



# 2019 Infant Mortality Annual Report



Department  
of Health

This report is dedicated to all the families who have lost an infant. The death of an infant is a tragic loss for families and the community. We hope that examining this data will enable us to find solutions and prevent further losses.

*"A life need not be long to be meaningful." - Unknown*

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# TABLE OF CONTENTS

PUBLIC HEALTH SURVEILLANCE 101	4
SECTION 1: GENERAL FINDINGS	5-12
Ohio Infant Mortality Rates by Race and Ethnicity	5-7
Ohio Five-Year Average Infant Mortality Rates by County	8
Neonatal and Postneonatal Mortality Rates by Race and Ethnicity	9-12
SECTION 2: A DEEPER LOOK	13-25
Infant Mortality by Duration of Gestation and Birthweight	13-14
Leading Causes of Infant Deaths	15-16
Sudden Unexpected Infant Death (SUID)	17-18
Pre-pregnancy Maternal Characteristics Associated With Infant Death	19-23
Access to Care	23
Infants Born at Less Than 24 Weeks Gestation	24
METHODS	26
REFERENCES	27
APPENDICES	28-42
Appendix A: The Ohio Equity Institute (OEI)	28-30
Appendix B: Ohio Department of Health Activities Aimed at Reducing Infant Mortality	31-32
Appendix C: Data Tables	33-42

## What is surveillance?

According to the Centers for Disease Control and Prevention (CDC), “public health surveillance is the ongoing, systematic collection, analysis, and interpretation of health-related data essential to planning, implementation, and evaluation of public health practice, closely integrated with the timely dissemination of these data to those responsible for prevention and control.” In public health, we identify the problem by using surveillance systems to monitor health events and behaviors occurring among a population. After the problem has been identified, the next question is, “What is the cause of the problem?” To fully answer this question, more specific scientific research is needed.

The data presented in this report is public health surveillance data and is an important component in Ohio’s response to the problem of infant mortality. However, we acknowledge that the data included here does not fully explain the numerous and complex causes of infant mortality. Embedded within the persistent disparities and inequities in infant deaths is a history of unequal social, economic, and environmental conditions. By understanding what’s happened in the past, individuals and organizations can better understand what is causing today’s disparities and identify solutions that move toward an equitable future.

## How do we use surveillance data?

Surveillance data, such as that included in this report, provides information that can be used by public health personnel, government leaders, and the public to guide public health policy and programs.

Surveillance data can be used to:

- Detect epidemics, health problems, and changes in health behaviors.
- Estimate magnitude and scope of health problems.
- Measure trends and characterize disease.
- Assess effectiveness of programs and control measures.
- Develop hypotheses and stimulate research.

## SECTION 1: GENERAL FINDINGS

### Ohio Infant Mortality Rate by Race and Ethnicity

In 2019, 929 Ohio infants died before their first birthday (Table 1, Figure 1). The number of white infants who died was 518, the lowest number in the past 10 years. There were 356 Black infant deaths in 2019, an increase of 17 from 2018. However, this is still lower than 2015, 2016, and 2017.

The infant mortality rate is the number of infant deaths per 1,000 live births. Ohio infant mortality across all races was 6.9 per 1,000 live births in 2019, the same as it was in 2018 (Table 1, Figure 2). The Black infant mortality rate was 14.3 in 2019, up from 13.9 in 2018 (Table 1, Figure 2). Black infants were more than 2.8 times more likely to die than white infants.

Table 1: Ohio Infant Mortality by Race and Ethnicity (2015-2019)

	2015		2016		2017		2018		2019	
	Infant Deaths	IMR*	Infant Deaths	IMR*	Infant Deaths	IMR*	Infant Deaths	IMR*	Infant Deaths	IMR*
All Races**	1,005	7.2	1023	7.4	982	7.2	938	6.9	929	6.9
<b>Race</b>										
White	580	5.5	609	5.8	550	5.3	553	5.4	518	5.1
Black	367	15.1	369	15.2	384	15.6	339	13.9	356	14.3
American Indian	2	‡	2	‡	0	‡	2	‡	3	‡
Asian/Pacific Islander	16	3.7^	18	3.8^	20	4.2	18	3.8^	21	4.4
<b>Ethnicity</b>										
Hispanic	42	6.0	54	7.3	54	7.2	45	6.1	45	5.8
Non-Hispanic***	963	7.3	969	7.4	927	7.2	893	7.0	883	7.0

Data Source: Resident Birth and Mortality Files from the Ohio Department of Health Bureau of Vital Statistics.

\*Infant mortality rate per 1,000 live births.

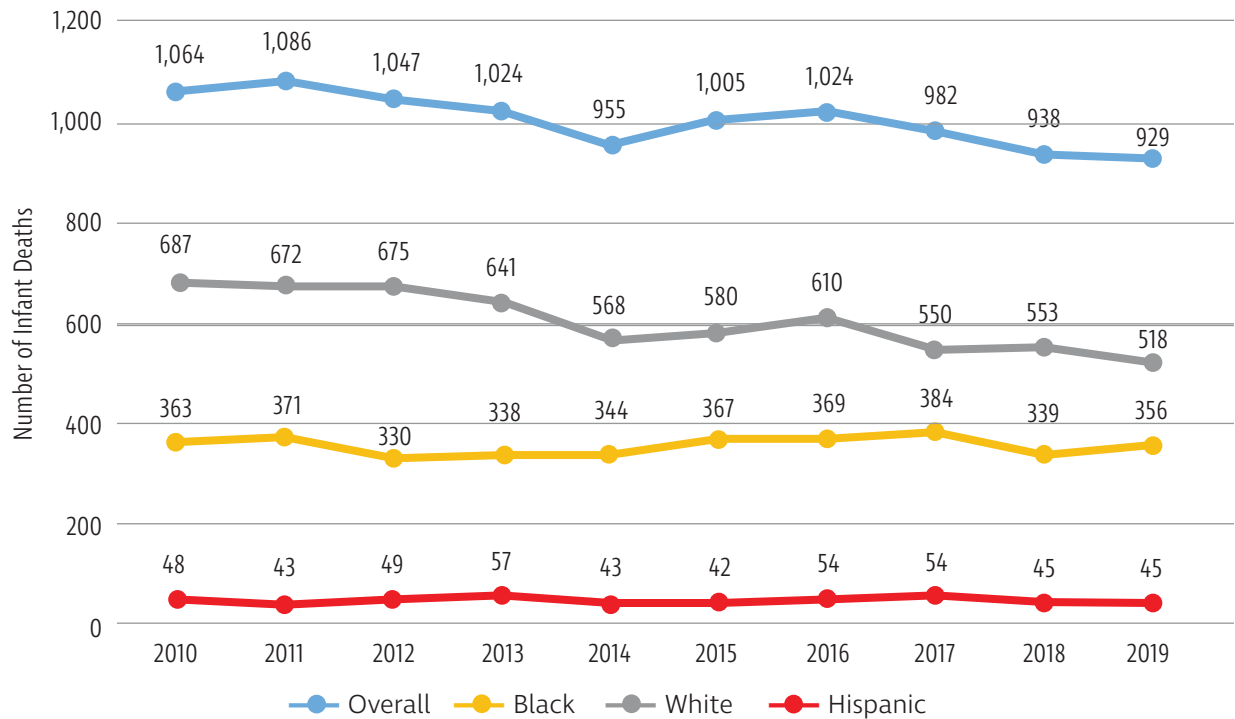
\*\*The total for all races includes deaths of unknown race.

\*\*\*Non-Hispanic deaths include those of unknown or missing ethnicity.

‡ Rates based on fewer than 10 infant deaths do not meet standards of reliability or precision and are suppressed.

^ Rates based on fewer than 20 infant deaths should be interpreted with caution.

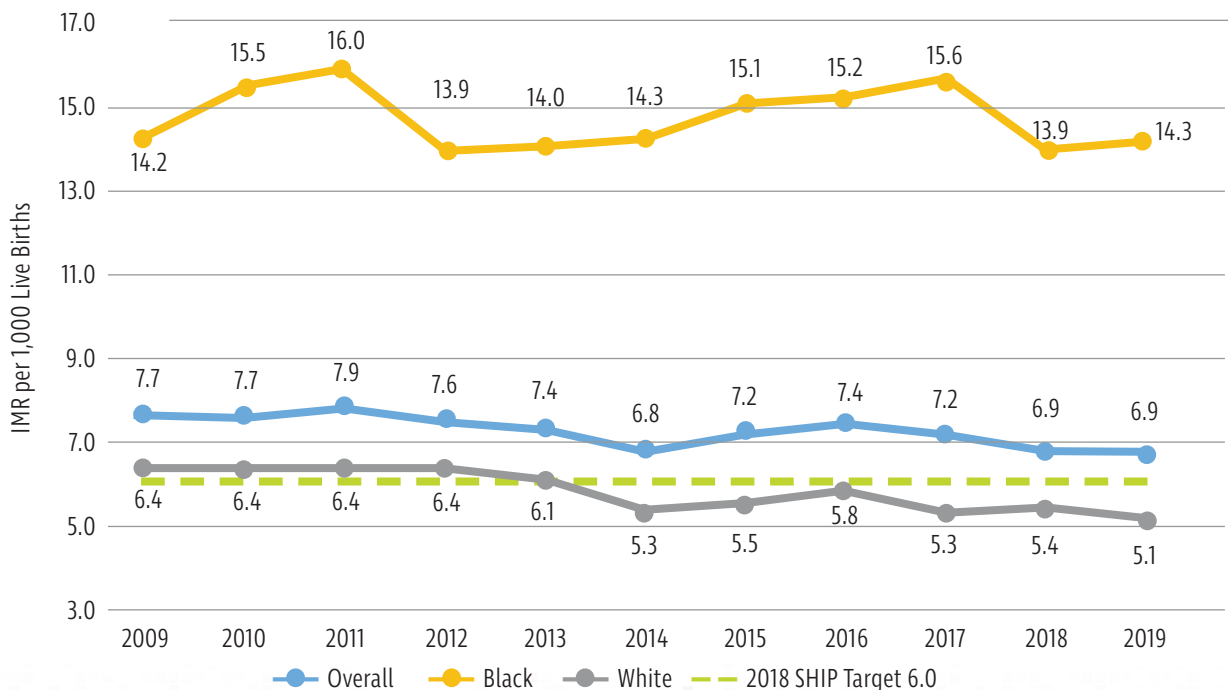
Figure 1: Number of Infant Deaths by Race and Ethnicity, Ohio (2010 – 2019)



Data Source: Resident Birth and Mortality Files from the Ohio Department of Health Bureau of Vital Statistics.

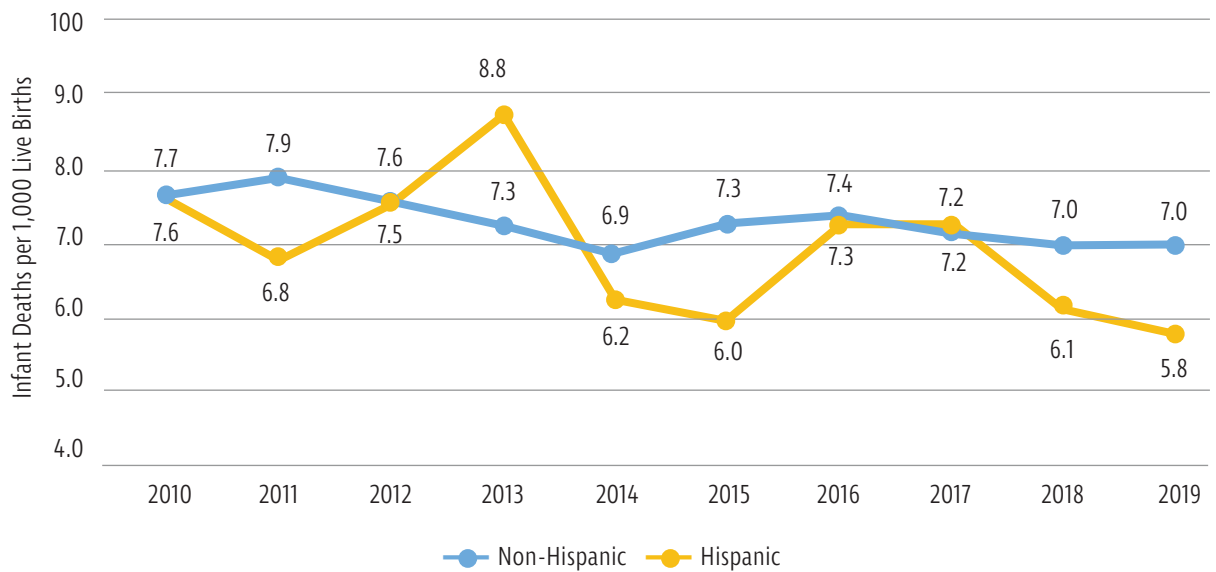
Since 2010, Ohio has seen small, but significant decreases in the overall and white infant mortality rates. From 2010 through 2019, the overall infant mortality rate decreased at an average of 1.2% per year, while the white infant mortality rate decreased an average of 2.6% per year. The Black and Hispanic infant mortality rates have not experienced a significant change during the past 10 years (Figures 2, 3). Ohio’s State Health Improvement Plan (SHIP) has set a 2028 target of 6.0 for Ohio’s overall infant mortality rate. This includes all priority populations identified in the SHIP.<sup>1</sup>

Figure 2: Infant Mortality Rate (per 1,000 live births) by Race, Ohio (2010 – 2019)



Data Source: Resident Birth and Mortality Files from the Ohio Department of Health Bureau of Vital Statistics.

