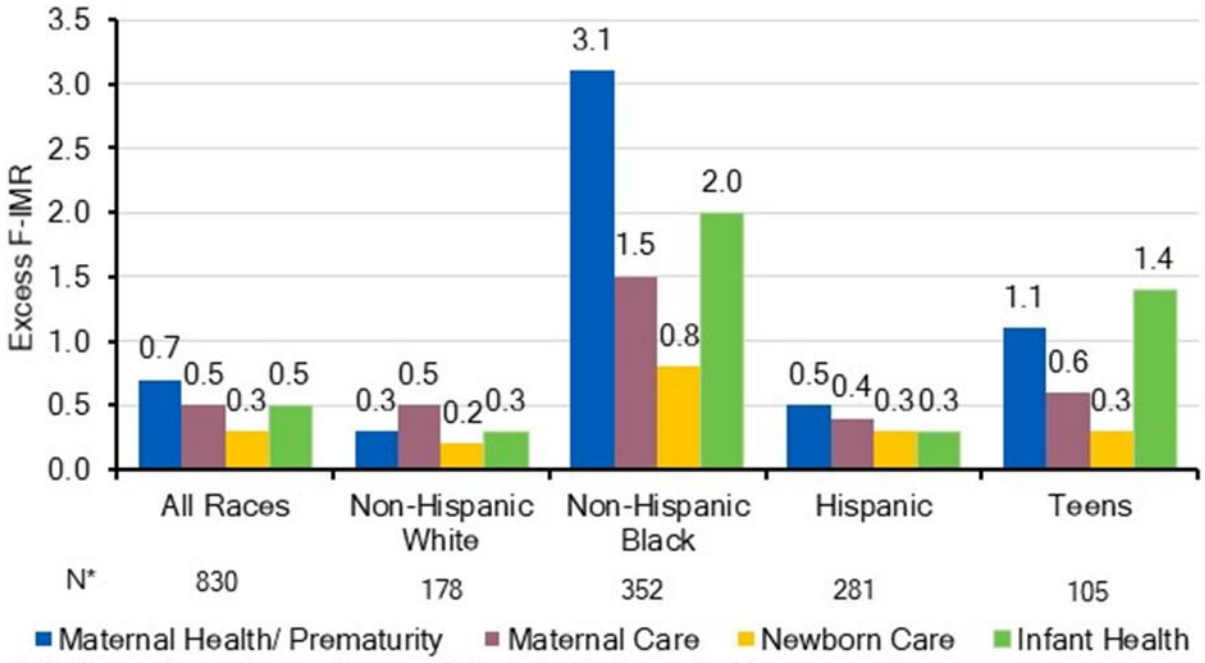
Phase II Analysis further investigated the risk periods with the highest excess feto-infant mortality to identify contributing risk factors and causes of death. Results of the Phase II Analysis are intended to identify programmatic and policy initiatives that are expected to have the most impact at reducing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

Phase I Analysis

In the following analysis, racial or ethnic categories are mutually exclusive. The category of teens includes all race 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 F-IMR was calculated as the number of fetal and infant deaths per 1,000 live births and fetal deaths and was the sum of the rate for each risk period. The 2016 F-IMRs were 6.2 per 1,000 for Non-Hispanic White mothers, 12.3 per 1,000 for Non-Hispanic Black mothers, 6.3 per 1,000 for Hispanic mothers, and 8.3 per 1,000 for teen mothers.

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, which had an F-IMR of 4.8 per 1,000. Calculated as the sum of each period of risk, Non-Hispanic Black mothers experienced a total of 7.5 excess fetal and infant deaths per 1,000 live births and fetal deaths in 2016. Total excess F-IMRs for Non-Hispanic White mothers, Hispanic mothers, and teen mothers were 1.3 per 1,000, 1.5 per 1,000, and 3.5 per 1,000, respectively (Figure 20).

Figure 20: Excess Feto-Infant Mortality Rates (F-IMR), 2016



N is the number of excess fetal and infant deaths for each of the groups shown.
Source: 2016 Linked Birth Infant Death Files
Prepared by: Maternal & Child Health Epidemiology
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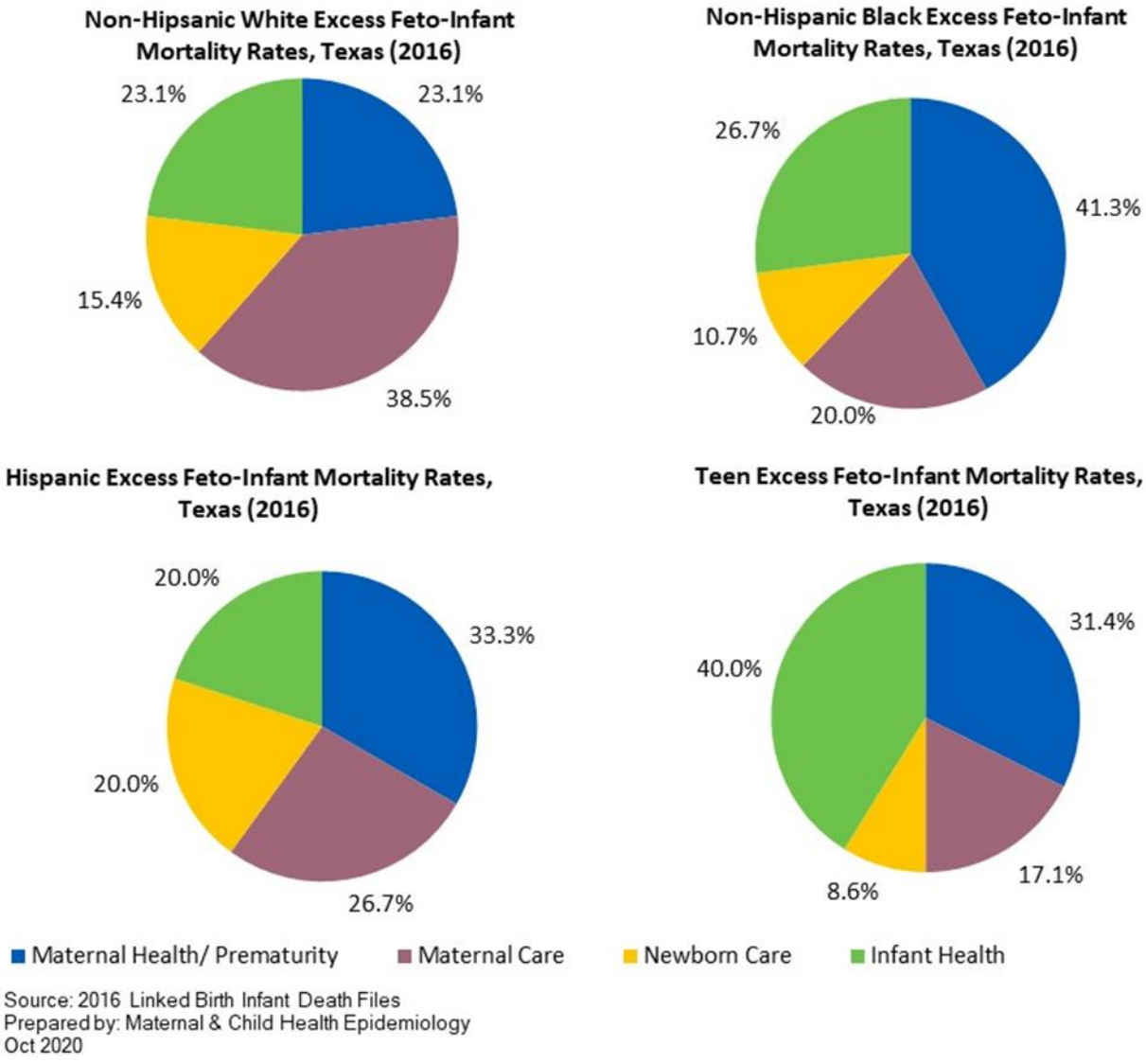
Non-Hispanic Black women had the highest excess F-IMR for all four risk periods (Figure 20), with 59 percent of all Non-Hispanic Black fetal and infant deaths being potentially preventable deaths (i.e. excess fetal and infant deaths). Moreover, 41 percent of the overall excess Non-Hispanic Black fetal and infant deaths occurred in the Maternal Health/Prematurity risk period (any deaths occurring with a birthweight below 1,500 grams). For teen mothers, 71 percent of excess feto-infant deaths occurred in the Maternal Health (31.4 percent) and Infant Health (40.0 percent) risk periods combined (Figure 21).

Figure 21: Percent of Excess Feto-Infant Mortality Rates (F-IMR) per Risk Period within Study Populations, 2016



Source: 2016 Linked Birth Infant Death Files
Prepared by: Maternal & Child Health Epidemiology
Oct 2020

Phase II Analysis

In the Phase I Analysis, the Maternal Health/Prematurity risk period and the Infant Health risk period were identified as periods with the highest amount of excess mortality, particularly for 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 targeted strategies for intervention.

Analysis of Maternal Health / Prematurity Risk Period

For fetal and infant deaths in the Maternal Health/Prematurity risk period, a Kitagawa analysis was conducted for each study population. The 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;
- 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).[24]

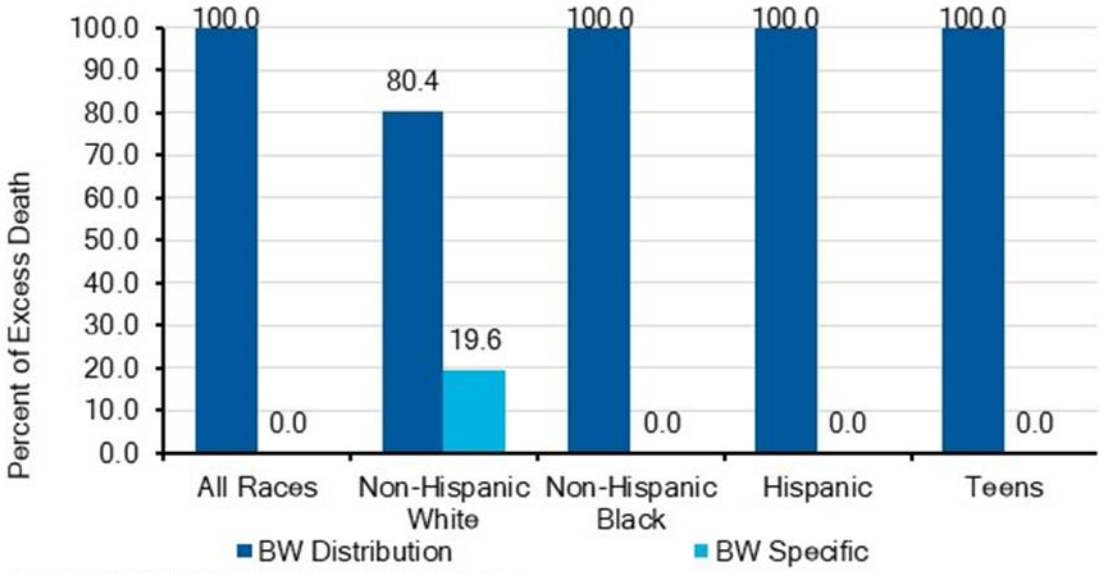
In other words, the analyses is trying to determine whether an excess feto-infant mortality emerged because of the greater number of VLBW infants in the study population compared to the reference group or because VLBW infants died at higher rates compared to the reference group.

This distinction is important because each requires different preventative measures. If there are excess deaths due to a higher number of VLBW infants being born, intervention methods should be aimed at preventing VLBW. If excess deaths occur for VLBW infants in a study population compared to the reference population, interventions should be aimed at 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 subpopulations examined, the majority of excess Maternal Health/Prematurity risk period deaths were attributable to a greater number of VLBW births (birth weight distribution) in these groups when compared to the reference population. Notably, for all populations other than Non-Hispanic White (total, Non-Hispanic Black, Hispanic, and teen), 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 these study populations, and especially for infants born to Non-Hispanic Black mothers (who had the highest excess infant mortality rates), interventions aimed at 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, some proportion of excess feto-infant death was also attributable to a higher mortality rate among VLBW births than the reference population.

[24] 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.

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



Source: 2016 Linked Birth Infant Death Files
Prepared by: Maternal & Child Health Epidemiology
Oct 2020

Birth Weight Distribution

To examine differences in birth weight distribution during the Maternal Health/Prematurity risk period, 1) a multivariable logistic regression analysis was conducted to identify factors associated with risk of delivering a VLBW baby and 2) the population attributable risk (PAR) percentages were calculated to determine attributable risk. 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. 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.

For the whole population, factors that were associated with increased risk of a VLBW births included multiple births, maternal weight gain less than 15 pounds, Non-Hispanic Black race/ethnicity of the mother, inadequate prenatal care, and previous preterm birth. Approximately 25 percent of VLBW births were attributable to multiple gestations, and 18 percent of all VLBW births were attributable to weight gain less than 15 pounds. Twelve percent of infant deaths were attributable to Non-Hispanic Black race/ethnicity. Four percent and five percent of all VLBW births could be attributed to inadequate prenatal care and previous preterm birth respectively.

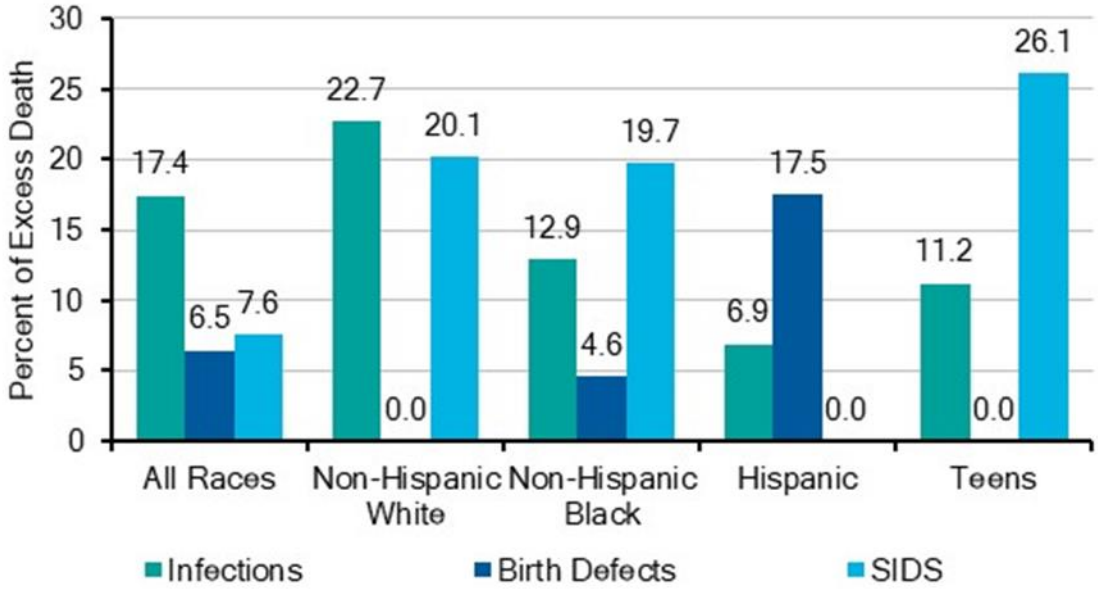
Excess deaths associated with birth weight distribution were seen for all subpopulations, with the Non-Hispanic Black population and teens experiencing the most excess mortality during this period of risk. All study populations were more likely to have the following risks for VLBW births compared to the reference population: maternal weight gain less than 15 pounds, high parity,

and inadequate prenatal care. Non-Hispanic Black, Hispanic, and Non-Hispanic White mothers were more likely to have had a previous preterm birth. Smoking and maternal weight gain over 40 pounds were more common risk factors for VLBW births among Non-Hispanic White mothers.