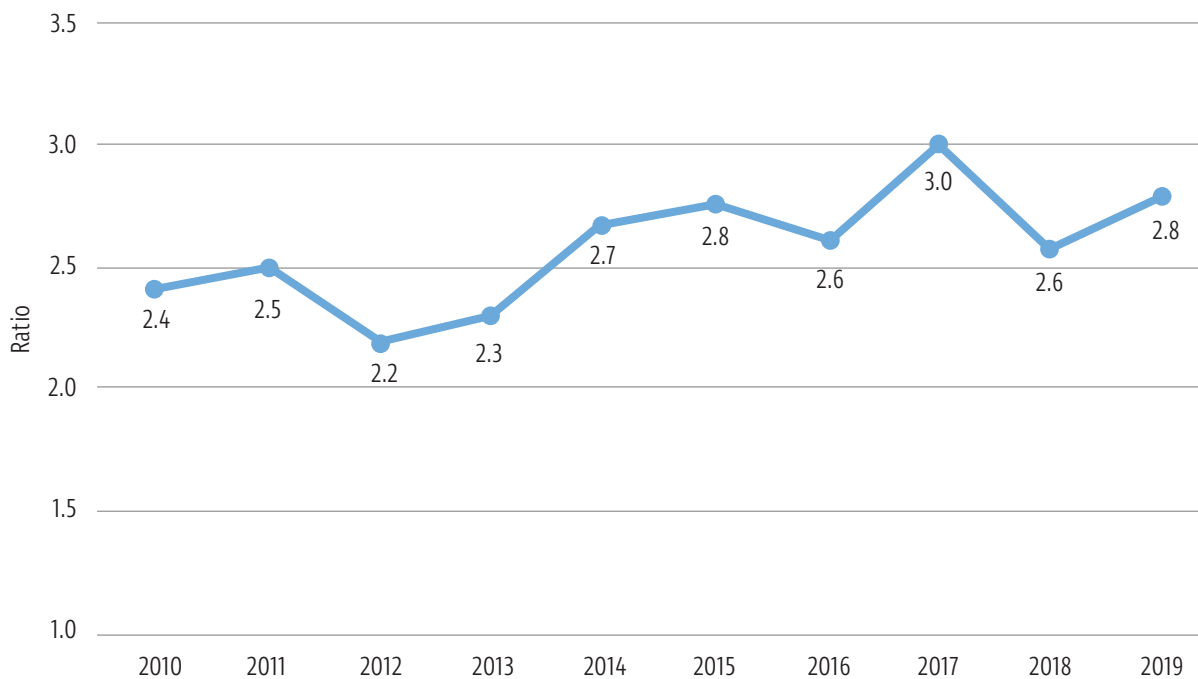
Figure 3: Infant Mortality Rate (per 1,000 live births) by Ethnicity, Ohio (2010 – 2019)



Data Source: Resident Birth and Mortality Files from the Ohio Department of Health Bureau of Vital Statistics.

Black infants die at a rate almost three times as that of white infants (Figure 4). The racial disparity between Black and white infant mortality is amplified due to decreases in white infant mortality without significant change in Black infant mortality.

Figure 4: Black/White Infant Mortality Ratio,\* Ohio (2010 – 2019)



Data Source: Resident Birth and Mortality Files from the Ohio Department of Health Bureau of Vital Statistics.

\*Black infant mortality rate divided by the white infant mortality rate.

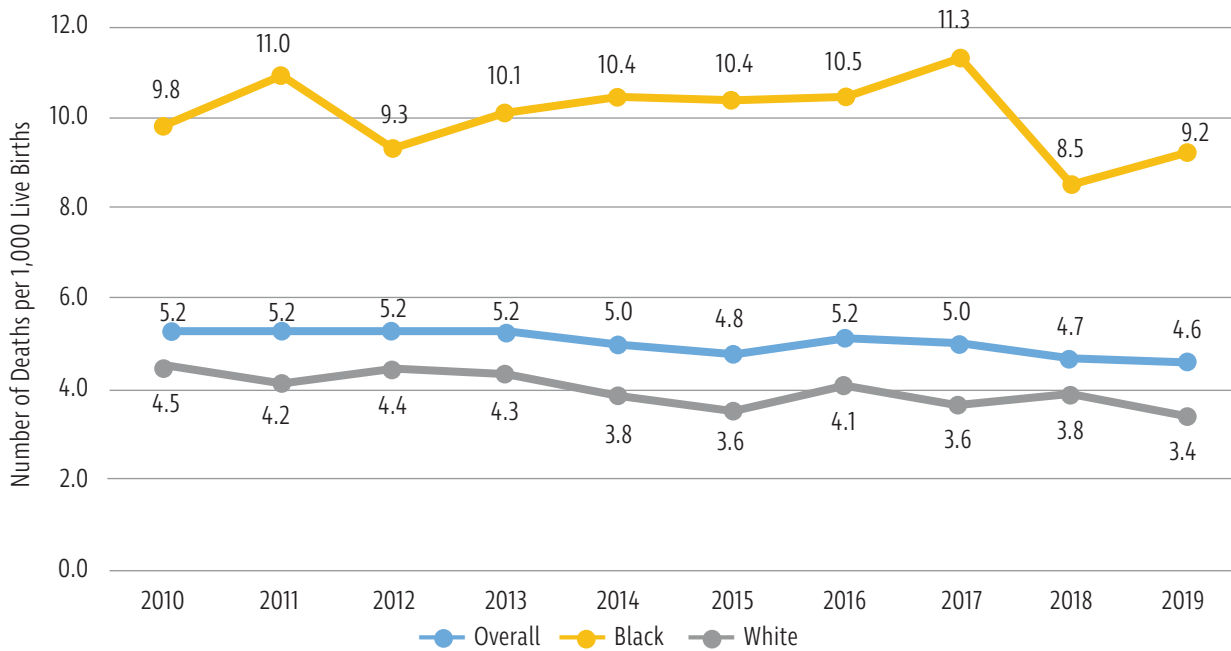


# Ohio Neonatal and Postneonatal Mortality by Race and Ethnicity

Neonatal deaths occur during the first 27 days of life. Neonatal mortality is associated with prematurity (birth before 37 weeks gestation), low birth weight, congenital anomalies, and health problems originating in the perinatal period, such as infections or birth trauma. There were 22 more Black neonatal deaths between 2018 and 2019, whereas there were 70 fewer Black neonatal deaths between 2017 and 2018.

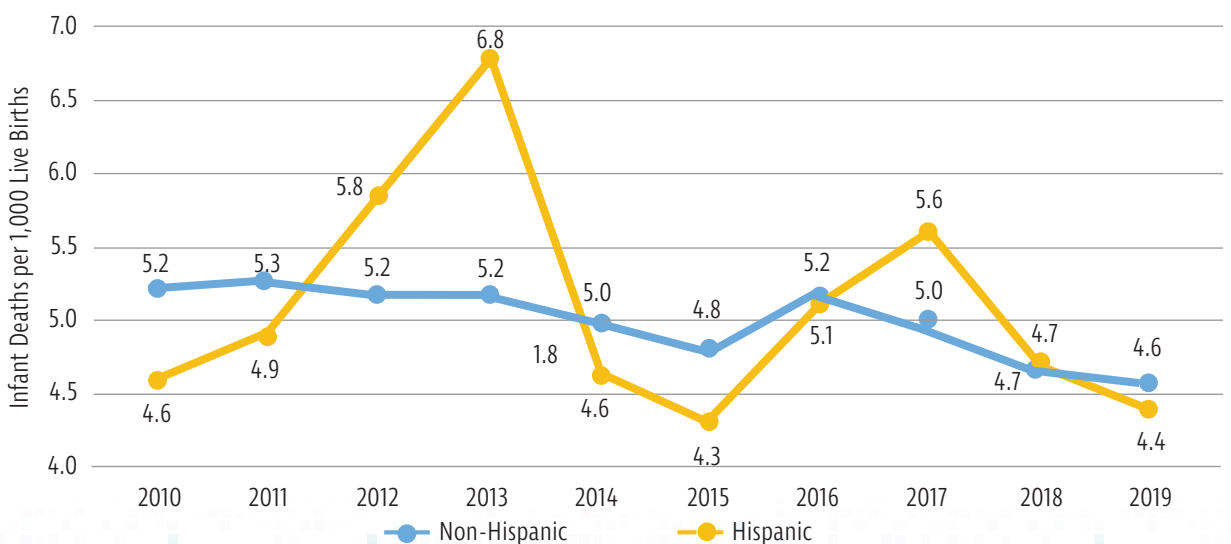
Between 2010 and 2019, the overall neonatal mortality rate decreased by an average of 1.4% per year, and the white neonatal mortality rate decreased an average of 2.6% per year during the same period. The Black and Hispanic neonatal mortality rates have not changed significantly during this time (Figures 6 and 7). Although the Black neonatal mortality rate went from 8.5 in 2018 to 9.2 in 2019, the 2019 Black neonatal mortality rate is lower than it was anytime between 2010 and 2017.

Figure 6: Trends in Ohio Neonatal Mortality (per 1,000 live births), by Race (2010–2019)



Data Source: Resident Birth and Mortality Files from the Ohio Department of Health Bureau of Vital Statistics.

Figure 7: Trends in Ohio Neonatal Mortality (per 1,000 live births), by Ethnicity (2010–2019)

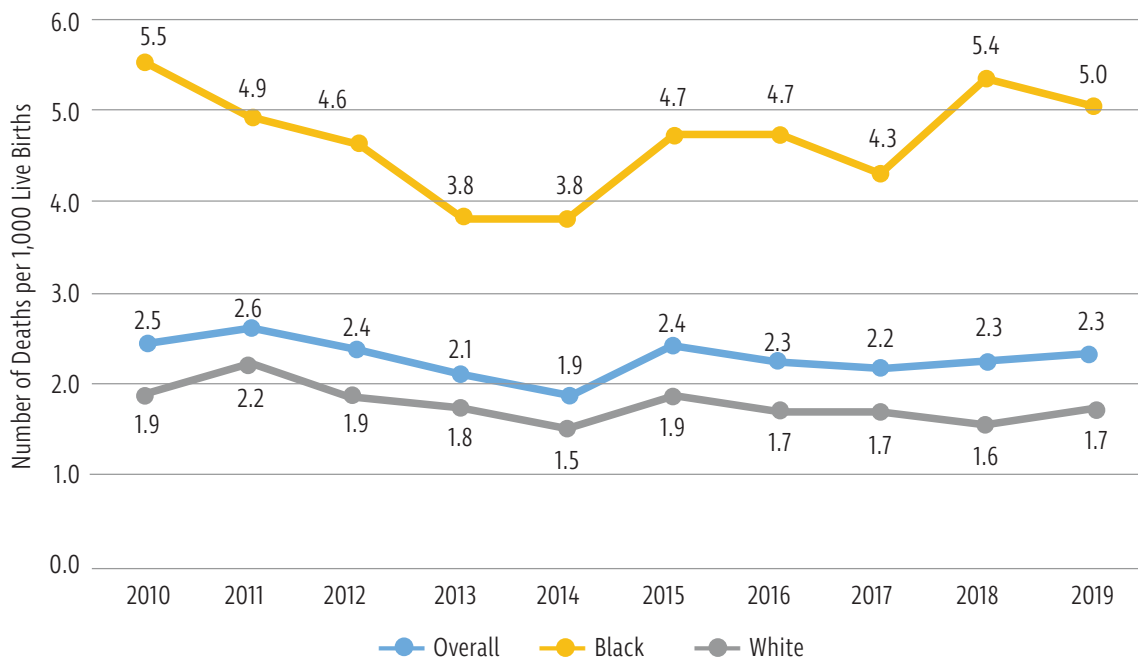


Data Source: Resident Birth and Mortality Files from the Ohio Department of Health Bureau of Vital Statistics.

Postneonatal deaths occur between 28 and 364 days of life. Common causes of death in the postneonatal period include sudden infant death syndrome (SIDS), congenital anomalies, and unintentional injuries. Ohio’s white infant postneonatal mortality rate decreased an average of 2.4% per year between 2010 and 2019. Overall and Black postneonatal mortality have not changed significantly during this period. While it’s not statistically significant, there appears to be a shift in the Black postneonatal mortality rate; from 2010 through 2013, there was a general downward trend. After 2013, the trend reversed and the postneonatal mortality rate began to increase (Figure 8). In 2019, there were five fewer Black postneonatal deaths compared to 2018, whereas there were 25 more in 2018 compared with 2017 (Table 2).

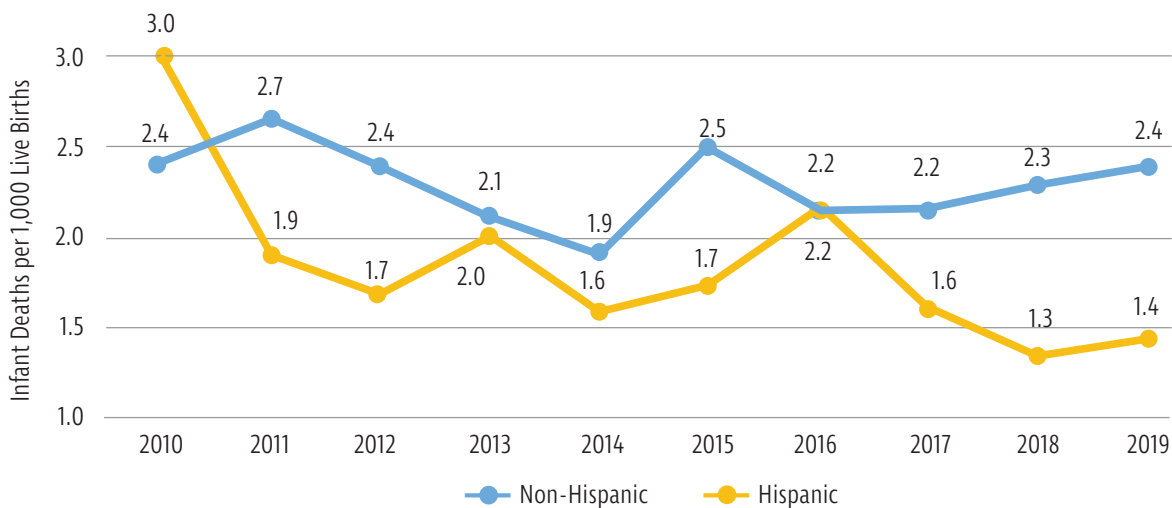
Hispanic postneonatal mortality in Ohio has decreased an average of 6.8% per year since 2010 (Figure 9). However, since there were relatively few Hispanic postneonatal deaths — less than 20 per year during the 10-year period — the rates should be interpreted with caution.

Figure 8: Trends in Ohio Postneonatal Mortality (per 1,000 live births), by Race (2010–2019)



Data Source: Resident Birth and Mortality Files from the Ohio Department of Health Bureau of Vital Statistics.