Analysis of Infant Health Risk Period

The Phase II analysis of the Infant Health Risk Period identified risk factors associated with infant death among infants 28 days and older, and the PAR percentages were calculated to determine attributable risk. Among all infant deaths in the Infant Health risk period, infections were the primary cause of death, accounting for 17 percent of excess deaths. Of the subgroups examined, Non-Hispanic Black mothers and teens had the greatest excess infant mortality in this risk period, with SIDS accounting for a large proportion of excess infant deaths in these populations (Figure 23). Birth defects contributed to 18 percent of excess mortality among Hispanic infants, and infections accounted for 23 percent of excess deaths among infants born to Non-Hispanic White mothers.

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



Source: 2016 Linked Birth Infant Death Files
Prepared by: Maternal & Child Health Epidemiology
Oct 2020

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. 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. Early prenatal care, having less than 12 years of education, Non-Hispanic Black race and ethnicity, breastfeeding, and smoking had the greatest impact on overall risk of infant death during this time period. Approximately 11 percent of infant deaths were attributable to Non-Hispanic Black race or ethnicity of the mother, and 10 percent of infant deaths were attributable to maternal education of less than 12 years. Infants whose mothers did not receive prenatal care in the first trimester had a 4.1 percent increased risk of infant death, and infants who were not breastfed had a 7.4 percent higher risk of death. Maternal smoking during pregnancy potentially contributed to 2.5 percent of infant deaths in the Infant Health risk period.

Summary of Phase II Analysis

Phase II of this analysis investigated the two periods of risk that were identified in Phase I as having the most excess deaths: Maternal Health/Prematurity risk period and the Infant Health risk period. Non-Hispanic Black mothers had the highest percentage of excess infant mortality in both of these risk periods followed by teens.

In the Maternal Health/Prematurity 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 the prevalence of VLBW births is expected to have the largest impact in preventing infant mortality for this risk period. For all study populations (Non-Hispanic White, Non-Hispanic Black, Hispanic, and teen), factors associated with excess mortality due to higher numbers of VLBW infants included weight gain less than 15 pounds, inadequate prenatal care, Medicaid-covered deliveries, high parity, and previous preterm birth.

In the Infant Health 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, infections were a primary contributor to excess mortality in this risk period.

Infant Health Practices

Breastfeeding

Breastmilk contains essential nutrients and antibodies necessary to best nourish infants and protect them from disease. Suboptimal breastfeeding is associated with a higher risk of necrotizing enterocolitis, lower respiratory infections, and chronic diseases such as asthma, obesity, and type 2 diabetes.[25] Reduced exclusive breastfeeding and shorter breastfeeding duration are associated with increased population risk for maternal breast and ovarian cancers, diabetes, hypertension, cardiovascular disease, and other poor outcomes.[26, 27, 28]

Initiation of Breastfeeding

According to the National Immunization Survey, 85.9 percent (95 percent Confidence Interval (CI): 83.5-88.3) of infants born in Texas in 2017 were ever breastfed (Figure 24).[29] This rate was slightly higher than the 2017 national rate (84.1 percent; 95 percent CI:83.1-85.1). Since 2012, Texas has met the Healthy People 2020 (HP 2020) target for the percentage of infants having ever breastfed of 81.9 percent (Figure 24).

[25] Bartick, M., & Reinhold, A. (2010). The burden of suboptimal breastfeeding in the United States: a pediatric cost analysis. *Pediatrics*, *125*(5), e1048-e1056.

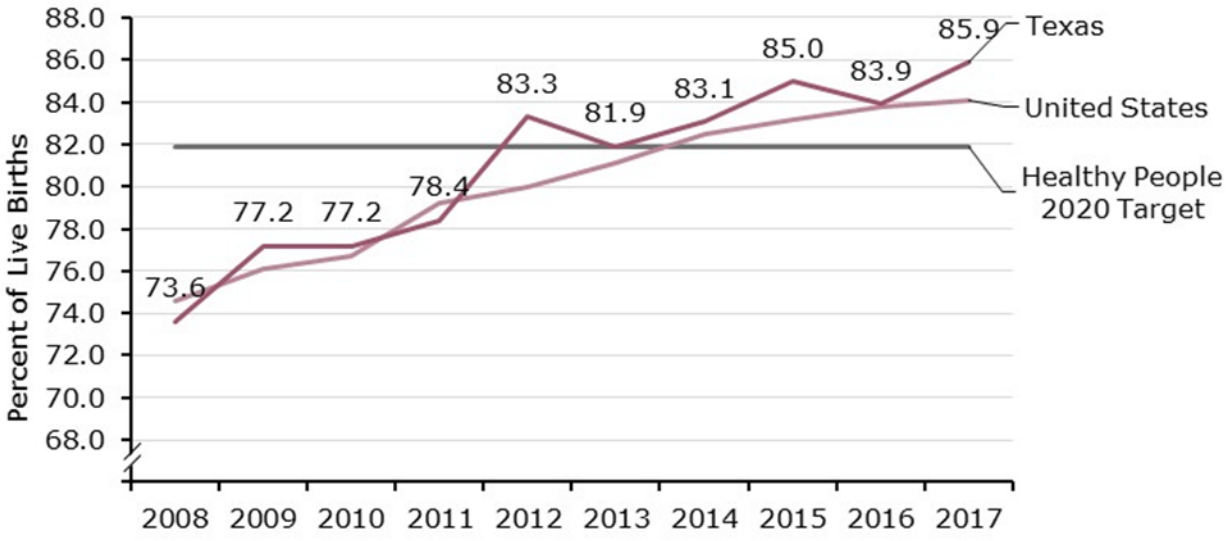
[26] World Health Organization. Breastfeeding. **who.int/health-topics/breastfeeding#tab=tab_1**.

[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] Centers for Disease Control and Prevention (CDC, 2020). Rates of Any and Exclusive Breastfeeding by State among Children Born in 2017. **https://www.cdc.gov/breastfeeding/data/nis_data/rates-any-exclusive-bf-by-state-2017.htm**

Figure 24: Percent of Infants Ever Breastfed in Texas and the United States, 2008-2017

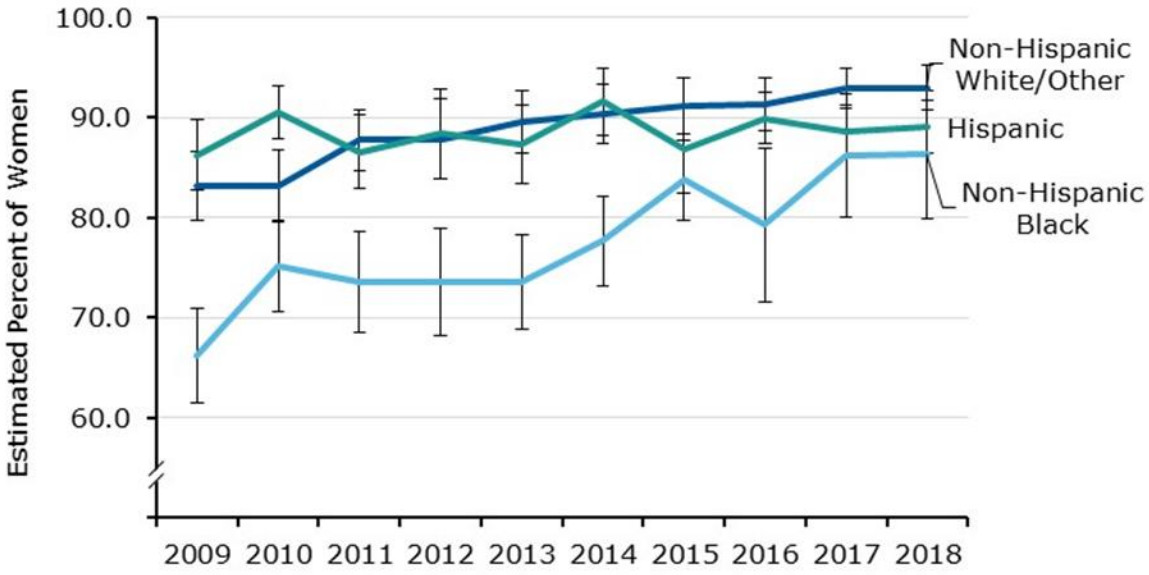


Breastfeeding rates through 2008 births are based on the landline sampling frame. Starting with 2009 births, rates are based on a dual-frame sample.
Source: National Immunization Survey
Prepared by: Maternal & Child Health Epidemiology Unit
Oct 2020

Significant racial or ethnic disparities exist, however, in the rate of women who have ever breastfed their infant. As shown in data from 2018 Pregnancy Risk Assessment Monitoring Systems (PRAMS), Non-Hispanic Black mothers reported lower rates of ever breastfeeding than Non-Hispanic White and Hispanic mothers (Figure 25). The Texas Women, Infants, and Children (WIC) Infant Feeding Practices Survey (IFPS) also showed similar results for breastfeeding initiation by race and ethnicity, with Non-Hispanic Black infants being least likely to receive only breastmilk and most likely to receive only formula while at the hospital or birthing center. Of women who reported that they had ever breastfed their infant, Non-Hispanic Black women were the least likely to report breastfeeding or trying to breastfeed in the first hour after delivery (36.6 percent), and Non-Hispanic White women were most likely to breastfeed or attempt to breastfeed within this timeframe (47.2 percent). 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 'Other' women 67.3 percent). Of respondents who never initiated breastfeeding, a third believed formula was as good or better than breastfeeding.[30]

[30] 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.

Figure 25: Women Who Ever Breastfed Their Baby by Race and Ethnicity, Texas Pregnancy Risk Assessment Monitoring System (PRAMS) 2009-2018



Error Bars: 95% Confidence Interval
Source: 2009-2018 Texas PRAMS
Prepared by: Maternal & Child Health Epidemiology Unit
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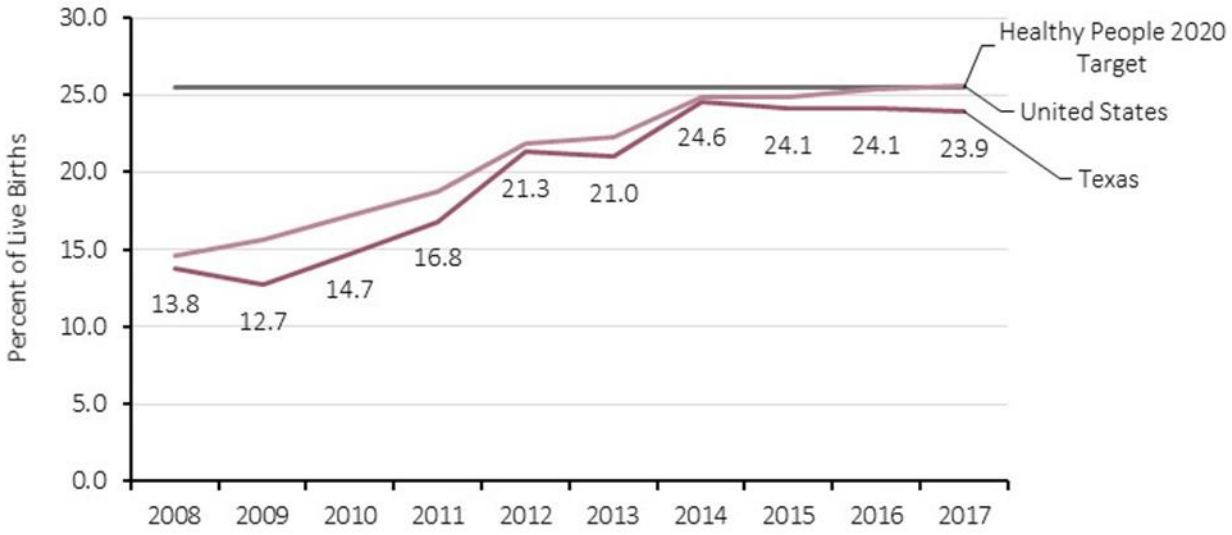
Initiating breastfeeding in the hospital is an important first step towards exclusive breastfeeding and Baby-Friendly Hospitals provide increased support for initiating breastfeeding in the hospital. In Texas, only 20.1 percent of births in 2018 occurred in a Baby-Friendly Hospital according to 2018 Baby-Friendly USA and 2017 National Center for Health Statistics data.[31]

[31] Centers for Disease Control and Prevention. National Center for Chronic Disease Prevention and Health Promotion, Division of Nutrition, Physical Activity, and Obesity (2018) Breastfeeding Report Card. **cdc.gov/breastfeeding/data/reportcard.htm**. [Accessed October 15, 2018]

Exclusive Breastfeeding

While most (85.9 percent) Texas mothers reported having ever breastfed, rates of exclusive breastfeeding were significantly lower. Research has shown that maternal and infant health outcomes are optimized when the baby is exclusively breastfed for the first six months of life with continued breastfeeding in combination with introduction of complementary foods for at least one to two years after birth.[32, 33] According to the National Immunization Survey, 23.9 percent (95 percent CI: 21.0-26.8) of Texas mothers reported breastfeeding exclusively at six months in 2017 (Figure 26).[31] Given the discrepancy between breastfeeding initiation and the percent of women who continue breastfeeding, barriers to maintaining exclusive breastfeeding for the recommended duration existed.