Figure 9: Trends in Ohio Postneonatal Mortality (per 1,000 live births), by Ethnicity (2010–2019)



Data Source: Resident Birth and Mortality Files from the Ohio Department of Health Bureau of Vital Statistics.

Table 2: Ohio Neonatal, Postneonatal, and Overall Infant Mortality (per 1,000 live births), by Race and Ethnicity (2015–2019)

Race/Ethnicity	Year	Neonatal Deaths	Neonatal Mortality Rate	Postneonatal Deaths	Postneonatal Mortality Rate	Total Infant Deaths	Infant Mortality Rate	Births
White	2015	379	3.6	201	1.9	580	5.5	106,028
	2016	429	4.1	181	1.7	610	5.8	104,957
	2017	375	3.6	175	1.7	550	5.3	103,709
	2018	393	3.8	160	1.6	553	5.4	102,570
	2019	342	3.4	176	1.7	518	5.1	101,021
Black	2015	252	10.4	115	4.7	367	15.1	24,288
	2016	255	10.5	114	4.7	369	15.2	24,316
	2017	278	11.3	106	4.3	384	15.6	24,542
	2018	208	8.5	131	5.4	339	13.9	24,359
	2019	230	9.2	126	5.0	356	14.3	24,971
All Races	2015	667	4.8	338	2.4	1,005	7.2	139,312
	2016	713	5.2	311	2.3	1,024	7.4	138,198
	2017	684	5.0	298	2.2	982	7.2	136,895
	2018	632	4.7	306	2.3	938	6.9	135,226
	2019	614	4.6	315	2.3	929	6.9	134,564
Hispanic Ethnicity (Any Race)	2015	30	4.3	12	1.7*	42	6.0	6,974
	2016	38	5.1	16	2.2*	54	7.3	7,425
	2017	42	5.6	12	1.6*	54	7.2	7,473
	2018	35	4.7	10	1.3*	45	6.1	7,434
	2019	34	4.4	11	1.4*	45	5.8	7,729

Data Source: Resident Birth and Mortality Files from the Ohio Department of Health Bureau of Vital Statistics.

\*Rates based on fewer than 20 infant deaths should be interpreted with caution.

## SECTION 2: A DEEPER LOOK

### Infant Mortality by Duration of Gestation and Birthweight

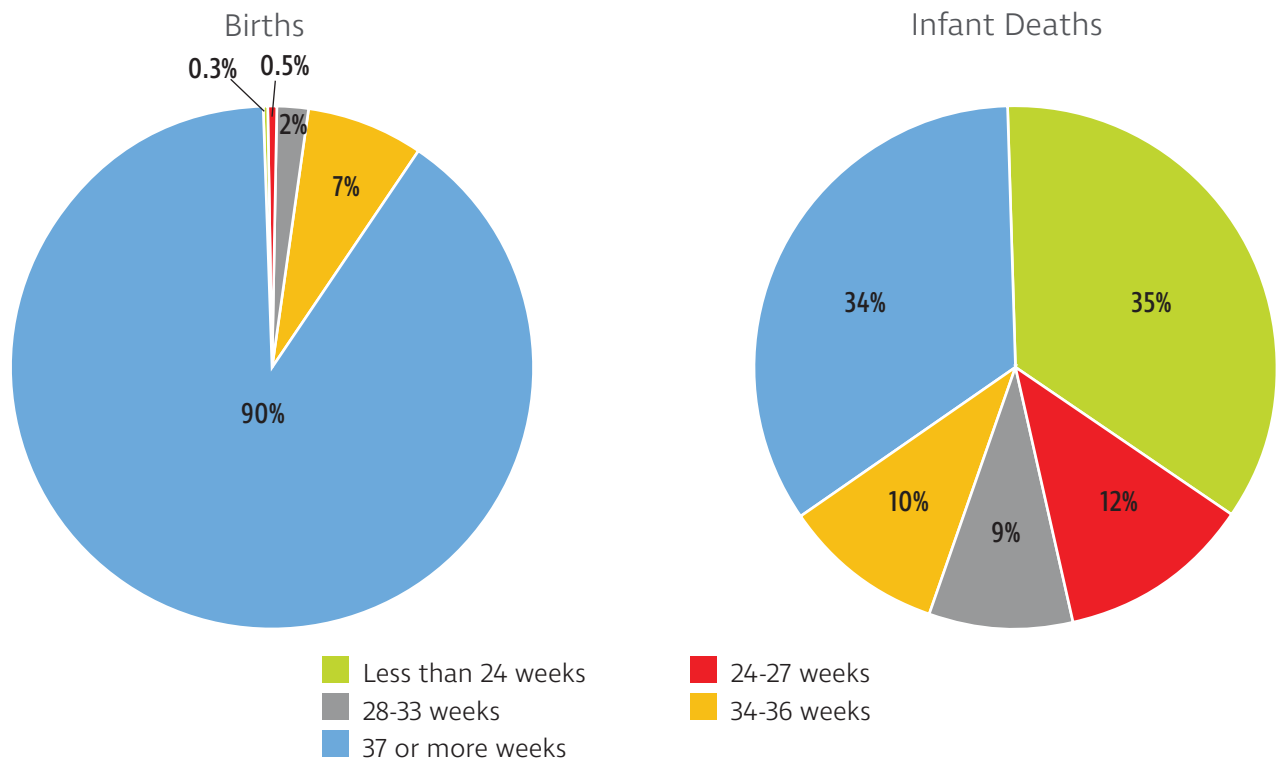
Preterm birth is one of the largest risk factors for infant mortality. About two-thirds (66%) of infants who died in 2019 were born preterm (less than 37 weeks gestation). In comparison, just 10% of all infants born in 2019 were preterm (Figure 10). Similarly, while infants born at less than 24 weeks gestation made up just 0.3% of births, they made up 35% of infant deaths.

Black infants were more likely than white infants to be born at less than 24 weeks gestation (43% versus 28%, respectively).

Low birth weight is highly associated with preterm birth, but it can also be related to infection during pregnancy, maternal smoking, alcohol or drug abuse, and maternal age. Overall, half of infants who died had very low birthweight (less than 1,500 grams, or about 3.3 pounds). Fifty-seven percent of Black infants who died were born with very low birthweight, compared with 44% of white infants who died.

One in five (20%) infants who died were born small for gestational age, meaning they had a birthweight at or below the 10th percentile, given the infant's gestational age and sex.

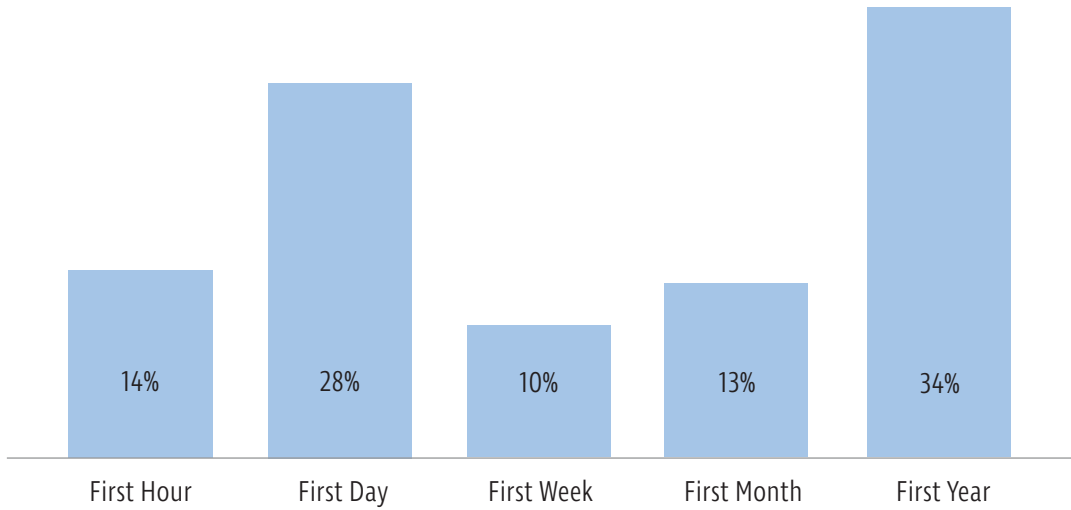
Figure 10: Proportion of Infant Births and Deaths by Gestational Age, Ohio (2019)



Data Source: Period Linked Infant Death File from the Ohio Department of Health, Bureau of Vital Statistics.

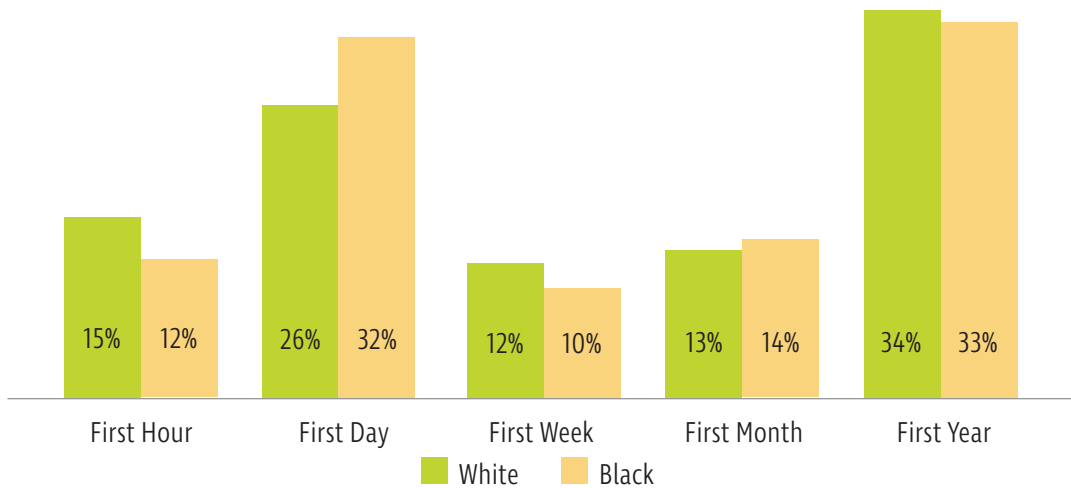
Among infants who died in 2019, about half (52%) did not survive beyond one week. Fourteen percent died in their first hour of life, an additional 28% died within their first day, and an additional 10% died in their first week (Figure 11).

Figure 11: Age at Death Among Infants Who Died, Ohio (2019)



Data Source: Period Linked Infant Death File from the Ohio Department of Health, Bureau of Vital Statistics.

Figure 12: Age at Death Among Infants Who Died, by Race, Ohio (2019)



Data Source: Period Linked Infant Death File from the Ohio Department of Health, Bureau of Vital Statistics.

## Leading Causes of Infant Death

The Ohio Department of Health uses the Modified Dollfus classification system to monitor the leading causes of infant deaths.<sup>2</sup> This system groups the underlying causes of death into the following categories: birth asphyxia, congenital anomalies (birth defects), external injuries, obstetric (OB) conditions, perinatal infections, other infections, prematurity related conditions, and sudden infant death syndrome (SIDS).<sup>\*</sup> Causes of death that do not fall into these classifications are classified as "other."

Among all infant deaths, prematurity related conditions were the most common cause of death (29%), followed by congenital anomalies (19%) and external injuries (12%). Six percent of deaths were due to SIDS (Table 3).

The number of infant deaths due to external injuries increased from 95 in 2018 to 111 in 2019. The infant mortality rate for external injury has also increased slightly, from 0.7 per 1,000 live births in 2018 to 0.8 in 2019.

Although disparities between Black and white infants exist across all causes of death, the disparity varies by specific cause (Figure 14).

Table 3: Top 5 Causes of Infant Death by Race and Ethnicity, Ohio (2019)

Rank	Total	White	Black	Hispanic* (2015-2019)
1	Prematurity	Prematurity	Prematurity	Prematurity
2	Congenital	Congenital	Congenital	Congenital
3	External injuries	External injuries	External injuries	OB conditions
4	OB conditions	OB conditions	Perinatal infections	Perinatal infections/SIDS (tie)
5	SIDS/Perinatal infections (tie)	SIDS	OB conditions	External injuries

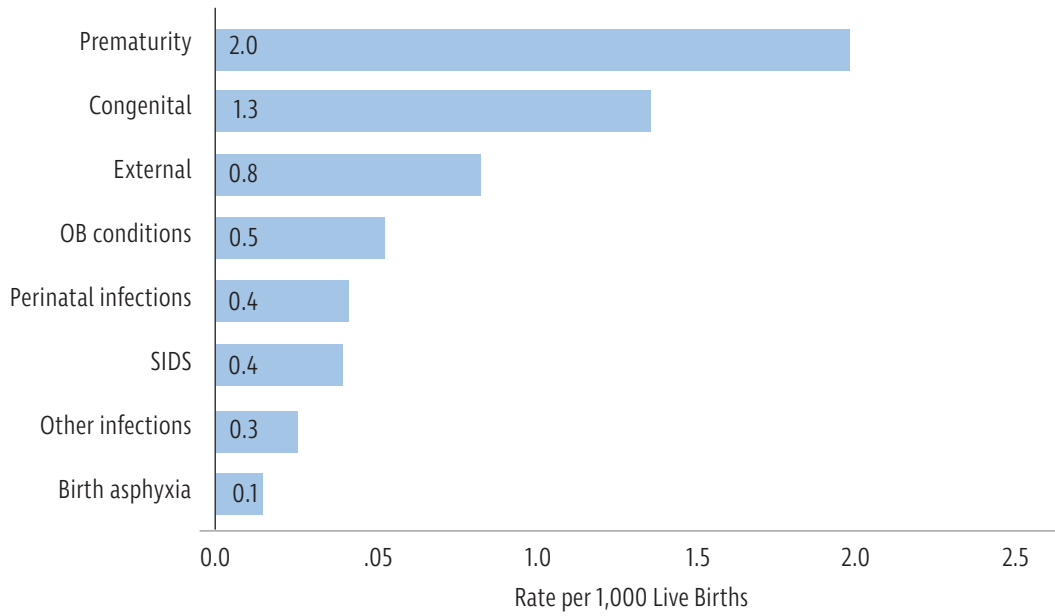
*\* We combined multiple years of data for the Hispanic population due to high variability based on small numbers.*

*Data Source: Period Linked Infant Death File from the Ohio Department of Health, Bureau of Vital Statistics.*

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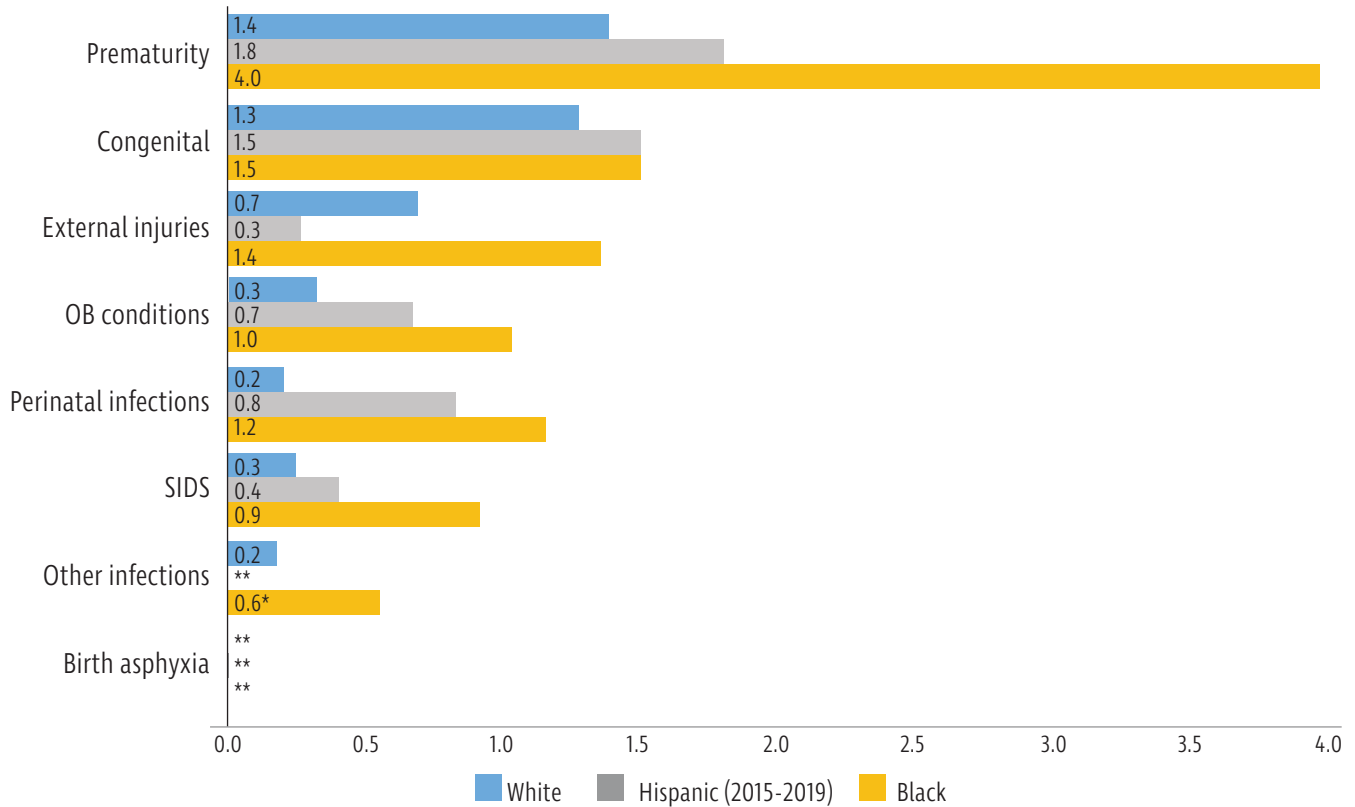
<sup>\*</sup>In the modified Dollfus classification system, sudden infant death syndrome (SIDS) is included with congenital anomalies. The Ohio Department of Health has placed SIDS in a separate category.

Figure 13: Cause-specific Infant Mortality Rates, Ohio (2019)



Data Source: Period Linked Infant Death File from the Ohio Department of Health, Bureau of Vital Statistics.

Figure 14: Cause-specific Infant Mortality Rates by Race and Ethnicity, Ohio (2019)



Data Source: Period Linked Infant Death File from the Ohio Department of Health, Bureau of Vital Statistics.

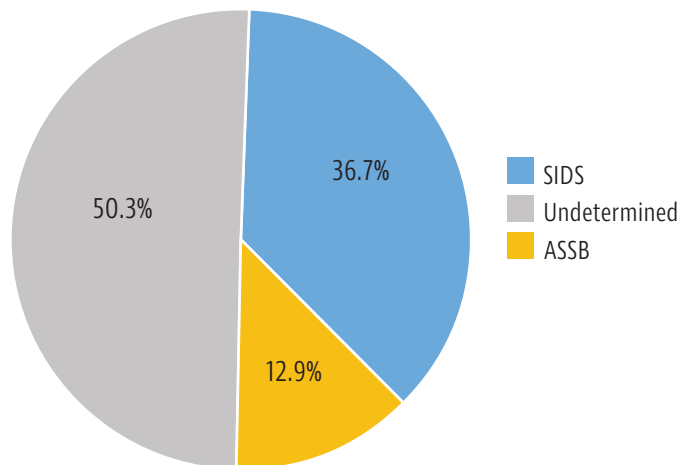
\* Based on a numerator less than 20, interpret with caution.

\*\*The Hispanic mortality rate for other infections and the mortality rates for birth asphyxia are suppressed due to a numerator less than 10.

## Sudden Unexpected Infant Death (SUID)

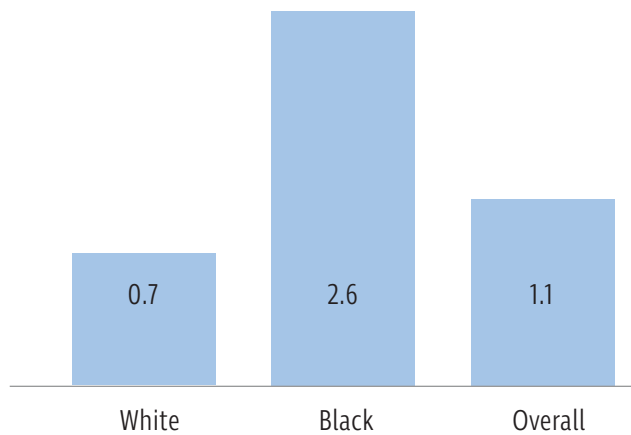
Sudden unexpected infant death (SUID) is a term used to describe any sudden and unexpected infant death, whether explained or unexplained, that occurs during infancy. After investigation, the cause of SUIDs may be attributed to accidental suffocation, positional asphyxia, overlay, entrapment, SIDS, or undetermined causes. The specific causes of SUID fall into separate categories in the Modified Dollfus classification system. Since SUID deaths most often occur in a sleep environment, it is useful to examine these separately. For this report, SUID includes infants with the following underlying causes of death: sudden infant death syndrome (SIDS), accidental suffocation and strangulation in bed (ASSB), and undetermined.

Figure 15: Sudden Unexpected Infant Death (SUID) by Underlying Cause of Death, Ohio (2019)



Data Source: Resident Birth and Mortality Files from the Ohio Department of Health Bureau of Vital Statistics.

Figure 16: Sudden Unexpected Infant Death (SUID) Rate\* by Race, Ohio (2019)



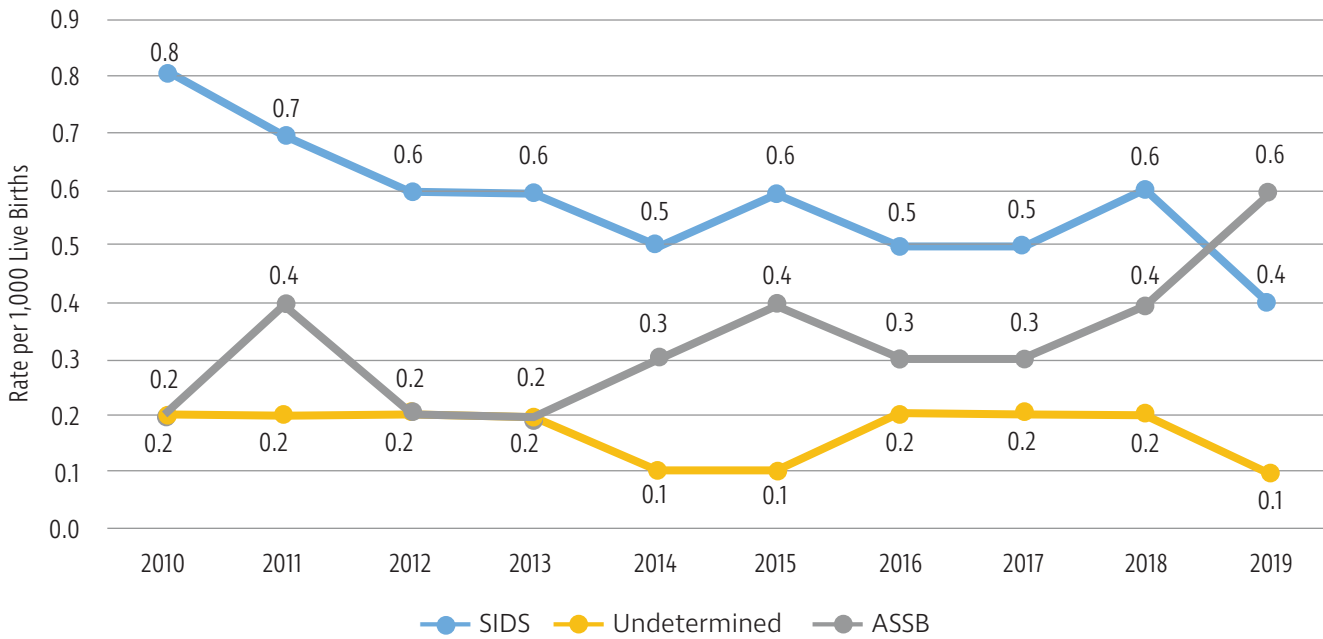
\* Rate per 1,000 live births.

Data Source: Resident Birth and Mortality Files from the Ohio Department of Health Bureau of Vital Statistics.

In 2019, there was a total of 147 cases of SUID in Ohio. This accounts for about 16% of all infant deaths. Approximately 45% of SUIDs occurred to Black infants, even though Black infants represented only 19% percent of Ohio's 2019 infant population. The SUID rate in Black infants is almost four times higher than the rate in white infants (Figure 16).

The overall SUIDS rate in 2019 was 1.1 per 1,000 live births (Figure 16), compared with a rate of 1.2 in 2018. The ASSB rate has increased every year since 2016, from 0.3 per 1,000 to 0.6 in 2019 (Figure 17).

Figure 17: Rates\* of Sudden Unexpected Infant Death by Underlying Cause, Ohio (2010-2019)



\*Rates per 1,000 live births.

Data Source: Resident Birth and Mortality Files from the Ohio Department of Health Bureau of Vital Statistics.

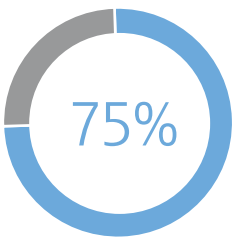
The Ohio Child Fatality Review (CFR) program was established in 2000 by the Ohio General Assembly. The law creating the program mandates CFR boards in each of Ohio’s counties (or regions) to review the deaths of all children younger than 18 years of age. As part of this process, boards conduct death scene investigations, which provide more detail than is available in Vital Statistics records on the circumstances surrounding deaths that take place in a sleep environment. The latest Ohio Child Fatality Review Annual Report can be downloaded at [odh.ohio.gov/wps/portal/gov/odh/know-our-programs/child-fatality-review/media/2019-cfr-annual-report](https://odh.ohio.gov/wps/portal/gov/odh/know-our-programs/child-fatality-review/media/2019-cfr-annual-report) and contains a section dedicated to deaths that occur in a sleep environment.

## Pre-pregnancy Maternal Characteristics Associated With Infant Death

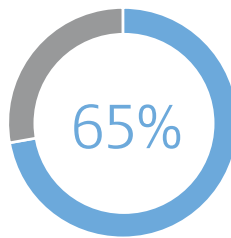
Based on existing literature, certain maternal health behaviors, characteristics, and health conditions are associated with increased risk of infant death. It is important that these issues be addressed in the pre-conception or inter-conception period. Culturally appropriate care and counseling is vital for modifying health behaviors and controlling health conditions. It is also vital to identify the underlying institutional and societal factors that contribute to these behaviors and conditions.

Three-quarters (75%) of Ohio infants who died in 2019 were born to mothers who had a previous pregnancy. Sixty-five percent were born to mothers with a previous live birth, and 13% were born to mothers with a previous preterm birth. Previous preterm birth was more common among Black mothers (19%) than white mothers (11%).

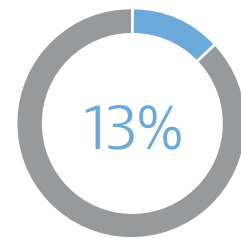
Previous pregnancy



Previous live birth



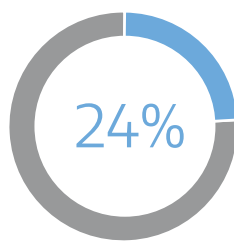
Previous preterm birth



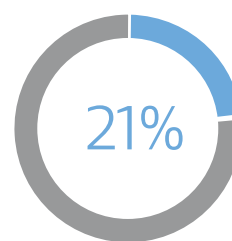
## Maternal Smoking

Twenty-four percent of infants who died were born to mothers who reported smoking in the three months prior to pregnancy. Slightly fewer (21%) infants who died were born to mothers who reported smoking during the first trimester of pregnancy.

Smoking in 3 months prior to pregnancy



Smoking during first trimester pregnancy



Smoking, both before and during the first trimester, was most common among white mothers. Twenty-eight percent of infants who were born to white mothers and died had a mother who smoked before pregnancy, compared with 20% of those who were born to Black mothers. Similarly, 24% of white infants who died had mothers who smoked during the first trimester compared with 17% of those born to Black mothers.