Figure 26: Percent of Infants Who Were Exclusively Breastfed for Six Months in Texas and the United States, 2008-2017



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
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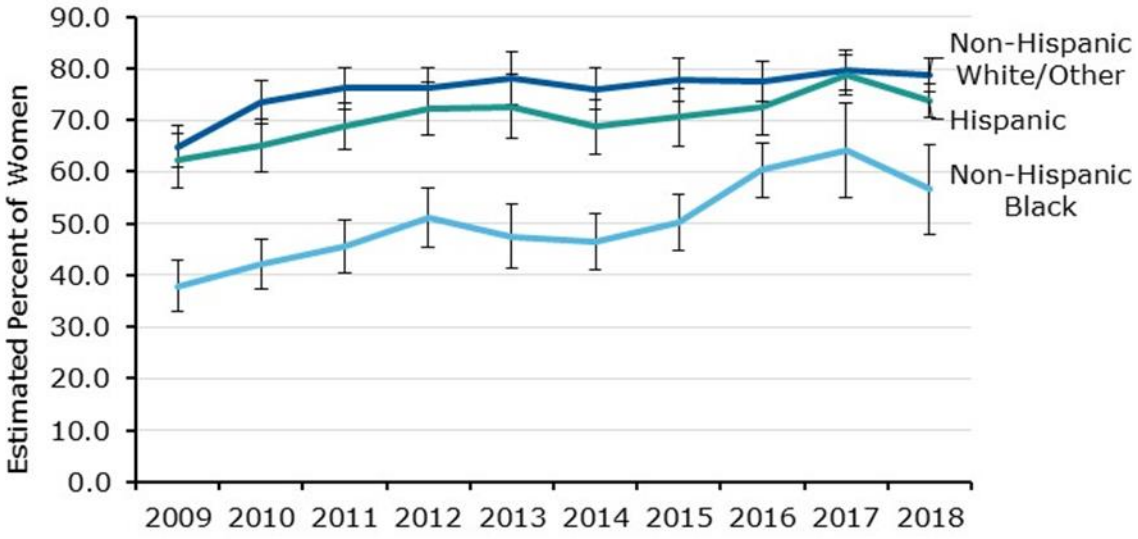
[32] Section on Breastfeeding. (2012). Breastfeeding and the use of human milk. Pediatrics, 129(3), e827-e841.

[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.

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 deaths.[34] According to Texas Pregnancy Risk Assessment Monitoring System (PRAMS) data, 74.1 percent of mothers reported placing their infant on their back to sleep in 2018. This percentage has increased by over 20 percent since 2008. Despite this significant increase, substantial racial and ethnic differences still existed. Although the proportion of Non-Hispanic Black mothers placing their infant on their back to sleep increased by 50 percent between 2009 and 2018, the percent was still significantly lower among Non-Hispanic Black mothers than among Non-Hispanic White mothers and Hispanic mothers in 2018 (Figure 27).

Figure 27: Women Who Reported Placing Infant on Back to Sleep by Race and Ethnicity, Texas PRAMS 2009-2018



Error Bars: 95% Confidence Interval
Source: 2009-2018 Texas PRAMS
Prepared by: Maternal & Child Health Epidemiology Unit
Oct 2020

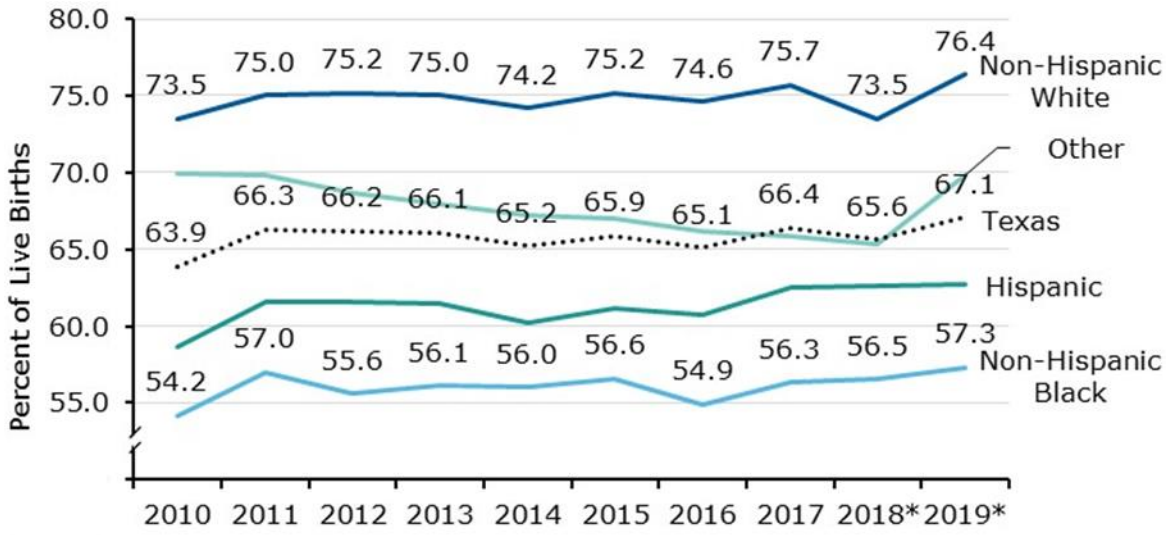
[34] American Academy of Pediatrics, Task Force on Sudden Infant Death Syndrome (2011). SIDS and other sleep-related infant deaths: Expansion of recommendations for a safe infant sleeping environment. *Pediatrics,* vol. 128, no. 5, pp. 1030-1039.

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 84.8 percent.[35] As a whole, Texas is not meeting this target percentage. In 2019, 67.1 percent of mothers entered prenatal care within the first trimester (Figure 28). In 2019, Texas had the third lowest proportion of women receiving first trimester care compared to other states.20 Nationally, 75.8 percent of mothers entered prenatal care during the first trimester in 2019.20

Disparities in first trimester prenatal care access were apparent between different racial and ethnic groups, with a larger percentage of Non-Hispanic White women receiving prenatal care in the first trimester of pregnancy compared to all other racial and ethnic groups consistently from 2010-2019. While the percentages of Hispanic and Non-Hispanic Black mothers receiving first trimester prenatal care have consistently been below the state average, a smaller percentage of Non-Hispanic Black women received prenatal care in the first trimester than any other racial or ethnic group from 2010 to 2019. The proportion of women of 'Other' racial and ethnic backgrounds received access to prenatal care in the first trimester was similar to the state average in 2018; this has steadily decreased from 2010 to 2018 followed by an increase in 2019 (Figure 28).

Figure 28: Percent of Live Births Where Mother Received Prenatal Care in the First Trimester by Race and Ethnicity, 2010-2019



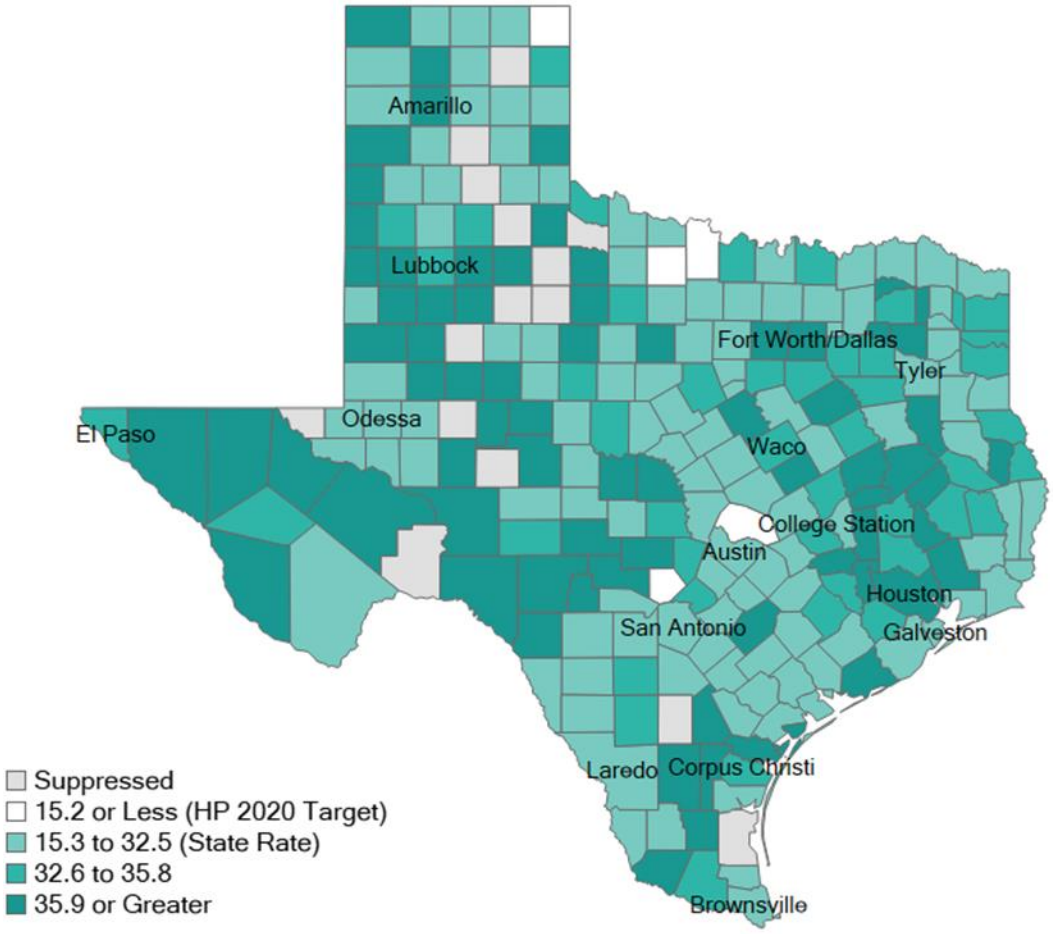
*2018 and 2019 Texas data are provisional
Source: 2010-2019 Birth Files
Prepared by: Maternal & Child Health Epidemiology Unit
Oct 2020

[35] Healthy People 2020, Office of Disease Prevention and Health Promotion, United States Department of Health and Human Services. MICH-10.1 Increase the proportion of pregnant women who receive prenatal care beginning in the first trimester. healthypeople.gov/node/4833/data_details.

Late entry (after first trimester) into prenatal care is a statewide problem. In 2018, with the suppression of fifteen counties with zero cases, only five Texas counties, Archer, Clay, Kendall, Lipscomb, and Williamson, met the HP 2020 target percentage of less than 15.2 percent of women not entering prenatal care in the first trimester (Figure 29).

Using Texas Pregnancy Risk Assessment Monitoring System (PRAMS) 2018 survey data, among mothers who reported that they did not receive care in the first trimester of their pregnancy, 48.6 (95 percent Confidence Interval: 40.8-56.5) 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.

Figure 29: Percent of Live Births Where Mother Did Not Receive Prenatal Care in the First Trimester (Obstetric Estimate), 2018



2018 Texas data are provisional
Source: 2018 Birth File
Prepared by: Maternal & Child Health Epidemiology Unit
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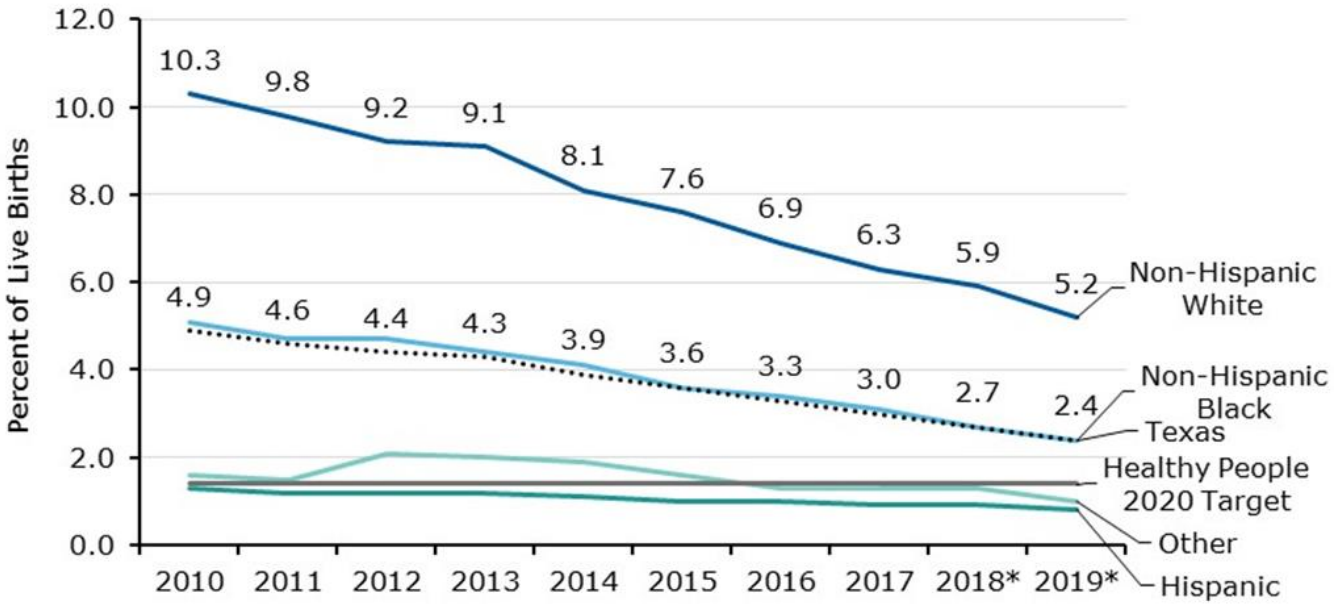
Maternal Health

Smoking

With 3.3 percent of women smoking during pregnancy in 2016, Texas had the fourth lowest prevalence of smoking during pregnancy of any state and the District of Columbia. Comparatively, the national average was 7.2 percent of women smoking during pregnancy.[36] Hispanic women and women of 'Other' race or ethnicity had the lowest prevalence of smoking during pregnancy, both in Texas and in the nation. Currently, only Hispanic women and women of 'Other' race or ethnicity are meeting the Healthy People 2020 (HP 2020) 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 50.2 percent in Texas over the past decade, there is still room for improvement, especially among Non-Hispanic White women (Figure 30).