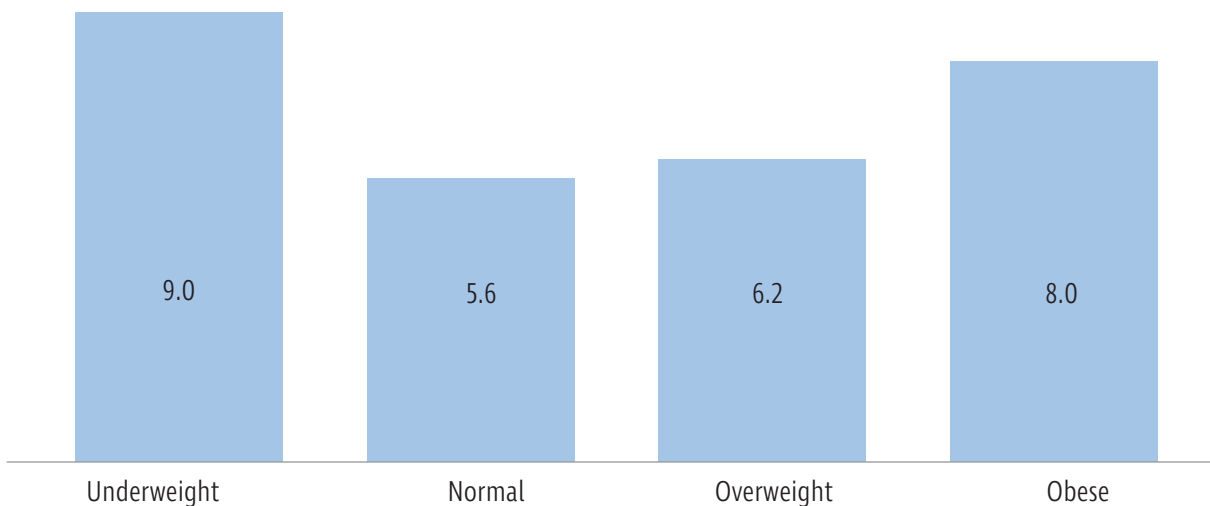
## Maternal Weight

Thirty-eight percent of infants who died had mothers who were obese (body mass index > 30mg/m<sup>2</sup>) prior to pregnancy. Obesity was more common in infants born to Black mothers, 45% versus 36% of those born to white mothers. In comparison, 35% of women ages 19-44 in Ohio are considered obese, according to the 2019 Ohio Medicaid Assessment Survey.

BMI-specific infant mortality rates show the highest rate of death among infants whose mothers were underweight (9.0 per 1,000 live births), followed by 8.0 for obese mothers, 6.2 for overweight mothers, and 5.6 for normal weight mothers (Figure 18).

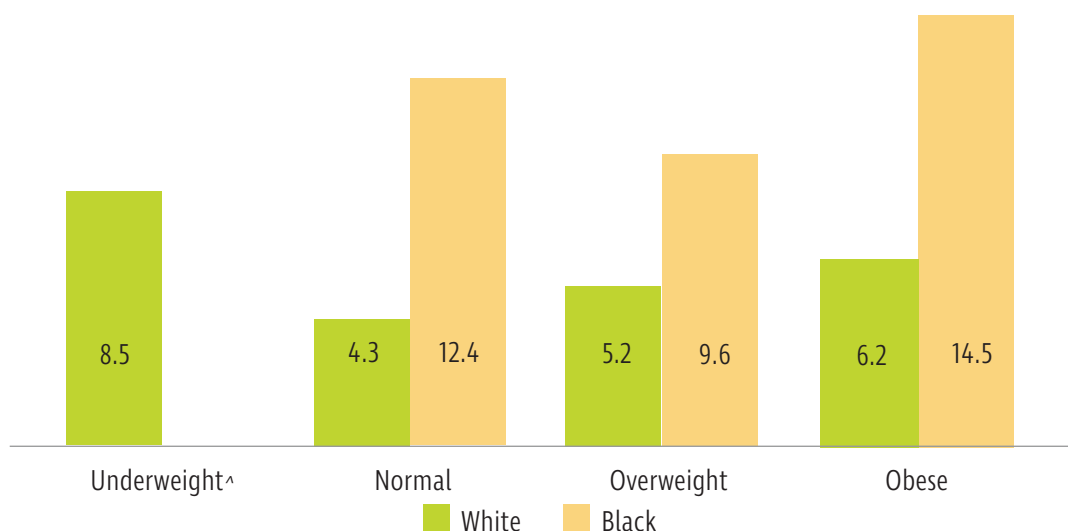
Causes of death varied by mother's body mass index (BMI) category. Prematurity related conditions were more frequently the cause of death among overweight and obese mothers (32% and 30%, respectively) than among normal weight mothers (27%).

Figure 18: Infant Mortality Rate (per 1,000 live births) by Mother's BMI\*, Ohio (2019)



\*BMI = Body Mass Index. A BMI < 18.5 is considered underweight, a BMI between 18.5 and 24.9 is normal, a BMI between 25 and 29 is overweight, and a BMI ≥ 30 is obese.  
Data Source: Resident Birth and Mortality Files from the Ohio Department of Health Bureau of Vital Statistics.

Figure 19: Infant Mortality Rate (per 1,000 live births) by Mother's BMI\* and Race, Ohio (2019)

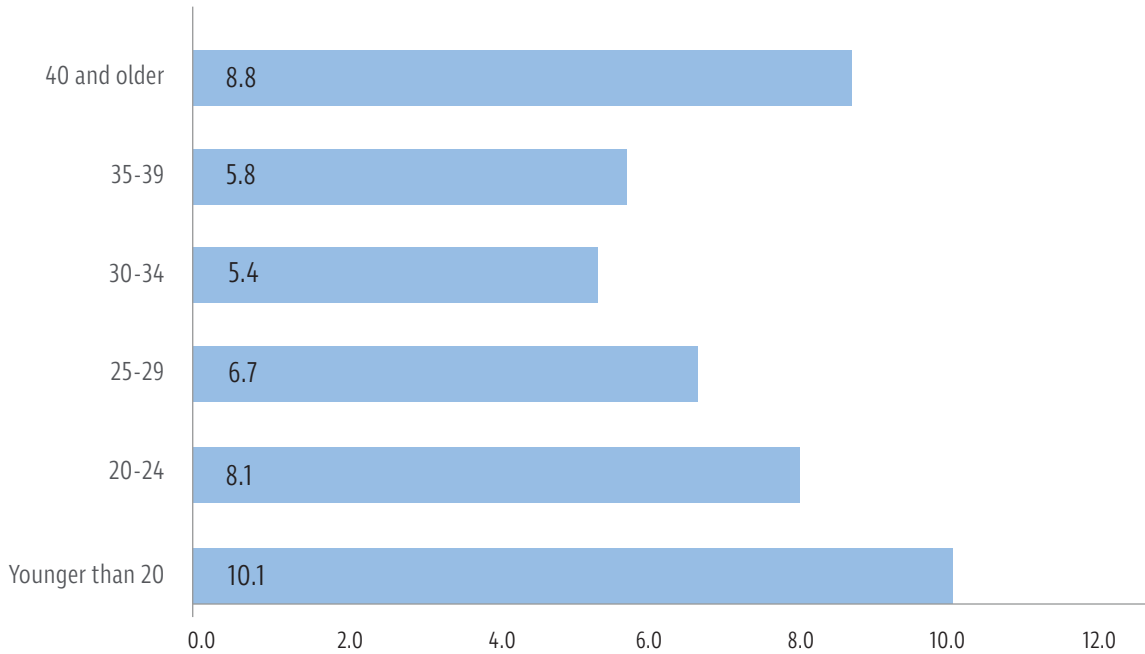


\*BMI = Body Mass Index. A BMI < 18.5 is considered underweight, a BMI between 18.5 and 24.9 is normal, a BMI between 25 and 29 is overweight, and a BMI ≥ 30 is obese.  
<sup>^</sup>The number of infant deaths to Black mothers was less than 9. Therefore, Black infant mortality rate is suppressed.  
Data Source: Resident Birth and Mortality Files from the Ohio Department of Health Bureau of Vital Statistics.

## Maternal Age

Infant mortality rates varied by maternal age group (Figure 20). Infants with mothers younger than 20 experienced the highest infant mortality rate (10.1 per 1,000 live births), followed by those with mothers aged 40 and older (8.8). The lowest infant mortality rate was for infants whose mothers were between the ages of 30 and 34 (5.4 deaths per 1,000 live births).

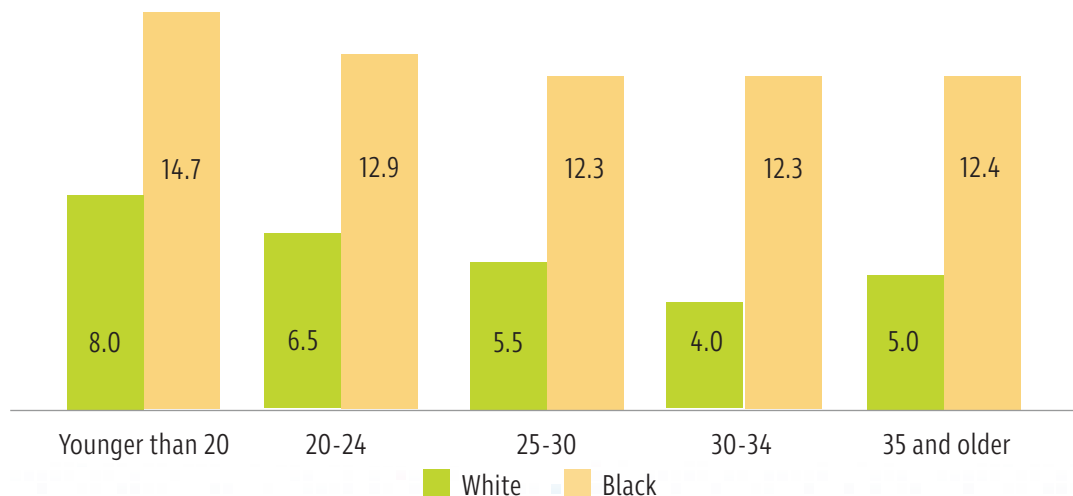
Figure 20: Infant mortality rate (per 1,000 live births) by maternal age, Ohio (2019)



Data Source: Resident Birth and Mortality Files from the Ohio Department of Health Bureau of Vital Statistics.

The age group that had the greatest disparity between Black and white infant mortality was 30-34 years. The Black infant mortality rate for infants with mothers aged 30-34 years was 12.3 per 1,000 live births, more than three times greater than the white infant mortality rate of 4.0 for the same maternal age group. In contrast, while infants born to mothers younger than age 20 had the highest mortality rate overall, the Black/white infant mortality ratio was smallest for this maternal age group. The mortality rate for infants born to Black mothers younger than age 20 was 14.7, compared with 8.0 for infants born to white mothers younger than age 20 (Figure 21).

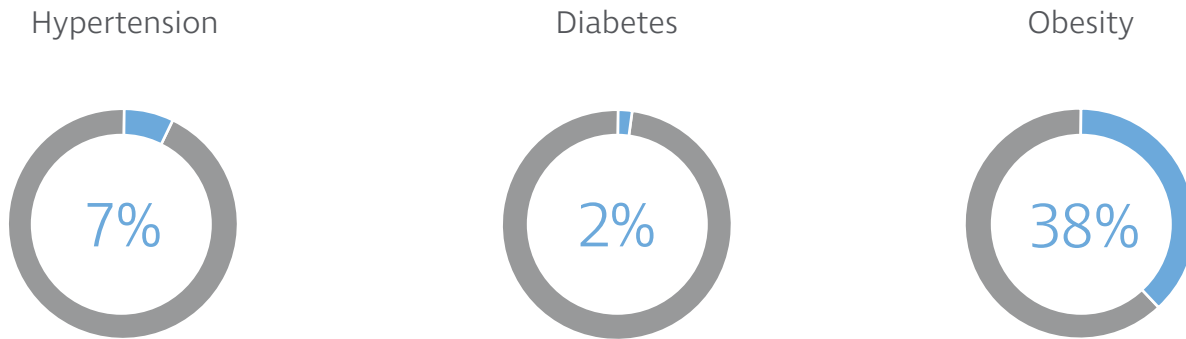
Figure 21: Infant Mortality Rate by Maternal Age and Race, Ohio (2019)



Data Source: Period Linked Infant Death File from the Ohio Department of Health, Bureau of Vital Statistics.

## Pre-pregnancy Maternal Health Conditions

Among infants who died, 7% had mothers with pre-pregnancy hypertension, and 2% had mothers with pre-pregnancy diabetes.

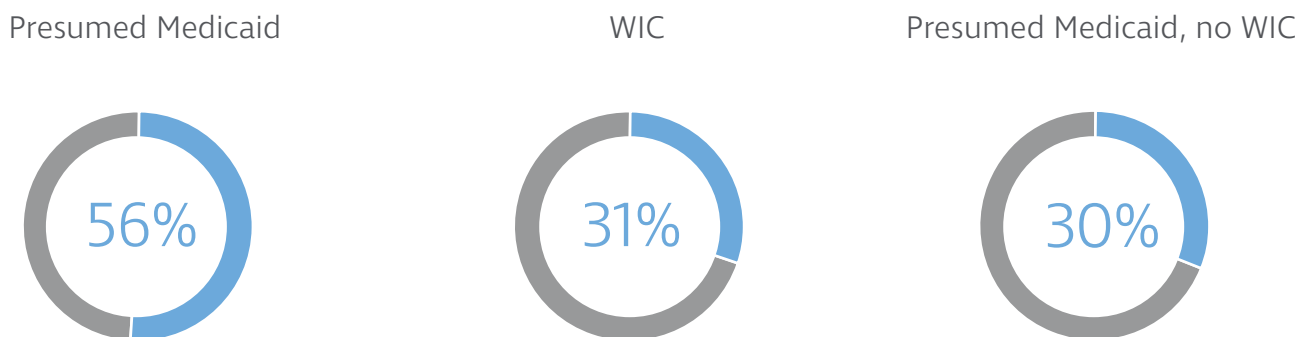


## Access to Care

More than half of infant deaths (56%) were to mothers reporting Medicaid<sup>+</sup> as their source of insurance. This was the same as the percentage of births that were paid for by Medicaid.

Thirty percent of infants who died had mothers who reported Medicaid insurance but did not participate in the Supplemental Nutrition Program for Women, Infants, and Children (WIC), a program that reduces infant mortality by reducing the incidence of babies born at low birthweights and provides support services necessary for full-term pregnancies. This suggests that these women may have been eligible for WIC but did not or could not access it.

Lack of prenatal care in the first trimester was common. Overall, 43% of infants who died were born to mothers who did not receive first trimester prenatal care. This was more common among infants born to Black mothers (47%), compared with those born to white mothers (41%). For comparison, just 27% of Ohio infants born in 2019 did not have first trimester prenatal care.



<sup>+</sup> Determined by payor of birth as indicated on the birth record.

The Ohio Department of Health (ODH) is leveraging datasets on the InnovateOhio Platform (IOP) to establish cross-program and cross-agency strategic initiatives that lead to better health outcomes.

- **Cross-Program Eligibility:** ODH is working with the Ohio Department of Job and Family Services (ODJFS) on a portal to confirm financial eligibility for WIC participation. With a WIC applicant's permission, local WIC staff can search the name and date of birth to find out if the applicant is enrolled in Medicaid, and/or receives Supplemental Nutrition Assistance Program (SNAP) benefits, and/or Temporary Assistance for Needy Families (TANF). Participation in these programs automatically qualifies an applicant financially for WIC services.
- **Home Visiting Referral Portal:** The Help Me Grow Web Referral Form is an online form that can be used to refer a pregnant woman/new parent to Home Visiting, Early Intervention, and/or WIC. Once completed, the form is automatically sent to the appropriate party and follow ups are made. The form is available at [www.helpmegrow.org](http://www.helpmegrow.org) under the "Sign Up or Refer" section.

As outreach occurs, WIC offices will work with ODH to document and report outreach attempts in order to secure enrollment.

## Infants Born at Less Than 24 Weeks Gestation

As shown in Figure 10, 35% of infants who died in 2019 were born before reaching 24 weeks gestation, despite accounting for just 0.3% of births. Infant deaths at less than 24 weeks gestation were more common among Black infants (48%) than white infants (43%) (Figure 22).

### *Prior to pregnancy*

- Forty-two percent of these infants had mothers who were obese prior to pregnancy.
- Twenty-two percent of infants who died and were born before 24 weeks gestation had mothers who smoked during the three months prior to becoming pregnant.
- Nineteen percent were conceived less than six months after a previous live birth, and more than half (53%) were conceived less than 18 months after a previous live birth.
- Fifteen percent were born to mothers who had a previous preterm birth.

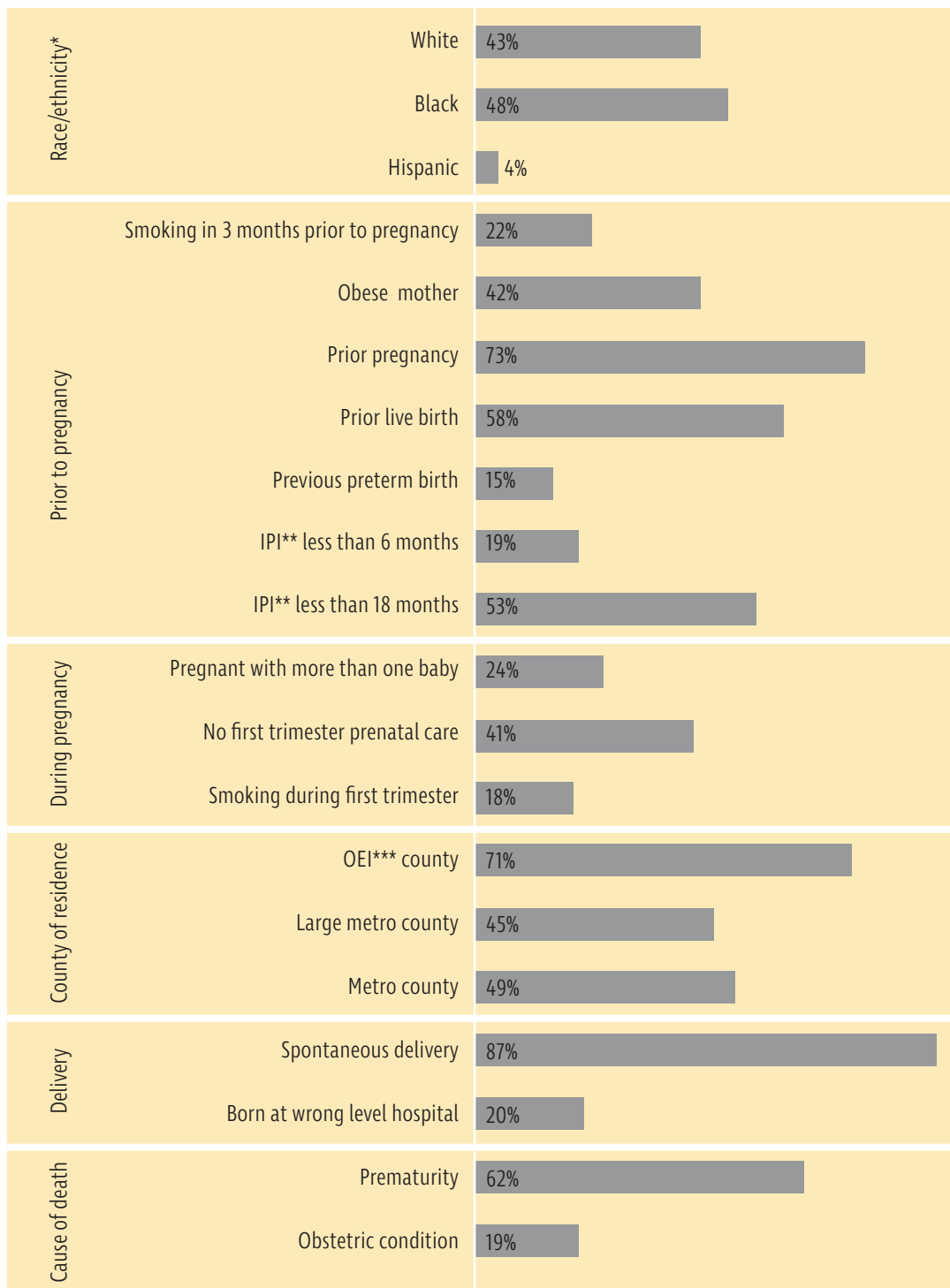
### *During pregnancy*

- Forty-one percent of infants who died and were born before 24 weeks gestation were born to mothers who did not have first trimester prenatal care.
- Twenty-four percent of infants who died and were born before 24 weeks gestation were part of multiple births (non-singleton births, such as twin or triplet births).
- Eighteen percent had mothers who smoked during the first trimester of pregnancy.

### *Cause of death*

- Among infants who died and were born before 24 weeks gestation, 62% died of prematurity and related conditions, and 19% died of obstetric conditions.

Figure 22: Maternal and infant attributes of Ohio infants who were born before 24 weeks gestation and died (2019)



Data Source: Resident Birth and Mortality Files from the Ohio Department of Health Bureau of Vital Statistics.

\*There were 18 infant deaths born to mothers of a race other than white or Black and 14 with unknown race.

\*\*Interpregnancy interval.

\*\*\*Ohio Equity Institute; OEI counties include nine Ohio counties with the greatest racial disparities in infant mortality. (See Appendix A.)

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## METHODS

This report contains data from the Birth Resident, Mortality, and Infant Mortality Period datasets that are part of Ohio's Vital Statistics System. The datasets were downloaded from the Secure Ohio Public Health Information Warehouse, a self-service online tool that allows authorized users to obtain the most recent public health data available about Ohio. The numerator for rates (deaths) is calculated from the Mortality dataset while the denominator (live births) is calculated from the Birth Resident dataset. Therefore, for race and ethnic specific rates, the numerator is based on infant race as reported on the death certificate, while the denominator is based on mother's race as reported on the birth certificate. Rates and percentages for subcategories with fewer than 10 infant deaths are suppressed due to insufficient reliability or confidentiality requirements. Causes of infant death were categorized using modified Dollfus criteria, which organizes infant deaths by cause and amenability to prevention efforts.<sup>2</sup>

For "Section 2: A Deeper Look," race and ethnicity are defined as the mother's self-reported race and ethnicity on the birth certificate.

Trend analyses were conducted using Joinpoint software, which tests for significant trends over time and identifies time points where changes in trends occur. References to rates increasing, decreasing, or being different from one another indicate that differences or changes are statistically significant at the  $p < 0.05$  level. When there appear to be observed differences between categories or over time, but these differences are not statistically significant, they are not mentioned in the text.

The Jenks natural breaks classification method was used to group counties by infant mortality rate for the map on page 8. This data clustering method creates classes or groups based on natural groupings. This is done by reducing the variance within classes and maximizing the variance between classes.

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## REFERENCES

1. Health Policy Institute of Ohio. Ohio 2020-2022 State Health Improvement Plan. June 2020. Available at <https://odh.ohio.gov/wps/portal/gov/odh/about-us/sha-ship/State-Health-Improvement-Plan>. Accessed on September 18, 2020.
2. Nakamura AM, Dove MS, Minnal A, Damesyn M, Curtis MP. Infant Mortality: Development of a Proposed Update to the Dollfus Classification of Infant Deaths. Public Health Rep. 2015;130(6):632-642. doi:10.1177/003335491513000613.

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## APPENDIX A:

### Ohio Equity Institute 2.0 – Working to Achieve Equity in Birth Outcomes

In 2019, two-thirds of mothers who experienced an infant loss lived in one of nine Ohio counties; a disproportionate number of these mothers were Black. Due to this alarming trend, the Ohio Department of Health continues to make strategic investments in the nine counties that carry the greatest burden of infant deaths and greatest racial disparities in infant deaths. These counties include: Butler, Cuyahoga, Franklin, Hamilton, Lucas, Mahoning, Montgomery, Stark, and Summit. Support is prioritized in these target geographies for a series of infant mortality-reduction strategies, including infant safe sleep education and access to cribs, perinatal smoking cessation services, evidence-based home visiting, reproductive health and wellness resources, birth defects surveillance, access to the Women, Infant and Children (WIC) program, and Fetal Infant Mortality Review boards.

In 2013, a local team was formed in each of these nine counties to create the Ohio Equity Institute (OEI). The current OEI structure (OEI 2.0) was developed in an effort to address key drivers of inequities in infant mortality and prioritizes the populations most vulnerable for poor birth outcomes.

Local ODH-funded OEI 2.0 teams are charged with implementing two strategies:

1. **Upstream strategy:** Local entities facilitate the development, adoption, or improvement of policies and/or practices that impact the social determinants of health related to preterm birth and low birth weight, which often drive the inequities in birth outcomes within the OEI counties. Upstream efforts further focus on:

Reducing barriers for priority pregnant women to access clinical and social services by improving the quality, availability, and cultural competence of service delivery.

Working with local leadership and partners who can directly address identified barriers to a healthy pregnancy (such as housing, transportation, or food access) through the adoption or improvement of policies and/or practices.

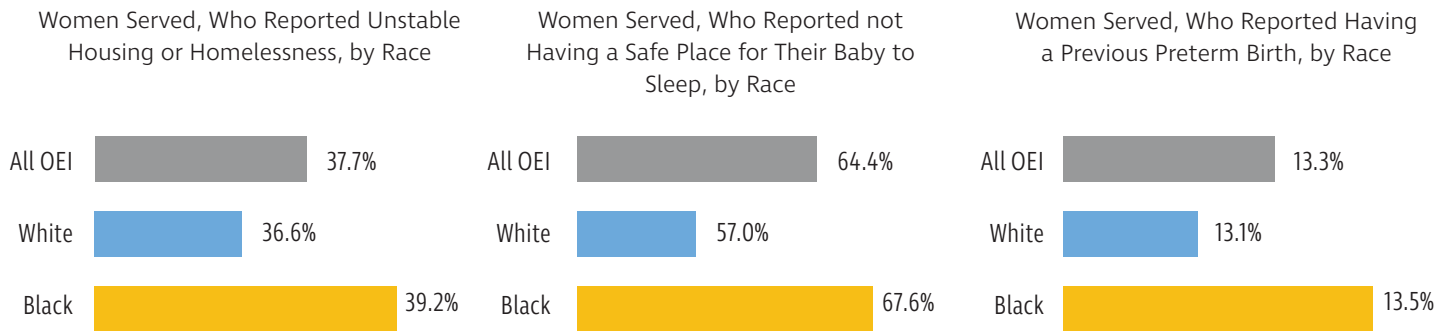
Policy and practice changes adopted during year one of the grant were implemented in year two. OEI teams used local data to determine the most impactful areas to focus policy and practice change efforts. Most OEI teams are focused on practice and policy changes in the areas of housing, transportation, and access to healthcare.

2. **Downstream strategy:** Local neighborhood navigators identify and connect a portion of each county's Black prenatal population to clinical and social services to reduce stress and improve access to resources needed for new and growing families. Efforts prioritize non-traditional avenues of outreach designed and tailored to identify women not currently reached by existing systems and programs.

Streamlining access and referrals to resources and services for our moms and babies is paramount to ensuring each woman receives the totality of support she wants and deserves during her pregnancy.

OEI strives for 80% of pregnant women served through neighborhood navigation to self-identify as Black. From Oct. 1, 2019 – Sept. 5, 2020, nearly 70% of the women served were Black. Of all women served during this same timeframe, 37.7% reported a history of unstable housing or homelessness, 64.4% reported they did not have a safe place for their baby to sleep, and 13.3% reported experiencing a previous preterm birth (Figure A1 page 29).

Figure A1



OEI teams work diligently to support the pregnant women they serve and connect them to needed community resources. Local OEI teams collectively employed roughly 30 neighborhood navigators. Each OEI team designs unique community outreach strategies aimed at identifying unreached pregnant women in their neighborhoods, communities, and counties. Outreach strategies include canvassing neighborhoods, talking to moms at grocery stores and corner stores, use of social media, and creating partnerships with local hospitals and other local social service organizations.

OEI teams receive technical assistance to support their local capacity in program design and implementation, epidemiology, monitoring and evaluation, and community engagement. Support is provided by the Ohio Department of Health, as well as contracted vendors to ensure targeted, unique technical assistance for each individual team.

The fiscal year 2019 OEI report can be accessed at <https://odh.ohio.gov/wps/portal/gov/odh/know-our-programs/infant-vitality/oei/2019-oei-annual-report>.