Figure 30: Percent of Live Births Where Mother Smoked Cigarettes During Pregnancy by Race and Ethnicity, 2010-2019

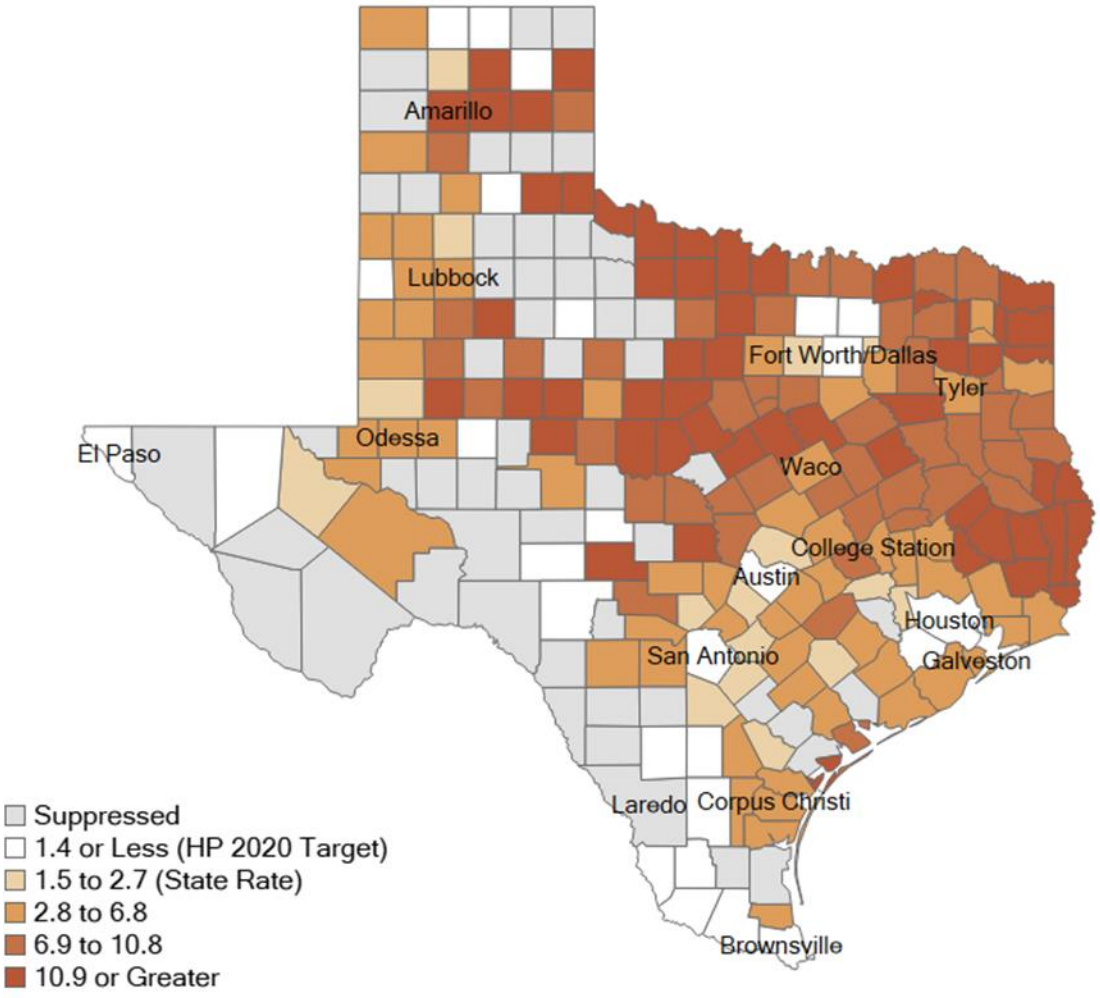


*2018 and 2019 Texas data are provisional
Source: 2010-2019 Birth Files
Prepared by: Maternal & Child Health Epidemiology Unit
Oct 2020

[36] Drake P, Driscoll A and Mathews T (February 2018). *Cigarette Smoking During Pregnancy: United States, 2016,* NCHS Data Brief 305, cdc.gov/nchs/data/databriefs/db305.pdf**,** accessed February 2021.

Regional differences in the prevalence of smoking during pregnancy existed throughout Texas (Figure 31). In 2018, 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 31: Percent of Live Births Where Mother Smoked During Pregnancy, 2018



2018 Texas data are provisional
Source: 2018 Birth File
Prepared by: Maternal & Child Health Epidemiology Unit
Oct 2020

Maternal Mental Health

Mental health is an important health indicator at all phases of life; however, mental health prior to pregnancy can have implications for pregnancy and postpartum. Maternal mental health not only plays a role in the health of the mother, but also impacts birth outcomes and the health and development of the infant throughout the life course. Research indicates associations between poor mental health before and during pregnancy and negative birth outcomes, including preterm birth, low birthweight, reduced breastfeeding initiation rates, and birth outcomes that do not result in a live birth.[37,38,39,40] Postpartum depression has been associated with negative consequences for maternal health, quality of life, and personal interaction and to the development of the child.[41]

Depression can affect women before and during pregnancy, or in the postpartum period. Based on Texas Pregnancy Risk Assessment Monitoring System (PRAMS) 2018 data, 11.8 percent of pregnant women in Texas experienced depression in the three months leading up to their pregnancy. This survey also showed that screening for depression during pregnancy was similar across race and ethnic groups with 70.8 percent of Non-Hispanic White and 'Other' women, 74.2 percent of Non-Hispanic Black women, and 74.0 percent of Hispanic women reported being screened during pregnancy. Hispanic women were less likely to report experiencing depression during pregnancy (8.8 percent) than Non-Hispanic White or 'Other' women (14.8 percent), or Non-Hispanic Black women (21.1 percent) (Figure 32).

[37] 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. **doi.org/10.1007/s10995-011-0916-4**.

[38] 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. **doi.org/10.1001/archgenpsychiatry.2010.111**.

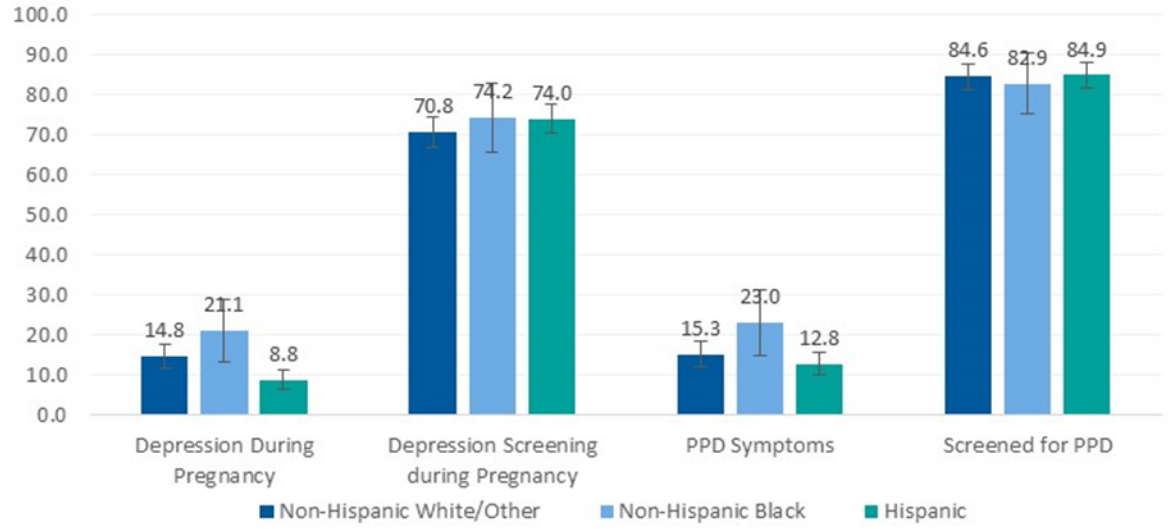
[39] Gavin, A. R., Chae, D. H., Mustillo, S., & Kiefe, C. I. (2009). Prepregnancy depressive mood and preterm birth in black and white women: findings from the CARDIA Study. *Journal of women's health (2002)*, *18*(6), 803–811. **doi.org/10.1089/jwh.2008.0984**.

[40] 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.

[41] 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. **doi.org/10.1177/1745506519844044**.

The PRAMS 2018 survey also showed that 84.6 percent of Non-Hispanic White women, 82.9 percent of Non-Hispanic Black women, and 84.9 percent of Hispanic women reported they were screened for postpartum depression. Paralleling the trends in prenatal depression, Non-Hispanic Black women had the highest rate of postpartum depression symptoms (23.0 percent), followed by Non-Hispanic White and 'Other' (15.3 percent), and Hispanic women (12.8 percent) (Figure 32). Postpartum depression is treatable, and screening mothers for depression during medical visits is an important step to accessing treatment resources.[42]

Figure 32: Percent of Texas Women with Symptoms of Depression during Pregnancy and Postpartum Depression and Screened for Depression during Pregnancy or Postpartum, by Race and Ethnicity, Texas PRAMS 2018



Source: 2018 Texas Pregnancy Risk Assessment Monitoring System.
Prepared by: Maternal and Child Health Epidemiology Unit.
Nov 2020

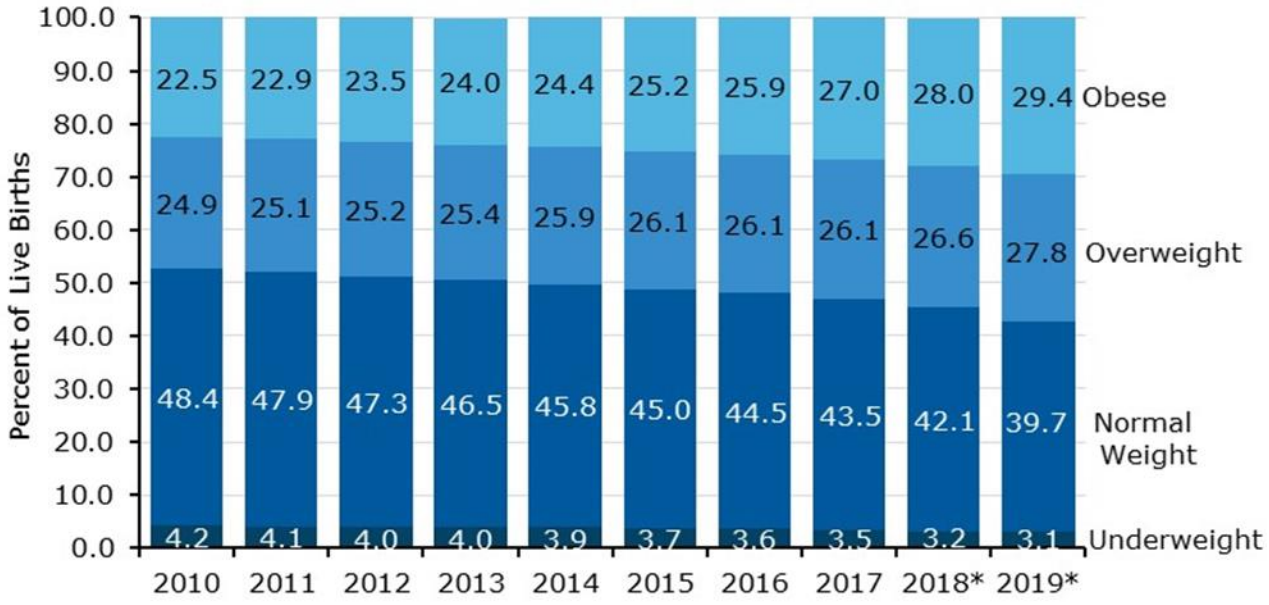
[42] Centers for Disease Control and Prevention (CDC, 2019). Depression During and After Pregnancy. cdc.gov/reproductivehealth/features/maternal-depression/index.html.

Pre-Pregnancy Obesity

Obesity is a well-known risk factor for developing hypertension, diabetes, and a variety of other medical problems during pregnancy.[43] Obesity and conditions associated with obesity during pregnancy increase the risk of developing chronic conditions later in life.[44, 45, 46, 47]

A rise in pre-pregnancy obesity has been observed over the past decade, both in Texas and in other states.7 The percentage of mothers with a pre-pregnancy body mass index (BMI) in the obese range has increased 30.5 percent in Texas since 2010 (Figure 33).

Figure 33: Maternal Pre-pregnancy Body Mass Index Distribution for All Live Births, 2010-2019



*2018 and 2019 Texas data are provisional
Source: 2010-2019 Birth Files
Prepared by: Maternal & Child Health Epidemiology Unit
Oct 2020

[43] 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.

[44] 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.

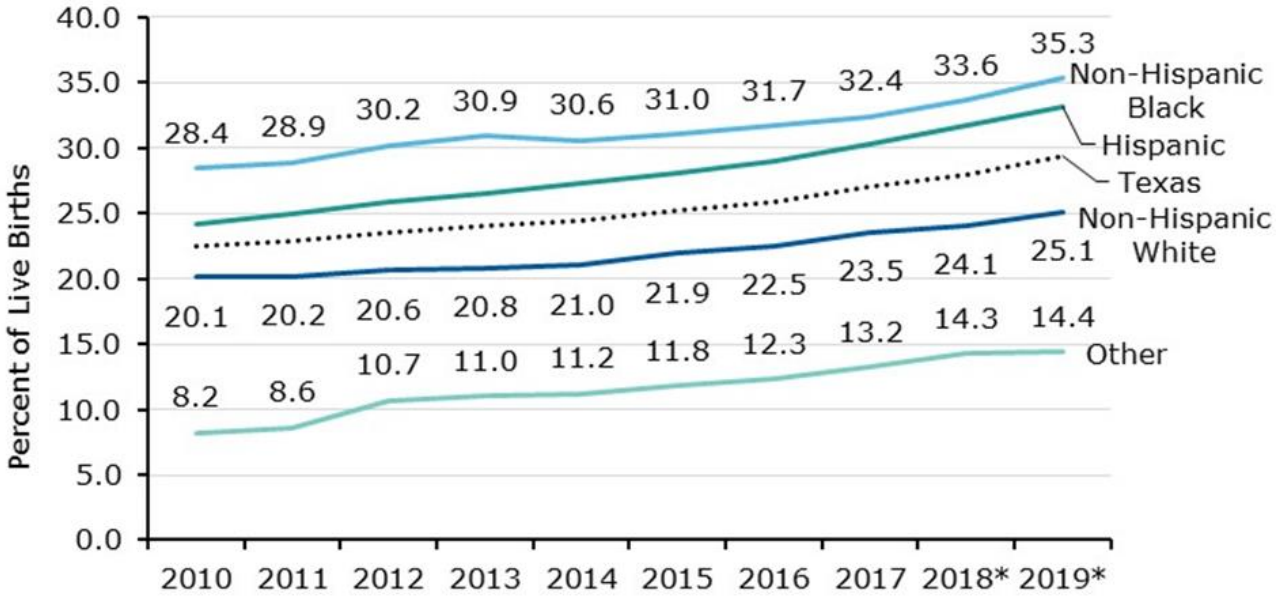
[45] Papachatzi, E., Dimitriou, G., Dimitropoulos, K., & Vantarakis, A. (2013). Pre-pregnancy obesity: maternal, neonatal and childhood outcomes. Journal of neonatal-perinatal medicine, 6(3), 203-216.

[46] 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/**.

[47] 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. **doi.org/10.1016/j.preghy.2016.08.231**.