Figure A2: Trends in Infant Mortality rate (per 1,000 live births), by OEI County and Race (2015-2019)

--White --Black --All Races



Data Source: Ohio Department of Health Bureau of Vital Statistics. \*Rates based on fewer than 10 deaths do not meet standards of reliability or precision and are suppressed.

Note: The number of Black infant deaths in Butler, Mahoning, and Stark counties were less than 10 in multiple years. For this reason, trends are not shown for Black infant mortality in these counties. Additionally, the number of white infant deaths in Mahoning County was less than 10 in multiple years; therefore, trends are not shown for white infant mortality in Mahoning County.

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## Appendix B: Ohio Department of Health Activities That Contribute to Reducing Infant Mortality

### Maternal & Infant Wellness/Home Visiting

The Ohio Department of Health invests in several key strategies aimed at reducing infant deaths, including: safe sleep education and access to cribs, perinatal smoking cessation services, pre- and interconception health efforts, and Ohio Equity Institute: Working to Achieve Equity In Birth Outcomes Neighborhood Navigation for pregnant women.

- Cribs for Kids® Programs provided safety-approved cribs and infant safe sleep education, based on the recommendations from the American Academy of Pediatrics, to 5,961 families in federal fiscal year 2019 (FFY19).
- The Mom's Quit for Two program funded 19 projects that follow the Baby Me Tobacco Free modality, as well as the 5 A's of Smoking Cessation (Ask, Advise, Assess, Assist, and Arrange) to serve 576 clients in state fiscal year 2020 (SFY20).
- The Ohio Equity Institute connected 1,522 pregnant women to clinical and social services through neighborhood navigation (FFY19).
- The Maternal Child Health Program funded 20 subgrantees to improve access to health and wellness, prenatal care, preventative medical visits information, and referrals, and to develop and implement workplace policies that support women's health initiatives in the workplace (FFY19).
- Evidence-based early childhood home visiting has proven effective for improving maternal and infant health outcomes and family wellbeing and is a priority initiative of Ohio Governor Mike DeWine. The Ohio Department of Health administers the implementation of four evidence-based and evidence-informed home visiting models across the state – Nurse Family Partnership, Healthy Families America, Parents as Teachers, and Moms & Babies First. ODH's Early Childhood Home Visiting System is funded through Ohio's General Revenue Fund; the Federal Health Resources & Services Administration's Maternal, Infant, and Early Childhood Home Visiting Program (MIECHV); the Maternal Child Health Block Grant; and the Ohio Department of Medicaid. Enrollment in home visiting across Ohio increased in SFY20. See below.

ODH Early Childhood Home Visiting	SFY19	SFY20
All Models	9,650	10,756
Nurse Family Partnership	719	1,254
Healthy Families America	7,263	7,556
Parents as Teachers	618	606
Moms & Babies First	1,050	1,349

## Implicit Bias Training

Implicit bias refers to the attitudes or stereotypes that affect our understanding, actions, and decisions in an unconscious manner. They are activated involuntarily and without an individual's awareness or intentional control. Biases reside deep in the subconscious and cause us to have feelings and attitudes about other people based on characteristics such as race, ethnicity, age, and appearance. They are associative in nature and can be formed through repeated exposure or experiences. It's important to explore types of implicit biases, understand them, what effects they can cause, and how to address them.

Implicit bias impacts all aspects of our decision-making and thus is a contributing factor to health disparities. Health disparities are the differences in the incidence and prevalence of health conditions and health status between groups. Educating staff at the state and local level about implicit bias supports maternal, child, and family health practitioners in taking action to ensure equitable development and implementation of policies and programs that impact the women, children, and families served.

Ensuring programs are equitably designed and delivered by agency staff and subrecipients is paramount to ensuring equity in maternal and child health outcomes.

The first round of implicit bias trainings began with Ohio Department of Health, Bureau of Maternal, Child and Family Health (BMCFH) program and policy staff on September 2019, was followed by five subsequent trainings that were hosted in the five Ohio regions for BMCFH grantees, and ended in January 2020. The trainings served 193 participants total.

The second round of implicit bias trainings was hosted by the Ohio Department of Health Pregnancy-Associated Mortality Review (PAMR) program. One training was held for Ohio Department of Health staff on May 12-13, 2020, followed by five virtual trainings for maternal healthcare providers on July 15, August 5, August 12, September 1-2, and September 15-16, 2020. These trainings served 208 participants total.

Among the 208 participants in the second round of trainings, 37% were registered nurses, 10% were social workers, and 5% were community health workers. The remaining participants ranged from lactation consultants, OB/GYN or family medicine providers, dietitians, certified midwives, and other public health employees (i.e. WIC, home visiting, OEI, etc.).

The ODH PAMR program will continue to hold 15 additional trainings between October 1, 2020, and June 30, 2022. The next five trainings have been scheduled for October 20, 2020, December 2, 2020, December 8, 2020, January 12-13, 2021, and February 9, 2021.

Appendix C:

Supplementary Data Tables

Table C1: Ohio Neonatal, Postneonatal, and Infant Mortality, by County (2019)

Area	Neonatal Deaths***	Neonatal Mortality Rate	Postneonatal Deaths****	Postneonatal Mortality Rate	Total Infant Deaths	Infant Mortality Rate	Total Births
Adams	0	*	1	*	1	*	333
Allen	6	*	1	*	7	*	1,259
Ashland	5	*	2	*	7	*	580
Ashtabula	3	*	3	*	6	*	1,086
Athens	0	*	2	*	2	*	488
Auglaize	2	*	1	*	3	*	528
Belmont	3	*	3	*	6	*	657
Brown	1	*	4	*	5	*	489
Butler	20	4.5	12	2.7**	32	7.2	4,470
Carroll	0	*	2	*	2	*	280
Champaign	2	*	0	*	2	*	383
Clark	8	*	1	*	9	*	1,574
Clermont	3	*	5	*	8	*	2,247
Clinton	0	*	1	*	1	*	465
Columbiana	5	*	1	*	6	*	1,022
Coshocton	2	*	4	*	6	*	445
Crawford	0	*	2	*	2	*	454
Cuyahoga	79	5.7	41	2.9	120	8.6	13,937
Darke	1	*	0	*	1	*	612
Defiance	4	*	1	*	5	*	416
Delaware	6	*	1	*	7	*	2,147
Erie	6	*	0	*	6	*	744
Fairfield	11	6.2**	3	*	14	7.9**	1,772
Fayette	0	*	0	*	0	*	298
Franklin	85	4.6	42	2.3	127	6.9	18,350
Fulton	5	*	0	*	5	*	481
Gallia	2	*	3	*	5	*	350
Geauga	5	*	1	*	6	*	895
Greene	8	*	2	*	10	5.8**	1,718
Guernsey	3	*	1	*	4	*	447
Hamilton	72	6.8	27	2.5	99	9.3	10,608
Hancock	1	*	0	*	1	*	889
Hardin	1	*	0	*	1	*	390
Harrison	0	*	0	*	0	*	144
Henry	1	*	0	*	1	*	307
Highland	2	*	3	*	5	*	530
Hocking	0	*	2	*	2	*	312
Holmes	3	*	2	*	5	*	781
Huron	3	*	1	*	4	*	683
Jackson	2	*	0	*	2	*	348

Table C1 continued

Area	Neonatal Deaths***	Neonatal Mortality Rate	Postneonatal Deaths****	Postneonatal Mortality Rate	Total Infant Deaths	Infant Mortality Rate	Total Births
Jefferson	2	*	2	*	4	*	664
Knox	2	*	3	*	5	*	715
Lake	3	*	1	*	4	*	2,188
Lawrence	2	*	0	*	2	*	631
Licking	7	*	2	*	9	*	2,004
Logan	1	*	0	*	1	*	535
Lorain	10	3.1**	4	*	14	4.3**	3,266
Lucas	28	5.4	21	4.0	49	9.4	5,231
Madison	1	*	1	*	2	*	460
Mahoning	16	6.6**	7	*	23	9.5	2,431
Marion	1	*	4	*	5	*	740
Medina	3	*	0	*	3	*	1,690
Meigs	0	*	2	*	2	*	212
Mercer	0	*	2	*	2	*	606
Miami	4	*	4	*	8	*	1,239
Monroe	0	*	0	*	0	*	141
Montgomery	40	6.2	18	2.8**	58	9.0	6,409
Morgan	0	*	0	*	0	*	133
Morrow	1	*	0	*	1	*	368
Muskingum	9	*	3	*	12	12.5**	957
Noble	1	*	0	*	1	*	145
Ottawa	2	*	0	*	2	*	330
Paulding	2	*	0	*	2	*	221
Perry	0	*	1	*	1	*	416
Pickaway	5	*	5	*	10	17.0**	587
Pike	2	*	1	*	3	*	362
Portage	11	8.2**	2	*	13	9.7**	1,342
Preble	3	*	1	*	4	*	427
Putnam	0	*	0	*	0	*	427
Richland	5	*	3	*	8	*	1,432
Ross	5	*	2	*	7	*	786
Sandusky	4	*	2	*	6	*	651
Scioto	3	*	4	*	7	*	777
Seneca	1	*	2	*	3	*	559
Shelby	3	*	2	*	5	*	620
Stark	15	3.7**	7	*	22	5.4	4,104
Summit	18	3.1**	17	2.9**	35	6.0	5,859
Trumbull	9	*	2	*	11	5.1**	2,150
Tuscarawas	4	*	4	*	8	*	1,165
Union	2	*	1	*	3	*	709
Van Wert	0	*	1	*	1	*	359

Table C1 continued

Area	Neonatal Deaths***	Neonatal Mortality Rate	Postneonatal Deaths****	Postneonatal Mortality Rate	Total Infant Deaths	Infant Mortality Rate	Total Births
Vinton	1	*	0	*	1	*	124
Warren	4	*	4	*	8	*	2,456
Washington	0	*	1	*	1	*	622
Wayne	10	6.9**	3	*	13	9.0**	1,441
Williams	3	*	0	*	3	*	436
Wood	10	7.8**	1	*	11	8.5**	1,287
Wyandot	1	*	0	*	1	*	227
Total	614	4.6	315	2.3	929	6.9	134,560

Data Source: Ohio Department of Health, Bureau of Vital Statistics.

\* Rates based on fewer than 10 deaths do not meet standards of reliability or precision and are suppressed.

\*\* Rates based on fewer than 20 infant deaths should be interpreted with caution.

\*\*\* Neonatal Death – Death of a live-born infant during the first 27 days of life.

\*\*\*\* Postneonatal Death – Death of infant aged 28 days through 364 days of life.

\*\*\*\*\* The total for Ohio includes six births with unknown county of residence.

Table C2: All Deaths

Attribute	Percentage	Numerator	Denominator
<b>Behavioral</b>			
Mother smoked pre-pregnancy	24.1	216	896
Mother smoked first trimester	20.5	184	896
Mother smoked third trimester	15.0	134	895
Interpregnancy interval < 18 months	46.0	172	374
Interpregnancy interval < 6 months	15.2	57	374
<b>Social</b>			
Low income (presumed Medicaid)	55.7	497	893
Education less than high school	20.9	187	893
Father not on birth certificate	32.7	304	929
<b>Medical: Pre-pregnancy</b>			
Obesity	37.6	332	883
Hypertension	7.1	65	917
Diabetes	2.2	20	917
<b>Medical: Pregnancy</b>			
Gestational hypertension	7.9	72	917
Gestational diabetes	5.6	51	917
Twin or higher order pregnancy	14.1	129	917
<b>Healthcare and services</b>			
No first trimester prenatal care	43.3	354	818
Born in wrong level hospital***	10.9	94	864
WIC during pregnancy	30.7	272	885
No WIC but probably eligible	30.3	265	874
<b>Maternal pregnancy history</b>			
Prior pregnancy	75.4	678	899
Prior live birth	65.2	587	900
Prior preterm birth	13.3	122	917
<b>Demographic: Mother's race</b>			
Black	34.3	319	929
White	57.5	534	929
<b>Demographic: Mother's ethnicity</b>			
Hispanic	5.0	46	917
Non-Hispanic**	95.0	871	917
<b>Demographic: Mother's age (years)</b>			
< 18	2.1	19	910
18-19	5.7	52	910
20-24	25.3	230	910
25-29	30.8	280	910
30-34	22.5	205	910
35-39	10.6	96	910
40 or older	3.1	28	910
<b>Demographic: County of residence at death****</b>			
OEI county	60.8	565	929
Large metro county	37.2	346	929
Metro county	53	492	929

Table C2 continued

Attribute	Percentage	Numerator	Denominator
Micro county	9.3	86	929
Rural county	*	*	*
<b>Delivery: Gestational age</b>			
Before 20 weeks	10.3	93	906
20-23 weeks	24.8	225	906
24-27 weeks	11.8	107	906
28-33 weeks	9.5	86	906
34-36 weeks	9.7	88	906
37 weeks or more	33.9	307	906
<b>Delivery: Birth weight</b>			
Less than 500 grams	24.2	203	838
500-999 grams	19.5	163	838
1,000-1,499 grams	6.1	51	838
1,500-1,999 grams	5.6	47	838
2,000-2,499 grams	8.8	74	838
2,500 or more grams	35.8	300	838
Small for gestational age (SGA)	19.5	163	834
<b>Death: Timing</b>			
Within first hour of life	14.4	134	929
By end of first day	28.2	262	929
By end of first week	10.3	96	929
By end of first month	13.4	124	929
Before first birthday	33.7	313	929
<b>Death: Location</b>			
Within hospital as inpatient	74.1	688	929
ER or outpatient setting	15.4	143	929
Dead on arrival	*	*	*
Home	8.4	78	929
Hospice/nursing home/long term care facility	*	*	*
Other	1.2	11	929
<b>Dollfus cause of death category</b>			
Prematurity	28.6	266	929
Congenital anomaly	19.5	181	929
Obstetric condition	7.4	69	929
SIDS	5.8	54	929
External injuries	12	111	929
Perinatal infections	5.8	54	929
Birth asphyxia	2.1	19	929
Other infections	3.7	34	929
Other	15.2	141	929

\*Figure does not meet standards of reliability or precision, based on fewer than 10 deaths in the numerator. \*\*Non-Hispanic deaths include those of unknown or missing ethnicity. \*\*\*An infant born in a hospital without the appropriate level of care given the infant's gestational age and/or birth weight. Denominator includes infants born in a facility. \*\*\*\*County designations: **Large metro** (Cuyahoga, Franklin, Hamilton); **Metro** (Allen, Ashland, Ashtabula, Athens, Belmont, Butler, Clark, Clermont, Columbiana, Delaware, Erie, Fairfield, Geauga, Greene, Hancock, Huron, Jefferson, Knox, Lake, Lawrence, Licking, Lorain, Lucas, Mahoning, Marion, Medina, Miami, Montgomery, Muskingum, Pickaway, Portage, Richland, Ross, Sandusky, Scioto, Seneca, Stark, Summit, Trumbull, Tuscarawas, Union, Warren, Wayne, Wood); **Micro** (Auglaize, Brown, Carroll, Champaign, Clinton, Coshocton, Crawford, Darke, Defiance, Fayette, Fulton, Gallia, Guernsey, Hardin, Henry, Highland, Hocking, Holmes, Jackson, Logan, Madison, Meigs, Mercer, Morrow, Ottawa, Perry, Pike, Preble, Putnam, Shelby, Van Wert, Washington, Williams, Wyandot); **Rural** (Adams, Harrison, Monroe, Morgan, Noble, Paulding, Vinton); **OEI** (Butler, Cuyahoga, Franklin, Hamilton, Lucas, Mahoning, Montgomery, Stark, Summit).

Table C3: Deaths Among Infants Born &lt; 24 Weeks Gestation

Attribute	Percentage	Numerator	Denominator
<b>Behavioral</b>			
Mother smoked pre-pregnancy	22.1	68	308
Mother smoked first trimester	17.9	55	308
Interpregnancy interval < 18 months	50.7	36	71
Interpregnancy interval < 6 months	21.1	15	71
<b>Social</b>			
Low income (presumed Medicaid)	54.1	170	314
Education less than high school	19.7	60	304
Father not on birth certificate	39.6	126	318
<b>Medical: Pre-pregnancy</b>			
Obesity	42.4	130	307
Hypertension	6.3	20	318
Diabetes	*	*	*
<b>Medical: Pregnancy</b>			
Gestational hypertension	3.1	10	318
Gestational diabetes	3.1	10	318
Twin or higher order pregnancy	23.9	76	318
<b>Healthcare and services</b>			
No first trimester prenatal care	41.3	117	283
Born in wrong level hospital***	20.2	62	307
WIC during pregnancy	22.6	68	301
No WIC but probably eligible	35.2	105	298
<b>Maternal pregnancy history</b>			
Prior pregnancy	73.2	232	317
Prior live birth	58.4	185	317
Prior preterm birth	15.1	48	318
<b>Demographic: Mother's race</b>			
Black	42.5	135	318
White	47.5	151	318
<b>Demographic: Mother's ethnicity</b>			
Hispanic	4.4	14	318
Non-Hispanic**	95.6	304	318
<b>Demographic: Mother's age (years)</b>			
< 18	*	*	*
18-19	5.0	16	318
20-24	23.6	75	318
25-29	28.6	91	318
30-34	26.4	84	318
35-39	11.6	37	318
40 or older	3.1	10	318
<b>Demographic: County of residence at death****</b>			
OEI county	70.8	225	318
Large metro county	44.7	142	318

Table C3 continued

Attribute	Percentage	Numerator	Denominator
Metro county	49.4	157	318
Micro county	6.0	19	318
Rural county	*	*	*
<b>Delivery: Gestational age</b>			
Before 20 weeks	29.3	93	318
20-23 weeks	70.8	225	318
<b>Delivery: Birth weight</b>			
Less than 500 grams	72.6	185	255
500-999 grams	27.1	69	255
1,000-1,499 grams	*	*	*
1,500-1,999 grams	*	*	*
2,000-2,499 grams	*	*	*
2,500 or more grams	*	*	*
Small for gestational age (SGA)	*	*	*
<b>Death: Timing</b>			
Within first hour of life	29.3	93	318
By end of first day	56.6	180	318
By end of first week	5.7	18	318
By end of first month	6.0	19	318
Before first birthday	*	*	*
<b>Death: Location</b>			
Within hospital as inpatient	95.0	302	318
ER or outpatient setting	4.4	14	318
Dead on arrival	*	*	*
Home	*	*	*
Hospice/nursing home/long term care facility	*	*	*
Other	*	*	*
<b>Dollfus cause of death category</b>			
Prematurity	61.6	196	318
Congenital anomaly	*	*	*
Obstetric condition	19.2	61	318
SIDS	*	*	*
External injuries	*	*	*
Perinatal infections	8.5	27	318
Birth asphyxia	*	*	*
Other infections	*	*	*
Other	6.3	20	318

\*Figure does not meet standards of reliability or precision, based on fewer than 10 deaths in the numerator. \*\*Non-Hispanic deaths include those of unknown or missing ethnicity. \*\*\*An infant born in a hospital without the appropriate level of care given the infant's gestational age and/or birth weight. Denominator includes infants born in a facility. \*\*\*\*County designations: **Large metro** (Cuyahoga, Franklin, Hamilton); **Metro** (Allen, Ashland, Ashtabula, Athens, Belmont, Butler, Clark, Clermont, Columbiana, Delaware, Erie, Fairfield, Geauga, Greene, Hancock, Huron, Jefferson, Knox, Lake, Lawrence, Licking, Lorain, Lucas, Mahoning, Marion, Medina, Miami, Montgomery, Muskingum, Pickaway, Portage, Richland, Ross, Sandusky, Scioto, Seneca, Stark, Summit, Trumbull, Tuscarawas, Union, Warren, Wayne, Wood); **Micro** (Auglaize, Brown, Carroll, Champaign, Clinton, Coshocton, Crawford, Darke, Defiance, Fayette, Fulton, Gallia, Guernsey, Hardin, Henry, Highland, Hocking, Holmes, Jackson, Logan, Madison, Meigs, Mercer, Morrow, Ottawa, Pery, Pike, Preble, Putnam, Shelby, Van Wert, Washington, Williams, Wyandot); **Rural** (Adams, Harrison, Monroe, Morgan, Noble, Paulding, Vinton); **OEI** (Butler, Cuyahoga, Franklin, Hamilton, Lucas, Mahoning, Montgomery, Stark, Summit).

Table C4: Cause of Death

Attribute	Due to prematurity			Due to congenital anomaly			Due to obstetric condition			Due to external injury			Due to sudden infant death syndrome		
	%	Num.	Deno.	%	Num.	Deno.	%	Num.	Deno.	%	Num.	Deno.	%	Num.	Deno.
<b>Behavioral</b>															
Mother smoked pre-pregnancy	19.5	50	257	16.9	30	178	25.8	17	66	39.3	42	107	40.0	20	50
Mother smoked first trimester	15.2	39	257	12.9	23	178	21.2	14	66	35.5	38	107	38.0	19	50
Mother smoked last trimester	9.8	25	256	10.1	18	178	*	*	*	29.9	32	107	26.0	13	50
Interpregnancy interval < 18 months	56.1	37	66	40.7	35	86	*	*	*	50.8	33	65	54.3	19	35
Interpregnancy interval < 6 months	25.8	17	66	*	*	*	*	*	*	20.9	14	67	*	*	*
<b>Social</b>															
Low income (presumed Medicaid)	53.5	138	258	43.0	74	172	41.2	28	68	77.4	82	106	66.7	34	51
Education less than high school	17.1	43	251	22.0	39	177	25.8	17	66	20.6	22	107	37.3	19	51
Father not on birth certificate	35.3	94	266	19.3	35	181	44.9	31	69	39.6	44	111	27.8	15	54
<b>Medical: Pre-pregnancy</b>															
Obesity	39.8	101	254	33.9	59	174	39.4	26	66	29.5	31	105	52.9	27	51
Hypertension	10.2	27	265	*	*	*	*	*	*	*	*	*	*	*	*
Diabetes	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
<b>Medical: Pregnancy</b>															
Gestational hypertension	4.9	13	265	6.2	11	179	*	*	*	14.8	16	108	*	*	*
Gestational diabetes	4.2	11	265	7.8	14	179	*	*	*	9.3	10	108	*	*	*
Twin or higher order pregnancy	25.7	68	265	8.9	16	179	15.9	11	69	*	*	*	*	*	*
<b>Healthcare and services</b>															
No first trimester prenatal care	36.8	86	234	42.7	64	150	42.6	26	61	51.5	51	99	48.0	24	50
Born in wrong level hospital***	17.9	45	251	7.4	12	163	29.9	20	67	*	*	*	0	0	51
WIC during pregnancy	23.3	58	249	20.8	37	178	16.7	11	66	53.3	57	107	49.0	25	51
No WIC but probably eligible	35.0	86	246	26.7	46	172	24.2	16	66	30.2	32	106	23.5	12	51
<b>Maternal pregnancy history</b>															
Prior pregnancy	73.7	193	262	75.1	133	177	75.0	51	68	83.2	89	107	80.4	41	51
Prior live birth	58.0	152	262	68.4	121	177	64.7	44	68	79.4	85	107	76.5	39	51
Prior preterm birth	19.6	52	265	9.5	17	179	*	*	*	*	*	*	*	*	*
<b>Demographic: Mother's race</b>															
Black	37.2	99	266	21.0	38	181	37.7	26	69	30.6	34	111	42.6	23	54
White	53.0	141	266	71.8	130	181	47.8	33	69	64.0	71	111	48.2	26	54
<b>Demographic: Mother's Ethnicity</b>															
Hispanic	4.5	12	265	7.8	14	179	*	*	*	*	*	*	*	*	*
Non-Hispanic**	95.5	253	265	92.2	165	179	*	*	*	*	*	*	*	*	*
<b>Demographic: Mother's age (years)</b>															
< 18	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
18-19	6.5	17	263	*	*	*	*	*	*	*	*	*	*	*	*
20-24	24.7	65	263	20.7	37	179	22.1	15	68	32.7	35	107	19.6	10	51
25-29	27.8	73	263	35.2	63	179	25.0	17	68	31.8	34	107	39.2	20	51
30-34	24.3	64	263	21.2	38	179	35.3	24	68	15.9	17	107	*	*	*
35-39	12.6	33	263	11.7	21	179	*	*	*	*	*	*	*	*	*
40 or older	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

Table C4 continued

Attribute	Due to prematurity			Due to congenital anomaly			Due to obstetric condition			Due to external injury			Due to sudden infant death syndrome		
	%	Num.	Deno.	%	Num.	Deno.	%	Num.	Deno.	%	Num.	Deno.	%	Num.	Deno.
OEI county	64.7	172	266	55.8	101	181	63.8	44	69	55.0	61	111	74.1	40	54
Large metro county	41.4	110	266	29.8	54	181	47.8	33	69	29.7	33	111	46.3	25	54
Metro county	51.5	137	266	55.8	101	181	42.0	29	69	60.4	67	111	44.4	24	54
Micro county	7.1	19	266	14.4	26	181	*	*	*	9.9	11	111	*	*	*
Rural county	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
<b>Delivery: Gestational age</b>															
Before 20 weeks	22.4	59	264	*	*	*	33.8	23	68	*	*	*	*	*	*
20-23 weeks	51.9	137	264	*	*	*	55.9	38	68	*	*	*	*	*	*
24-27 weeks	18.9	50	264	*	*	*	*	*	*	*	*	*	*	*	*
28-33 weeks	*	*	*	22	39	177	*	*	*	*	*	*	*	*	*
34-36 weeks	*	*	*	21.5	38	177	*	*	*	17.9	19	106	*	*	*
37 weeks or more	*	*	*	49.7	88	177	*	*	*	75.5	80	106	86.3	44	51
<b>Delivery: Birth weight</b>															
Less than 500 grams	55.1	125	227	*	*	*	82.0	41	50	*	*	*	*	*	*
500-999 grams	36.1	82	227	9.3	16	172	*	*	*	*	*	*	*	*	*
1,000-1,499 grams	*	*	*	11.6	20	172	*	*	*	*	*	*	*	*	*
1,500-1,999 grams	*	*	*	15.1	26	172	*	*	*	*	*	*	*	*	*
2,000-2,499 grams	*	*	*	18.6	32	172	*	*	*	*	*	*	*	*	*
2,500 or more grams	*	*	*	43.0	74	172	*	*	*	86.0	92	107	82.4	42	51
Small for gestational age (SGA)	11.1	25	226	35.5	61	172	*	*	*	16.0	17	106	23.5	12	51
<b>Death: Timing</b>															
Within first hour of life	23.7	63	266	12.2	22	181	33.3	23	69	*	*	*	*	*	*
By end of first day	46.6	124	266	28.2	51	181	59.4	41	69	*	*	*	*	*	*
By end of first week	12.8	34	266	14.9	27	181	*	*	*	*	*	*	*	*	*
By end of first month	12.0	32	266	16.0	29	181	*	*	*	*	*	*	*	*	*
Before first birthday	4.9	13	266	28.7	52	181	*	*	*	90.1	100	111	81.5	44	54
<b>Death: Location</b>															
Within hospital as inpatient	94.7	252	266	81.8	148	181	94.2	65	69	17.1	19	111	*	*	*
ER or outpatient setting	4.5	12	266	*	*	*	*	*	*	55.0	61	111	57.4	31	54
Dead on arrival	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Home	*	*	*	10.5	19	181	*	*	*	24.3	27	111	20.4	11	54
Hospice/nursing home/long term care facility	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Other	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

Table C5: Ohio Infant Mortality Rates by Cause of Death (2010-2019)

Year	Prematurity	Congenital anomaly	Obstetric condition	External injury	Sudden infant death syndrome
2010	2.2	1.5	0.7	0.5	0.8
2011	2.2	1.6	0.8	0.6	0.7
2012	2.3	1.6	0.7	0.6	0.6
2013	2.1	1.5	0.6	0.5	0.6
2014	2.1	1.4	0.6	0.4	0.5
2015	2.0	1.3	0.7	0.7	0.6
2016	2.3	1.4	0.6	0.5	0.5
2017	2.3	1.3	0.7	0.6	0.5
2018	2.0	1.5	0.4	0.7	0.6
2019	2.0	1.3	0.5	0.8	0.4





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