Pre-pregnancy obesity is more prevalent among Non-Hispanic Black and Hispanic mothers than among Non-Hispanic White mothers or mothers of 'Other' race or ethnicity (Figure 34). However, over the past decade, the rate of pre-pregnancy obesity has risen most steeply among mothers of 'Other' race or ethnicity; a 74.9 percent increase in pre-pregnancy obesity has been observed among mothers of this group since 2010. Hispanic mothers have also seen a relatively large increase in pre-pregnancy obesity between 2010 and 2019 (a 36.8 percent increase among Hispanic mothers, compared with increases of 24.5 and 25.0 percent among Non-Hispanic Black and Non-Hispanic White mothers, respectively).

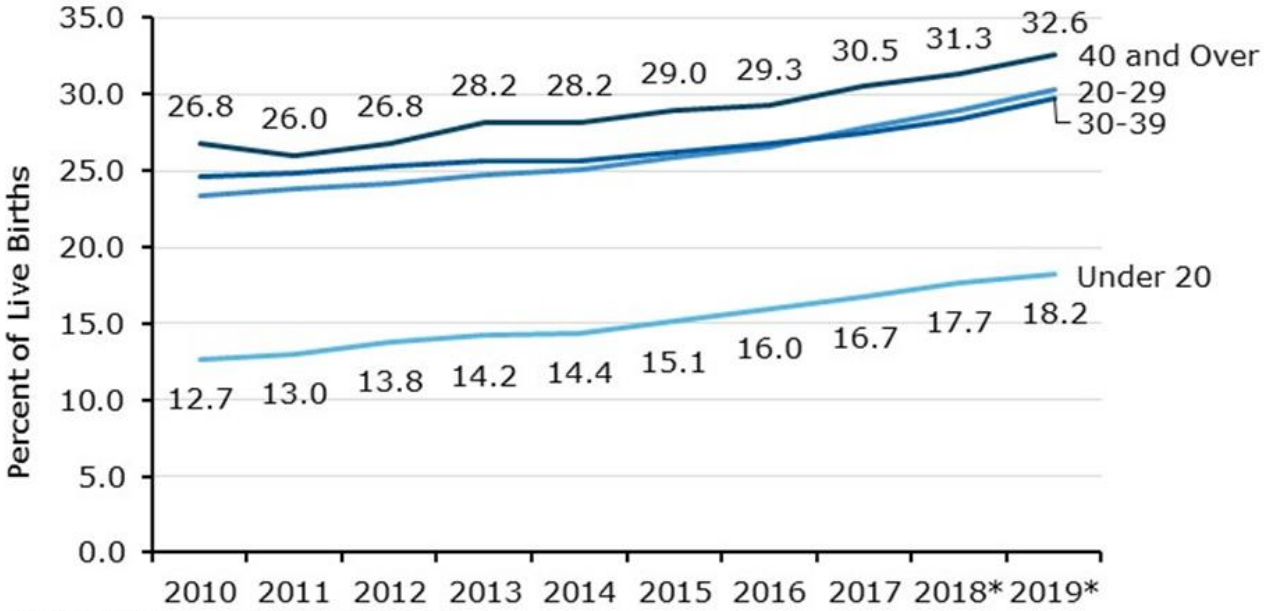
Figure 34: Maternal Pre-pregnancy Obesity by Race and Ethnicity, 2010-2019



*2018 and 2019 Texas data are provisional
Source: 2010-2019 Birth Files
Prepared by: Maternal & Child Health Epidemiology Unit
Oct 2020

Prevalence of pre-pregnancy obesity also differed by maternal age. In 2019, 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, 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 (Figure 35).

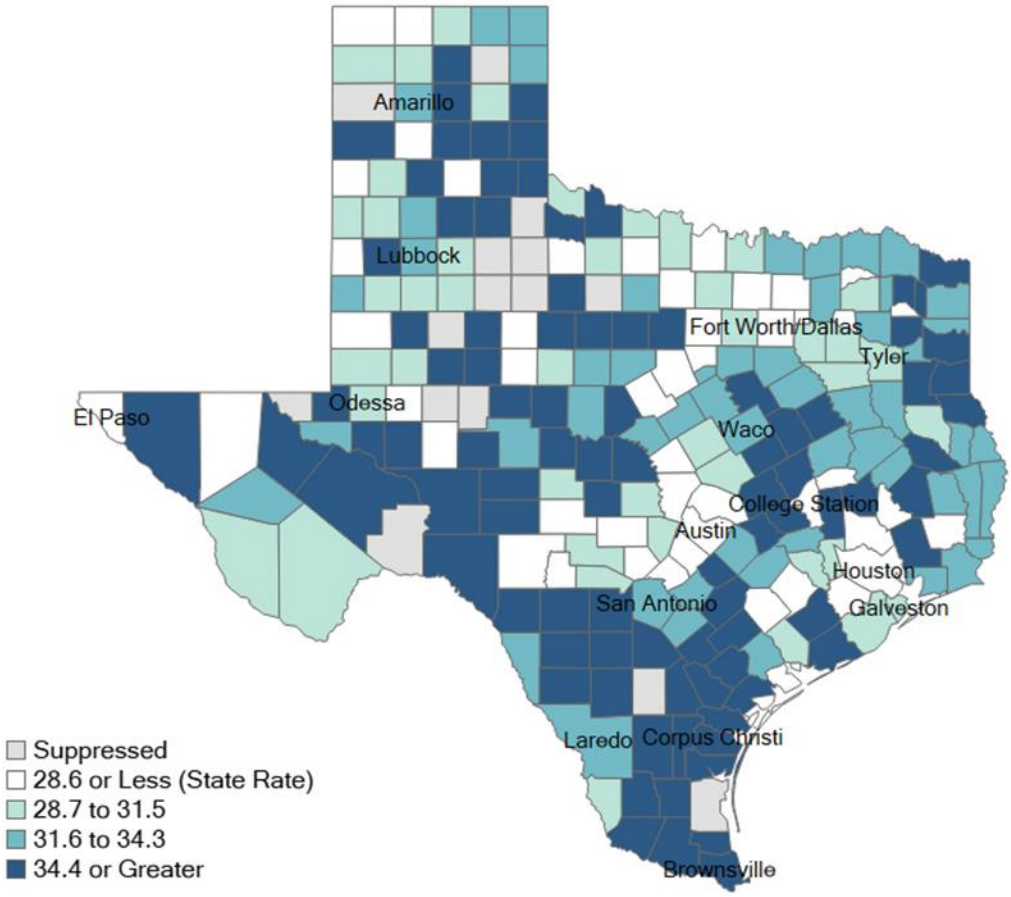
Figure 35: Maternal Pre-pregnancy Obesity by Age Group, 2010-2019



*2018 and 2019 Texas data are provisional
Source: 2010-2019 Birth Files
Prepared by: Maternal & Child Health Epidemiology Unit
Oct 2020

Although high pre-pregnancy rates were observed in counties across Texas, many counties in the Texas-Mexico Border Region had higher rates than the state rate. (Figure 36). In addition to 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) and other social determinants of health can vary widely within the same county.[48,49]

Figure 36: Percent of Births to an Obese Mother, 2018



2018 Texas data are provisional
Source: 2018 Birth File
Prepared by: Maternal & Child Health Epidemiology Unit
Oct 2020

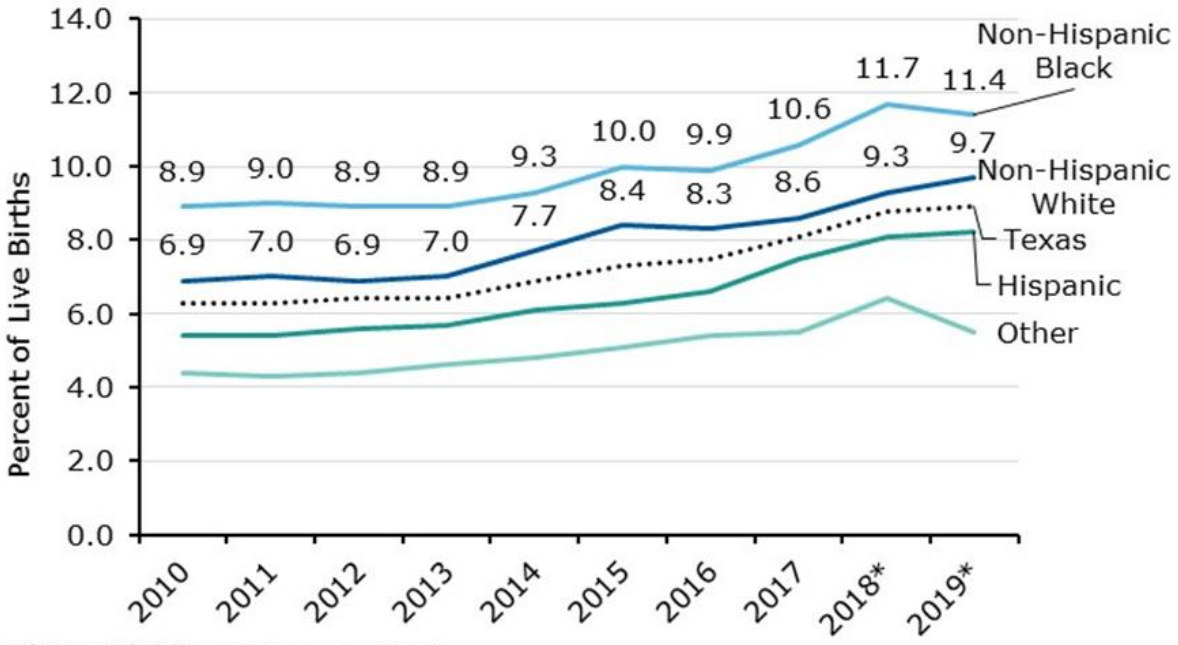
[48] Kolak, M., Bhatt, J., Park, Y. H., Padrón, N. A., & Molefe, A. (2020). Quantification of neighborhood-level social determinants of health in the continental United States. *JAMA network open*, *3*(1), e1919928-e1919928.

[49] 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.

Hypertension and Diabetes

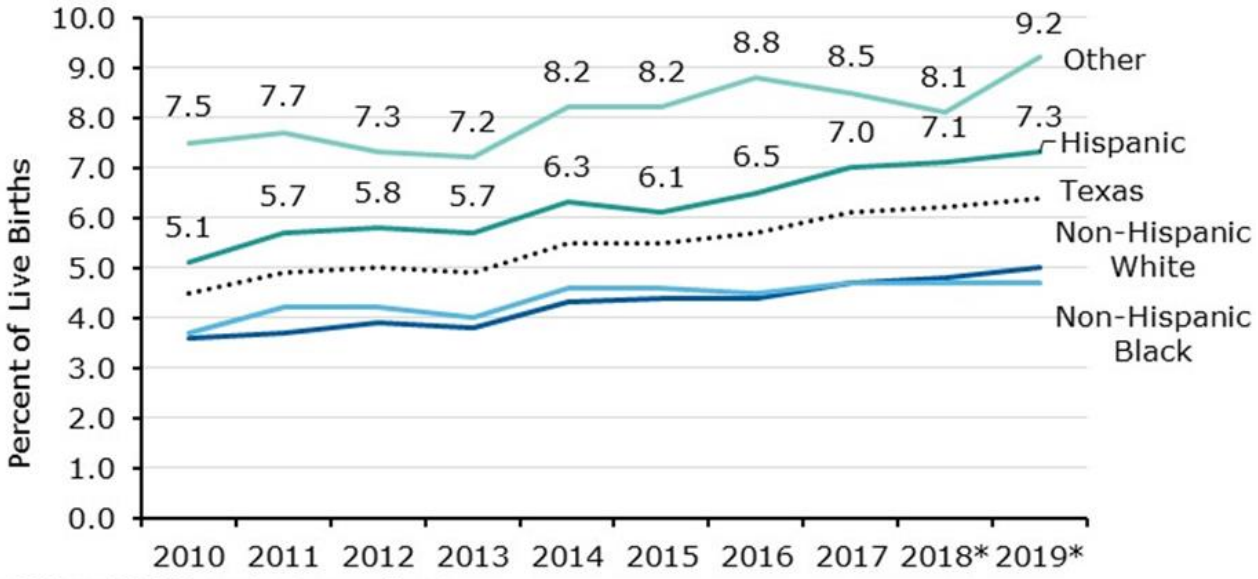
According to 2019 birth certificate data, 8.9 percent of all live births were to mothers with some form of hypertension, and 6.4 percent of all live births were to mothers who had diabetes (these mothers either had diabetes or hypertension pre-pregnancy or developed the condition over the course of the pregnancy). Rates of both hypertension and diabetes among mothers have increased in Texas (**Figure 37** and Figure 38). As with many health outcomes, both hypertension and diabetes rates differ by race and ethnicity. Of all racial or ethnic groups, Non-Hispanic Black women and Non-Hispanic White women had the highest percentages of maternal hypertension (Figure 37), while women in the 'Other' race or ethnicity category and Hispanic women had the highest percentages of maternal diabetes (Figure 38).

Figure 37: Rates of Maternal Hypertension by Race and Ethnicity, 2010-2019



*2018 and 2019 Texas data are provisional
Source: 2010-2019 Birth Files
Prepared by: Maternal & Child Health Epidemiology Unit
Oct 2020

Figure 38: Rates of Maternal Diabetes by Race and Ethnicity, 2010-2019



*2018 and 2019 Texas data are provisional
Source: 2010-2019 Birth Files
Prepared by: Maternal & Child Health Epidemiology Unit
Oct 2020

Pre-pregnancy obesity is associated with both hypertension and diabetes, as is seen in the literature.[43] Analysis of 2019 birth files from Texas showed that 22.4 percent of all mothers with pre-pregnancy obesity also had hypertension, diabetes, or both conditions. In contrast, only 8.6 percent of mothers with normal pre-pregnancy Body Mass Index (BMI) were hypertensive, diabetic, or had both. Women with diabetes during pregnancy and their infants are at increased risk for a variety of complications, including infant or fetal death.[50]

About nine percent of women who delivered in Texas in 2018 had some form of hypertension and 9.8 percent of all fetal and infant deaths were to hypertensive women. The mortality rate for infants of mothers with pre-pregnancy hypertension was 10.1 per 1,000, almost twice that mothers with gestational diabetes (5.4) and without hypertension (5.4).[51] Additionally, these women experienced high rates of severe maternal morbidity. Hypertension/eclampsia diagnoses were both leading indicators of severe maternal morbidity and were a leading cause of maternal death for Non-Hispanic Black women.[14]

[50] 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.
[51] 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. **wonder.cdc.gov/lbd-current-expanded.html**. [Accessed November 2020].

Maternal Mortality

The death of a mother is an immeasurable loss for her children and family. In 2020, Texas DSHS researchers and the Texas Mortality and Morbidity Review Committee (MMMRC) released a **joint biennial report s**ummarizing findings from the MMMRC case reviews and statewide rates, ratios, and trends related to maternal mortality, including maternal deaths. This section of the Healthy Texas Mothers and Babies Data Book references findings and discussions from that report.[14]

The most accurate identification of maternal deaths is essential to computing the maternal mortality ratio, which is a key performance indicator to improve maternal health and safety before, during, and after delivery.

A maternal death is defined as a vital registration term used for the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and the site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes as indicated by ICD coding.[14] The standard method for identifying maternal deaths relies on an obstetric cause-of-death code on the official death certificate but because of errors associated with the death certificate, Texas Department of State Health Services (DSHS) researchers developed the three-step enhanced method for the identification of maternal deaths in 2012.[52] Beginning with the 2013 death cohort, 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 calculated an enhanced maternal mortality ratio for identified maternal deaths that occurred during pregnancy or within 42 days postpartum, as indicated on the death certificate, per 100,000 live births for a given year.[14]

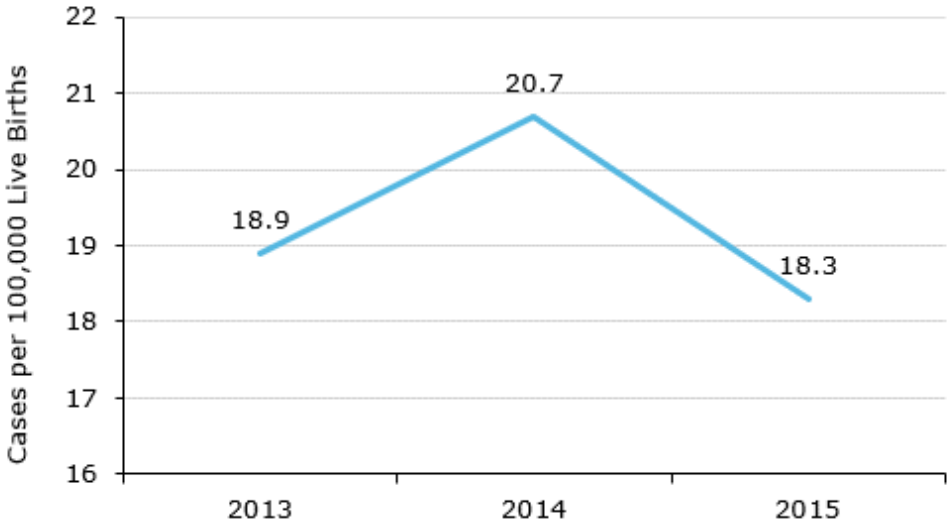
[52] Baeva, S., Saxton, D. L., Ruggiero, K., Kormondy, M. L., Hollier, L. M., Hellerstedt, J., ... & Archer, N. P. (2018). Identifying maternal deaths in Texas using an enhanced method, 2012. *Obstetrics & Gynecology*, *131*(5), 762-769.

The enhanced maternal mortality ratios for Texas for 2013 through 2015 were as follows (Figure 39):

- 18.9 maternal deaths per 100,000 live births for 2013
- 20.7 maternal deaths per 100,000 live births for 2014
- 18.3 maternal deaths per 100,000 live births for 2015

The enhanced method is different from the method used by others to calculate maternal mortality numbers and ratios and cannot be compared with other maternal mortality ratios or rates. Texas DSHS researchers will continue to apply this methodology for additional years so that trends can continue to be assessed.14

Figure 39: Enhanced Maternal Mortality Ratios for Texas, 2013-2015



Note: The 2015 Maternal Mortality Ratio (MMR) was updated to reflect an addition error in the original publication. The correct number of maternal deaths was 74 with a corresponding MMR of 18.3 per 100,000 live births.
Source: Texas Maternal Mortality and Morbidity Review Committee and DSHS Joint Biennial Report, 2020
Prepared by: Maternal & Child Health Epidemiology Unit
Jan 2022

In Texas, a primary responsibility of the MMMRC is to review cases of pregnancy-associated death to determine pregnancy-relatedness. A pregnancy-associated death is the death of a woman while pregnant or within one year of the end of pregnancy, regardless of the cause. Pregnancy-associated deaths are classified as pregnancy-related, pregnancy-associated but not pregnancy-related, or as pregnancy-associated but unable to determine pregnancy-relatedness. Review of 2013 cases are ongoing, but of the cases currently reviewed, the MMRC found 137 pregnancy-associated deaths in 2013. The MMMRC also determined that 54 cases (39 percent) were pregnancy-related, and 59 cases (43 percent) were pregnancy-associated but not related. The MMMRC was unable to determine pregnancy-relatedness for 24 (18 percent) of reviewed

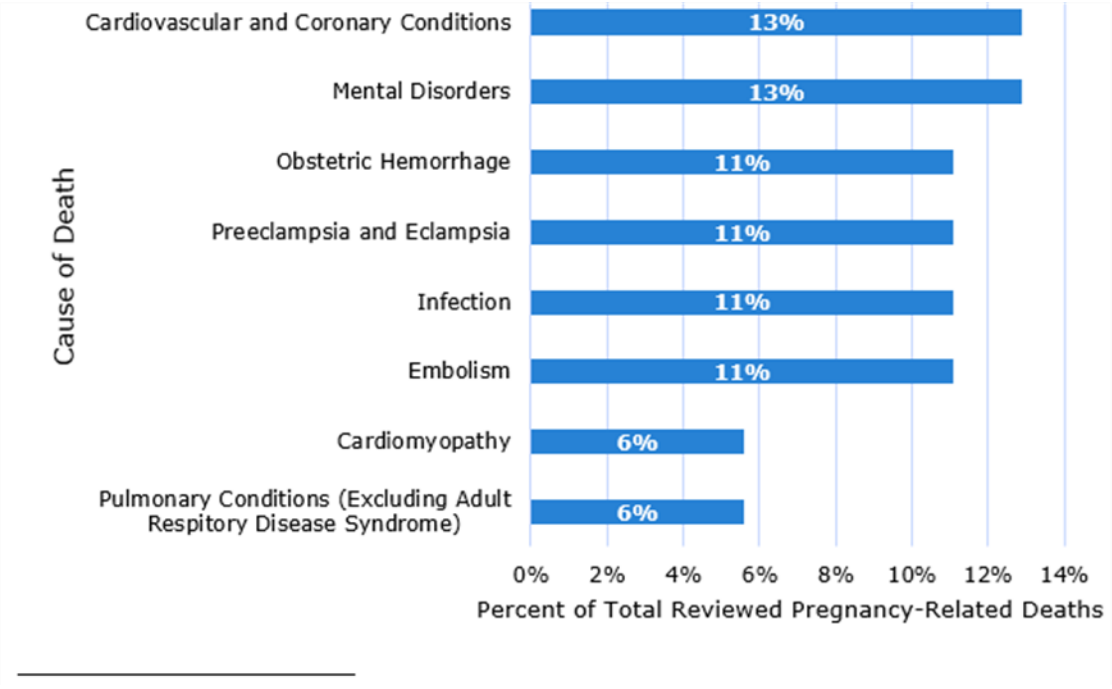
cases. The percentage of deaths identified among reviewed cases as pregnancy-related is consistent with findings from other states.[53]

Among pregnancy-related deaths reviewed, 31 percent of deaths were among Non-Hispanic Black women, 41 percent among Non-Hispanic White women, 26 percent among Hispanic women, and two percent among women of 'Other' races or ethnicities. In contrast, 11 percent of live births in 2013 were among Non-Hispanic Black women, 34 percent among Non-Hispanic White women, 48 percent among Hispanic women, and 6 percent among women of 'Other' races and ethnicities.

The MMMRC found that eight underlying causes of death accounted for 82 percent of all pregnancy-related death among reviewed 2013 cases.

Cardiovascular/coronary conditions and mental disorders (with or without substance use) were tied for the most frequently observed leading causes of maternal mortality. Obstetric hemorrhage, preeclampsia or eclampsia, infection, and embolism were tied for second (Figure 40). These underlying causes of death accounted for 70 percent of the 54 pregnancy-related deaths reviewed to date from the 2013 case cohort. Cardiomyopathy and pulmonary conditions tied for third, collectively accounting for 12 percent of pregnancy-related deaths.

Figure 40: Leading Underlying Causes of Reviewed Pregnancy-Related Deaths in Texas, 2013



n= 44
Source: Texas Maternal Mortality and Morbidity Review Committee and Department of State Health Services Joint Biennial Report, 2020
Prepared By: Healthy Texas Mothers and Babies Branch (DSHS)
Oct 2020

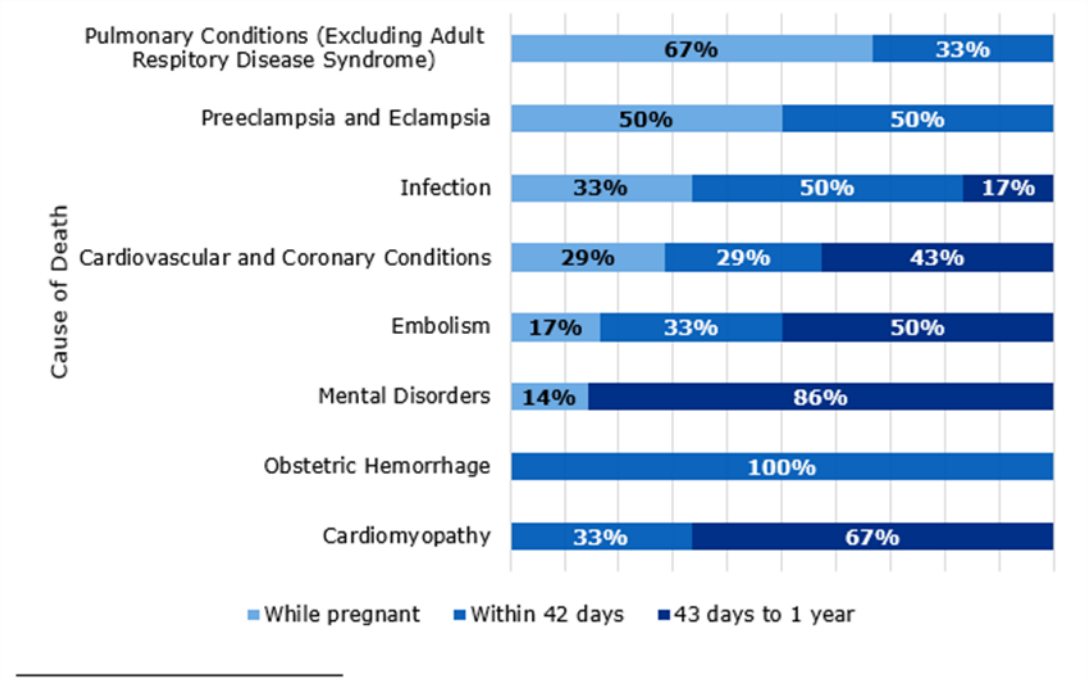
[53] CDC Foundation, CDC, AMCHP (2018). Report from Nine Maternal Mortality Review Committees: Building U.S. Capacity to Review and Prevent Maternal Deaths, p.14-15. **reviewtoaction.org/Report_from_Nine_MMRCs**.

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

- Obesity contributed to 35 percent of reviewed pregnancy-related deaths
- Mental disorders, other than substance use disorder (SUD), contributed to 16 percent of reviewed pregnancy-related deaths
- SUD, including SUD associated with mental disorders, contributed to 7 percent of reviewed pregnancy-related deaths

Timing of death in relation to pregnancy varied across leading underlying causes of reviewed pregnancy-related deaths. Among the 54 reviewed pregnancy-related deaths from the 2013 case cohort, 29 percent occurred during pregnancy, 40 percent occurred within 42 days of the end of pregnancy, and 31 percent occurred 43 days to one year from the end of pregnancy. Figure 41 shows how the timing of death is distributed across the leading underlying causes of pregnancy-related death.

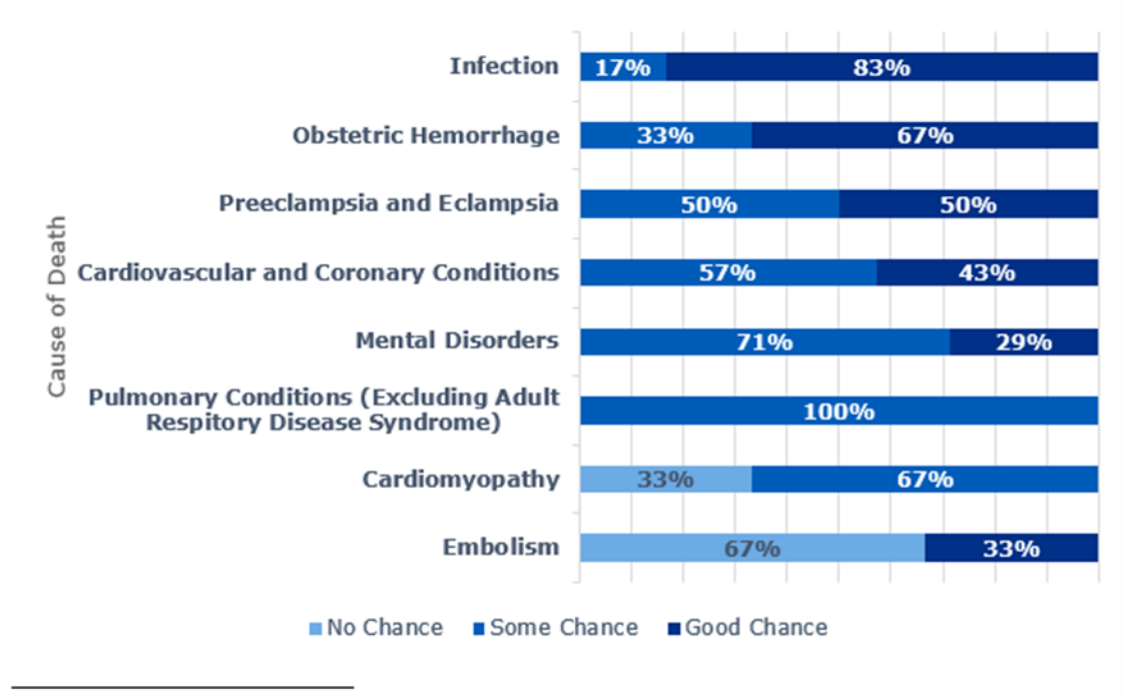
Figure 41: Top Underlying Causes of Reviewed Pregnancy-Related Deaths by Timing of Death in Relation to Pregnancy, Texas 2013



n= 44
Source: Texas Maternal Mortality and Morbidity Review Committee and Department of State Health Services Joint Biennial Report, 2020
Prepared By: Healthy Texas Mothers and Babies Branch (DSHS)
Oct 2020

The MMMRC determined that most reviewed pregnancy-related deaths were preventable. A death is considered preventable if the case review finds that there was at least some chance of the death being averted by one or more reasonable changes to the circumstances of the patient, provider, facility, systems, or community factors. The MMMRC determined that there was at least some chance for preventability in 89 percent of pregnancy-related deaths reviewed from the 2013 case cohort. Among the leading underlying causes of death, cases of pregnancy-related death with the highest chance of preventability were caused by infection, hemorrhage, preeclampsia or eclampsia, and cardiovascular/coronary conditions (Figure 42).

Figure 42: Degree of Preventability for Top Underlying Causes of Reviewed Pregnancy-Related Deaths by Rating of Chance to Alter Outcome, Texas, 2013



n= 44
Source: Texas Maternal Mortality and Morbidity Review Committee and Department of State Health Services Joint Biennial Report, 2020
Prepared By: Healthy Texas Mothers and Babies Branch (DSHS)
Oct 2020

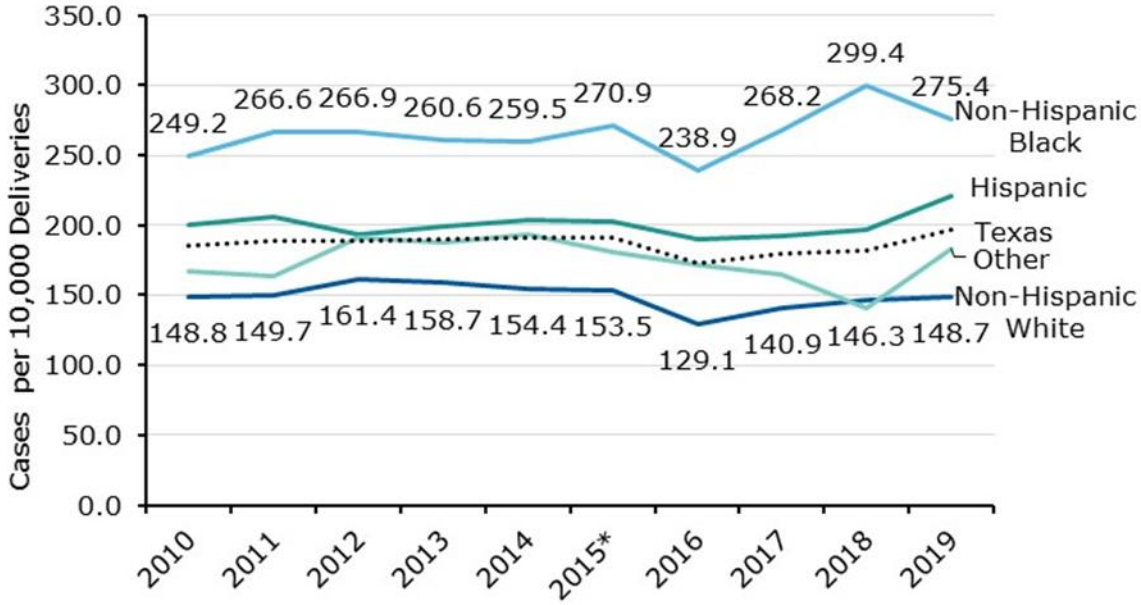
Factors that contribute to a pregnancy-related death may impact a woman over her life course. The MMMRC identified 367 factors that contributed to the 54 pregnancy-related cases reviewed from the 2013 cohort, an average of 6.8 contributing factors per case. Contributing factors are categorized within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

Severe Maternal Morbidity

Severe maternal morbidity (SMM) is intrinsically related to maternal mortality because it involves conditions that, if left untreated, could result in maternal death.[54] CDC defines SMM as unexpected outcomes of labor and delivery that result in significant short- or long-term consequences to a woman's health. Rates of delivery hospitalizations involving any SMM are estimated using specific information on hospital discharge records related to 21 conditions and procedures that can indicate incidence of severe morbidity. While the CDC criteria for measuring SMM may be a reasonable metric at the population-level, there are limitations which underscore the importance of facility-based severe maternal morbidity review.[14]

Though SMM rates in the United States have been rising in the past decade, according to data from Texas Hospital Inpatient Discharge Public Use Data Files, rate of delivery hospitalizations involving any SMM in Texas remained relatively stable from 2010 to 2019 (Figure 43).[15] Mirroring the trends observed for maternal deaths, there are substantial racial and ethnic disparities in the rates of mothers with serious pregnancy complications (Figure 43). Over the past ten years, Non-Hispanic Black mothers had higher rates of SMM than mothers of any other race/ethnic group, which is reflected in the maternal mortality rates for this group.

Figure 43: Rate of Severe Maternal Morbidity in Texas, 2010-2019



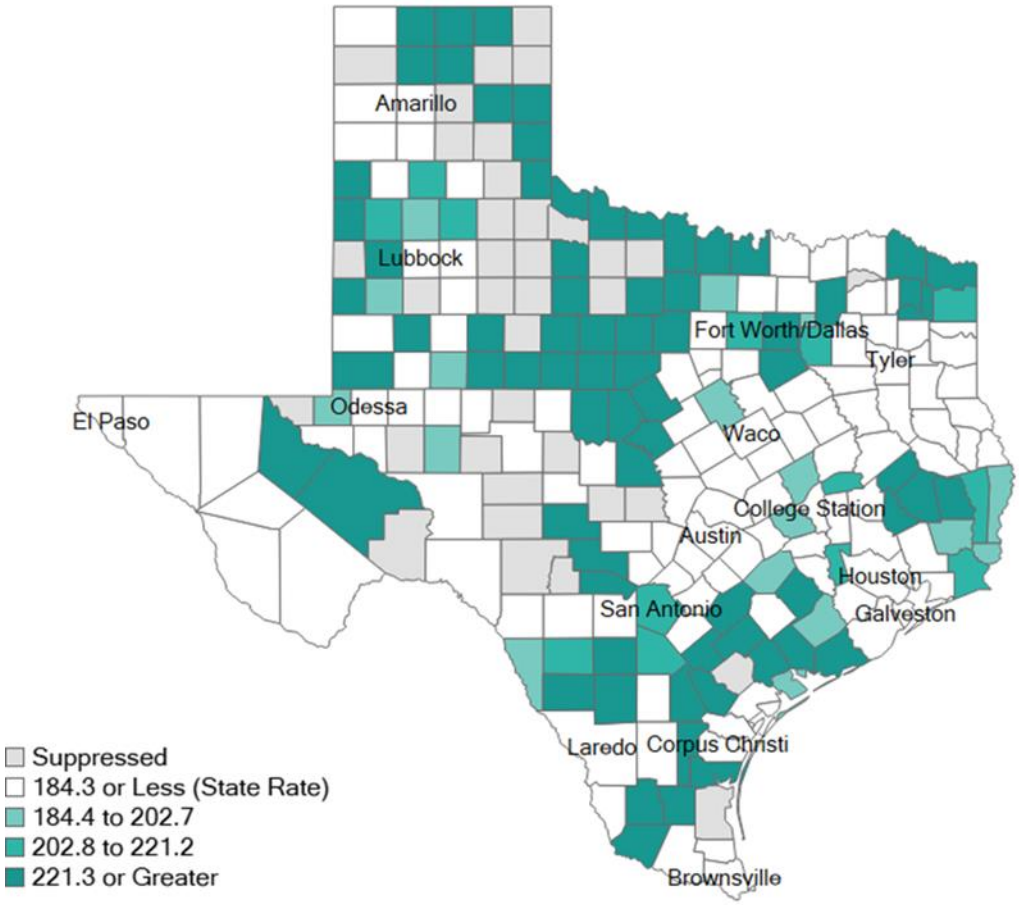
*Data transitioned to ICD-10-CM in the last quarter of 2015.
Source: 2010-2019 Texas Hospital Inpatient Public Use Data Files
CDC SMM codes list as of March 2019 was used to identify SMM
Prepared by: Maternal & Child Health Epidemiology Unit
Oct 2020

[54] Kilpatrick, S. K., Ecker, J. L., & American College of Obstetricians and Gynecologists. (2016). Severe maternal morbidity: screening and review. *American journal of obstetrics and gynecology*, *215*(3), B17-B22.

Several indicators, identified using ICD-10 codes, are used to classify a delivery as potentially involving SMM, including receipt of blood transfusions, which is usually related to a response for excessive bleeding around the time of delivery.[16] Blood transfusion, with or without other indicators of SMM, was the most common SMM indicator during 2019. Other common SMM indicators observed in Texas included disseminated intravascular coagulation, acute renal failure, hysterectomy, adult respiratory distress syndrome, and eclampsia.

When looking at combined 2015-2019 SMM data, there were clear geographic differences in the rate of SMM. Considering the suppression of counties with fewer than five SMM cases, SMM rates varied from 66.6 per 10,000 deliveries in Aransas County to the highest rate of 704.9 in Polk County. Many metropolitan counties had lower rates of SMM when compared to non-metropolitan areas (Figure 44).

Figure 44: Rate of Severe Maternal Morbidity per 10,000 Deliveries, 2015-2019



Data transitioned to ICD-10CM in the last quarter of 2015
Source: 2015-2019 Texas Hospital Inpatient Public Use Data Files
CDC SMM codes list as of March 2019 was used to identify SMM
Prepared by: Maternal & Child Health Epidemiology Unit
Oct 2020

Neonatal Abstinence Syndrome

Using opiates during pregnancy is associated with an increase in infants born with neonatal abstinence syndrome (NAS), a group of conditions that cause neonatal withdrawal such as body shakes, seizures, fever, and low birth weight.[55] Newborns with NAS are more likely than other infants to have low birthweight, respiratory and feeding problems, and other complications.[56] Mothers who use drugs such as opioids during pregnancy are more likely to have complications, such as prolonged hospital stay and death before hospital discharge.[57] 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 NAS.[56]

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 2009, though in recent years it has remained relatively stable, with even a small decline in 2019 (Figure 45). 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 had lower rates of NAS than the national average over the past decade.[58]

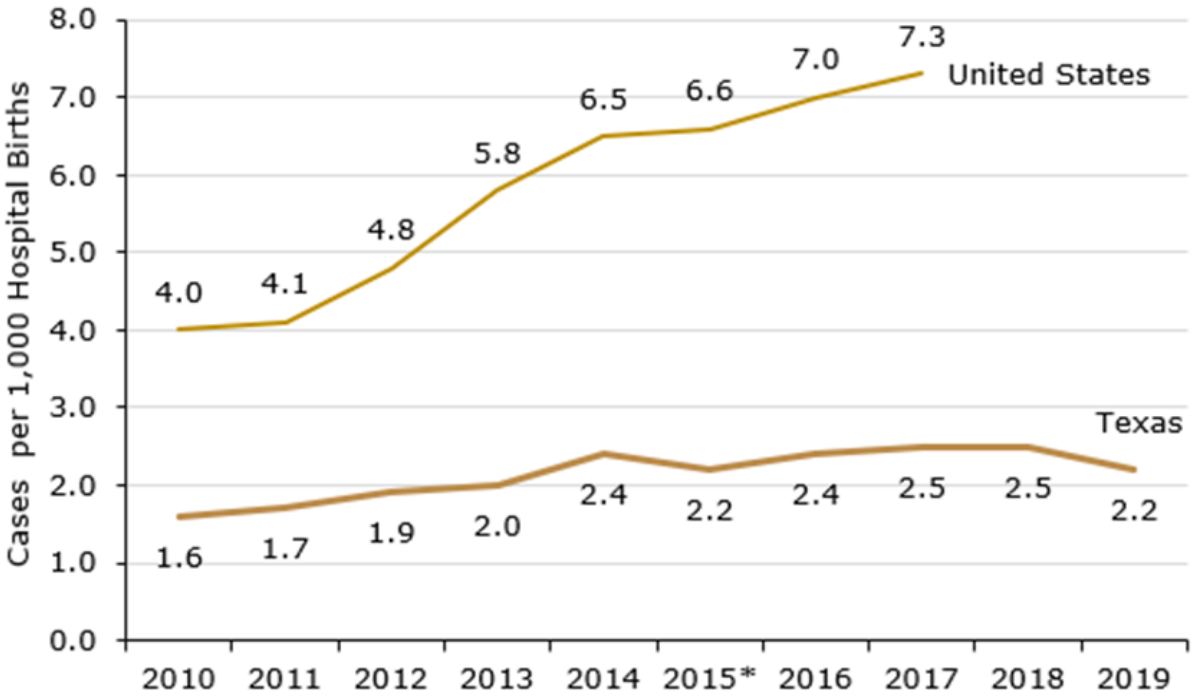
[55] March of Dimes (2019) Neonatal Abstinence Syndrome (NAS). **marchofdimes.org/complications/neonatal-abstinence-syndrome-(nas).aspx#**.

[56] National Insitute on Drug Abuse. Dramatic Increases in Maternal Opioid Use and Neonatal Abstinence Syndrome. **drugabuse.gov/related-topics/trends-statistics/infographics/dramatic-increases-in-maternal-opioid-use-neonatal-abstinence-syndrome**. [Accessed November 2017]

[57] 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*.

[58] United States Department of Health and Human Services, Health Resources and Services Administration, Maternal and Child Health Bureau, Division of State and Community Health (2019, April 1). Federally Available Data (FAD) Resource Document. **mchb.tvisdata.hrsa.gov/Home/Resources**. [Accessed October 11, 2019]

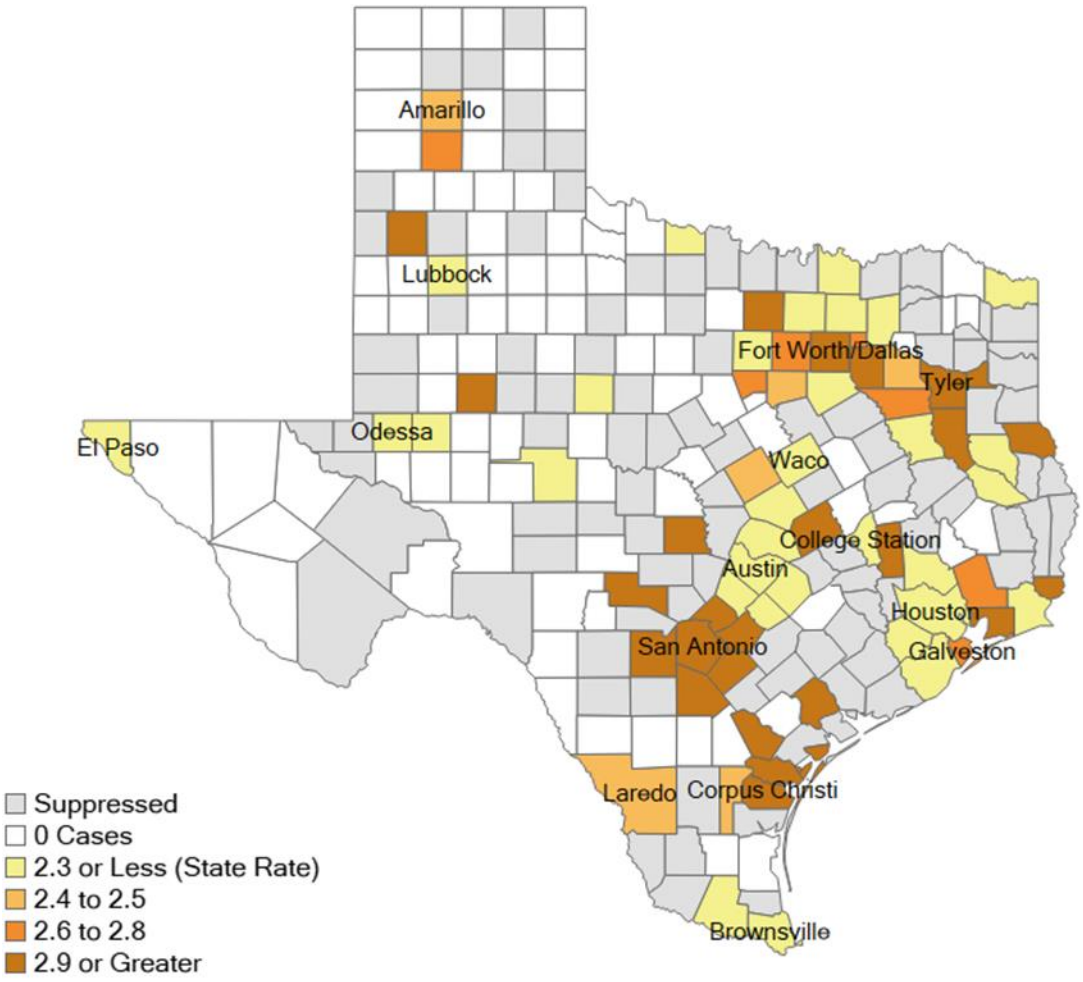
Figure 45: Rate of Neonatal Abstinence Syndrome in Texas and the United States, 2010-2019



*Data transitioned to ICD-10-CM in the last quarter of 2015
Sourse: 2010-2019 Health Care Utlization Project
Prepared by: Maternal & Child Health Epidemiology Unit
Nov 2020

Based on combined data from 2015 to 2019, the county with the highest NAS rate in the state was Bexar County (9.4 per 1,000 hospital births). Bexar County accounted for more than 27 percent of Texas' total NAS cases during 2015 to 2019 (Figure 46).

Figure 46: Neonatal Abstinence Syndrome Rate per 1,000 Hospital Births, 2015-2019

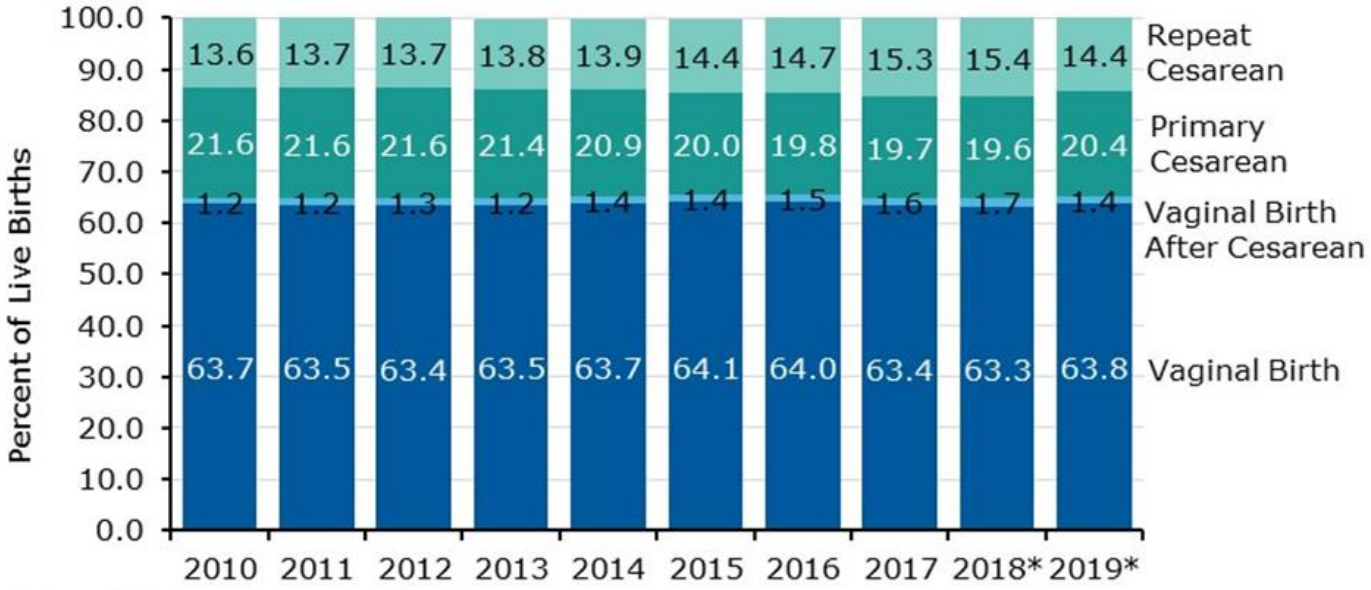


Data transitioned to ICD-10CM in the last quarter of 2015
Source: 2015-2019 Texas Hospital Inpatient Public Use Data Files
Prepared by: Maternal & Child Health Epidemiology Unit
Oct 2020

Delivery

The method of delivery for live births in Texas has remained relatively stable from 2010 to 2019 (Figure 47). In 2019, 65.2 percent of all Texas deliveries were vaginal births and 34.8 percent of deliveries were by cesarean section. The percent of infants born via primary cesarean section has decreased slightly since 2010; however, the proportion of infants born via repeat cesarean increased slightly through 2018. In 2019, the cesarean delivery rate in Texas (34.8 percent) was higher than the national rate (31.7 percent).[20] The vaginal birth after cesarean rate in Texas (9.2 percent of women with previous cesarean deliveries) was lower than the national rate (13.8 percent) in 2019.[20]

Figure 47: Percent of All Births by Delivery Method, 2010-2019



*2018 and 2019 Texas data are provisional
Source: 2010-2019 Birth Files
Prepared by: Maternal & Child Health Epidemiology Unit
Oct 2020

Conclusion

The Department of State Health Services (DSHS) Healthy Texas Mothers and Babies Data Book (Data Book) 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 and maternal hypertension.

Provisional 2018 and 2019 birth and death certificate data are presented in the Data Book 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 2019 for the fourth year in a row. Also, in 2019, the percent of preterm births in Texas increased for the fourth consecutive year, reversing some of the steady decline seen from 2008 to 2015.

Substantial racial and ethnic disparities exist for infant and maternal health indicators, including rates of infant mortality, preterm birth, safe sleep practices, breastfeeding practices, and severe maternal morbidity. Non-Hispanic Black mothers and infants have significantly higher rates of each of these adverse health outcomes than do other racial or ethnic groups. Infant health practices and maternal health indicators also differ by race and 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. Texas has also observed a decline in neonatal abstinence syndrome from 2018 to 2019 while national rates continued to rise. Conversely, Texas' teen birth rate and preterm birth rate continued to be higher than national rates, and the percent of mothers receiving early prenatal care in Texas was the third lowest in the nation in 2019.

Although many of the risk factors presented in this Data Book may appear to be related to individual risks and behaviors, it is important to acknowledge the larger role of social determinants of health (SDOH) that influence the risk factors of populations within the state, including how risk factors are influenced by accessibility, policies, environmental health, and other aspects of one's community. For example, risk of obesity and other diet-related conditions that influence pregnancy outcomes are embedded in larger structural and systemic concerns, so understanding the role of SDOH is necessary in addressing these risks.[59]

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.

[59] United States Department of Health and Human Services, Healthy People 2030. Social Determinants of Health. **health.gov/healthypeople/objectives-and-data/social-determinants-health**.

List of Acronyms

Acronym	Full Name
BMI	Body Mass Index
CDC	Centers for Disease Control and Prevention
DSHS	Texas Department of State Health Services
F-IMR	Feto-Infant Mortality Rate
HHS	U.S. Department of Health and Human Services
HP2020	Healthy People 2020
HRSA	Health Resources and Services Administration
ICD	International Classification of Diseases
IFPS	WIC Infant Feeding Practices Survey
IH	Infant Health (Prenatal Period of Risk)
IMR	Infant Mortality Rate
MC	Maternal Care (Prenatal Period of Risk)
MCH	Maternal and Child Health
MHP	Maternal Health/ Prematurity (Prenatal Period of Risk)
MMMRC	Texas Maternal Mortality and Morbidity Review Committee
NAS	Neonatal Abstinence Syndrome
NC	Neonatal Care (Prenatal Period of Risk)
NCHS	National Center for Health Statistics
PAR	Population Attributable Risk
PPD	Pregnancy and Postpartum Depression
PPOR	Perinatal Periods of Risk
PRAMS	Pregnancy Risk Assessment Monitoring System
SDOH	Social Determinants of Health

SIDS	Sudden Infant Death Syndrome
SMM	Severe Maternal Morbidity
SUD	Substance Use Disorder
THCIC	Texas Health Care Information Collection
VLBW	Very Low Birth Weight
WHO	World Health Organization
WIC	Women, Infants and Children

Appendix A

Information on Maternal and Infant Health in Texas

Diabetes Prevention and Control Reports and Data:

dshs.texas.gov/txdiabetes/data.shtm

hhs.texas.gov/sites/default/files/documents/laws-regulations/reports-presentations/2018/sb1-rider25-texas-medicaid-diabetes-council-coord-report-aug-2018.pdf

dshs.texas.gov/legislative/2014/TexasDiabetesCouncil-Statewide-Assessment-Report-120514.pdf

These links contain data sources and reports released since 2014 focusing on the prevalence, prevention, and treatment of diabetes in Texas, including reports focusing on gestational diabetes. This includes a report titled "Gestational Diabetes in Medicaid: Prevalence, Outcomes, and Costs" from 2014 that showed the rate of diabetes among pregnant women enrolled in Medicaid was underestimated on the birth certificate and provided a clearer estimate of the impact of gestational diabetes on this population. Links provided navigate to reports on Texas Medicaid recipients and diabetes including information on screening for gestational diabetes for pregnant women enrolled in Medicaid and 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

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

Texas DSHS Legislative Reports:

dshs.texas.gov/Legislative/Reports-2020.aspx

Reports submitted in 2020 to the Legislature are housed on this website. This includes the Maternal Mortality and Morbidity Review Committee and Department of State Health Services (DSHS) Joint Report and Maternal Health and Safety Activities Report. Reports are posted as they are submitted.

Texas DSHS Laws and Regulations Reports and Presentations:

hhs.texas.gov/laws-regulations/reports-and-presentations/all

This website contains reports and presentations provided to the Texas legislature and other governing bodies on how it is spending taxpayer funds.

Texas Health Data:

healthdata.dshs.texas.gov/Home

This online query tool from DSHS allows the visitor 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

This website contains the Pregnancy Risk Assessment Monitoring System (PRAMS) annual reports as well as links to other information and presentations about maternal and child health as well as 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 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, 2010-2019 (Figure 5)[a]

Year	Non-Hispanic White	Non-Hispanic Black	Hispanic	Other	Texas
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	15.7	27.4	37.6	9.9	**27.1**
2018[b]	13.8	26.3	34.7	9.3	**25.0**
2019[c]	13.6	24.6	32.6	8.7	**23.7**

[a] Rate per 1,000 population. Source: 2010-2019 Texas Birth Files.
[b] 2018 data are provisional and subject to change.
[c] 2019 data are provisional and subject to change.

Table B-2: (Figure 8)[a]

Year	Non-Hispanic White	Non-Hispanic Black	Hispanic	Other	Texas
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	4.8	11.0	5.4	3.9	**5.8**
2018[b]	5.1	10.9	4.5	4.3	**5.5**

[a] Rate per 1,000 live births. Source: 2010-2018 Texas Birth and Death Files.
[b] 2018 data are provisional and subject to change.

Table B-3: (Figure 17)[a]

Year	Non-Hispanic White	Non-Hispanic Black	Hispanic	Other	Texas
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	7.1	13.9	7.9	8.9	**8.4**
2018[b]	7.0	14.1	7.9	9.0	**8.5**
2019[c]	7.0	14.2	7.9	8.9	**8.4**

[a] Source: 2010-2019 Texas Birth Files.
[b] 2018 data are provisional and subject to change.
[c] 2019 data are provisional and subject to change.

Table B-4: **(Figure 28)**[a]

Year	Non-Hispanic White	Non-Hispanic Black	Hispanic	Other	Texas
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	75.7	56.3	62.5	65.9	**66.4**
2018[b]	73.5	56.5	62.6	65.3	**65.6**
2019[c]	76.4	57.3	62.7	69.8	**67.1**

[a] Computed using the obstetric estimate of gestation. Source: 2010-2019 Texas Birth Files.
[b] 2018 data are provisional and subject to change.
[c] 2019 data are provisional and subject to change.

Table B-5: **(Figure 30)**[a]

Year	Non-Hispanic White	Non-Hispanic Black	Hispanic	Other	Texas
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	6.3	3.1	0.9	1.3	**3.0**
2018[b]	5.9	2.7	0.9	1.3	**2.7**
2019[c]	5.2	2.4	0.8	1.0	**2.4**

[a] Source: 2010-2019 Texas Birth Files.
[b] 2018 data are provisional and subject to change.
[c] 2019 data are provisional and subject to change.

Table B-6: **(Figure 37)**[a]

Year	Non-Hispanic White	Non-Hispanic Black	Hispanic	Other	Texas
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	8.6	10.6	7.5	5.5	**8.1**
2018[b]	9.3	11.7	8.1	6.4	**8.8**
2019[c]	9.7	11.4	8.2	5.5	**8.9**

[a] Source: 2009-2018 Texas Birth Files.
[b] 2018 data are provisional and subject to change.
[c] 2019 data are provisional and subject to change.

Table B-7: **(Figure 38)**[a]

Year	Non-Hispanic White	Non-Hispanic Black	Hispanic	Other	Texas
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	4.7	4.7	7.0	8.5	**6.1**
2018[b]	4.8	4.7	7.1	8.1	**6.2**
2019[c]	5.0	4.7	7.3	9.2	**6.4**

[a] Source: 2010-2019 Texas Birth Files.
[b] 2018 data are provisional and subject to change.
[c] 2019 data are provisional and subject to change.