Illinois Infant Mortality Report

December 2020

Illinois Department of Public Health

Office of Women's Health and Family Services

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Figures and Tables

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The Illinois Department of Public Health would like to acknowledge the families and communities that have been affected by infant mortality, stillbirth, and pregnancy loss.

We hope our work to understand the causes of infant death will prevent other families from suffering through similar tragedies.

Executive Summary

Infant mortality, or the death of an infant before their first birthday, is a tragic event for families and communities. The purpose of this report is to present information about infant mortality in Illinois to inform prevention efforts and support public health programs in improving infant health.

Key Findings

- In 2018, the infant mortality rate was 6.5 deaths per 1,000 live births, slightly higher than the U.S. national rate of 5.7 per 1,000.
- In 2018, Illinois ranked 36th out of 50 states in infant mortality.
- Infants born to Black women die at rates more than double that of infants born to White, Hispanic, and Asian women.
- The leading causes of death for infants in 2018 were: prematurity or fetal malnutrition, birth defects, sudden unexpected infant death (SUID), and complications during pregnancy and delivery.
- The overall infant mortality rate decreased 22% from 2000 to 2018, but this decline was not equal across racial groups. While the infant mortality rate in Illinois declined among White and Hispanic infants during 2000-2018, it only declined during 2000-2008 for Black infants. Since 2008, the Black infant mortality rate has remained unchanged.
- Deaths during the first 28 days of life make up about two-thirds of infant deaths.
- While SUID rates among infants born to White and Hispanic mothers have remained stable since 2000, the SUID rate among infants born to Black mothers increased by 38% since 2009.
- If babies of Black women had fetal and infant mortality rates that were the same as the babies of low-risk White women, 212 Black fetal and infant deaths would be prevented each year.
- The period of risk with the most opportunity to prevent Black fetal/infant deaths and reduce racial disparities is the "maternal health/prematurity" period. Interventions to improve health in this period could target preconception health, perinatal care, and social determinants of health for Black women.
- Another period of risk with high opportunity to prevent fetal/infant deaths and reduce racial disparities is the "infant health" period. Interventions for preventing these deaths could include improvements in infant safe sleep practices, breastfeeding, and injury prevention.

Next Steps

The data presented in this report can help inform infant mortality prevention efforts throughout Illinois. The analyses show stark racial disparities in infant mortality rates, which reveals the need for targeted strategies to improve the health of Black infants and their mothers. This report serves as a foundation for understanding the underlying inequities facing Black mothers and their infants and to help inform programs and policies to improve outcomes.

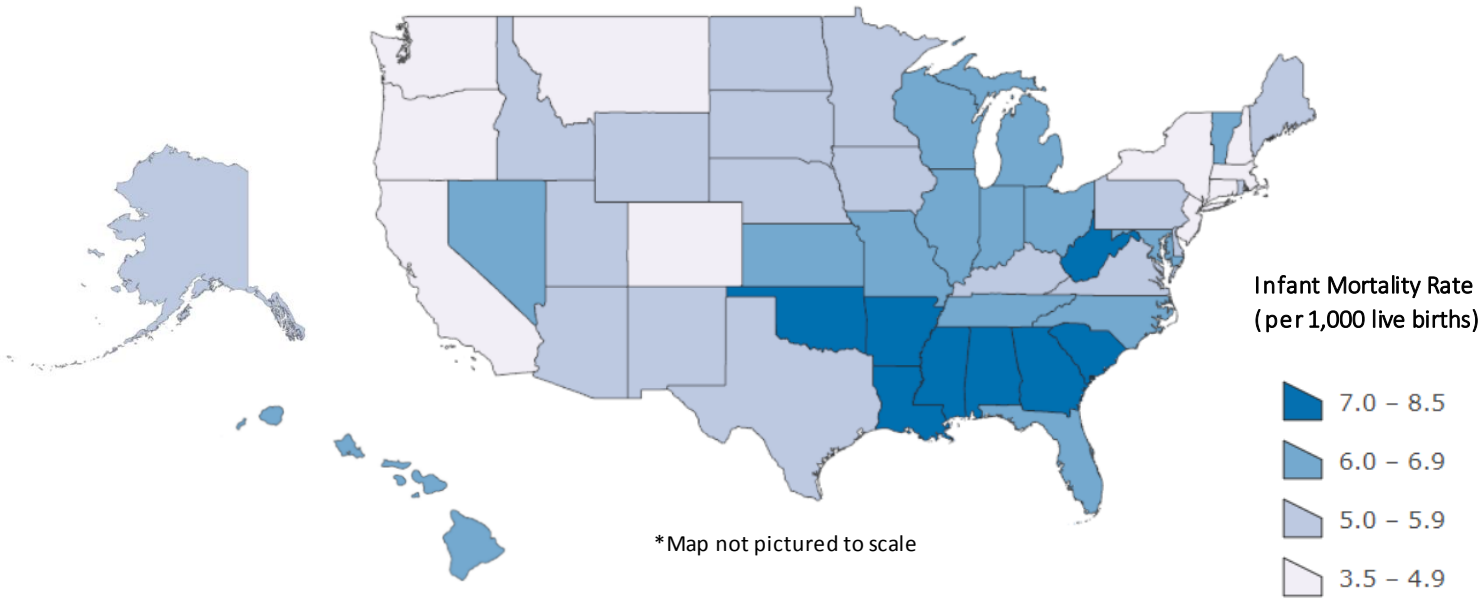
Background

Infant mortality is the death of an infant before his or her first birthday, and an infant mortality rate is the number of infant deaths per 1,000 live births. Infant mortality is an important indicator of the overall health of a community, as factors that influence infant mortality can also impact the wider community, such as living conditions, economic development, and quality and access to medical care.

Healthy People is a federal plan that releases decennial national objectives for improving the health of all Americans. The *Healthy People 2020 (HP2020)* plan sets a goal of decreasing infant mortality rates to no more than 6.0 infant deaths per 1,000 live births. While the United States met this target in 2018 with an overall infant mortality rate of 5.7, Illinois has not yet achieved the HP2020 objective and had an infant mortality rate of 6.5 in 2018.

During 2018, Illinois ranked 36th out of the 50 states for infant mortality rate. New Hampshire had the lowest infant mortality rate of 3.6 in 2018, while Mississippi had the highest at 8.3. Only 28 states had an infant mortality rate lower than the HP2020 objective.

Figure 1: Infant Mortality Rates Across the United States, 2018



Illinois Infant Mortality Trends

Infant mortality: the death of an infant before their first birthday.

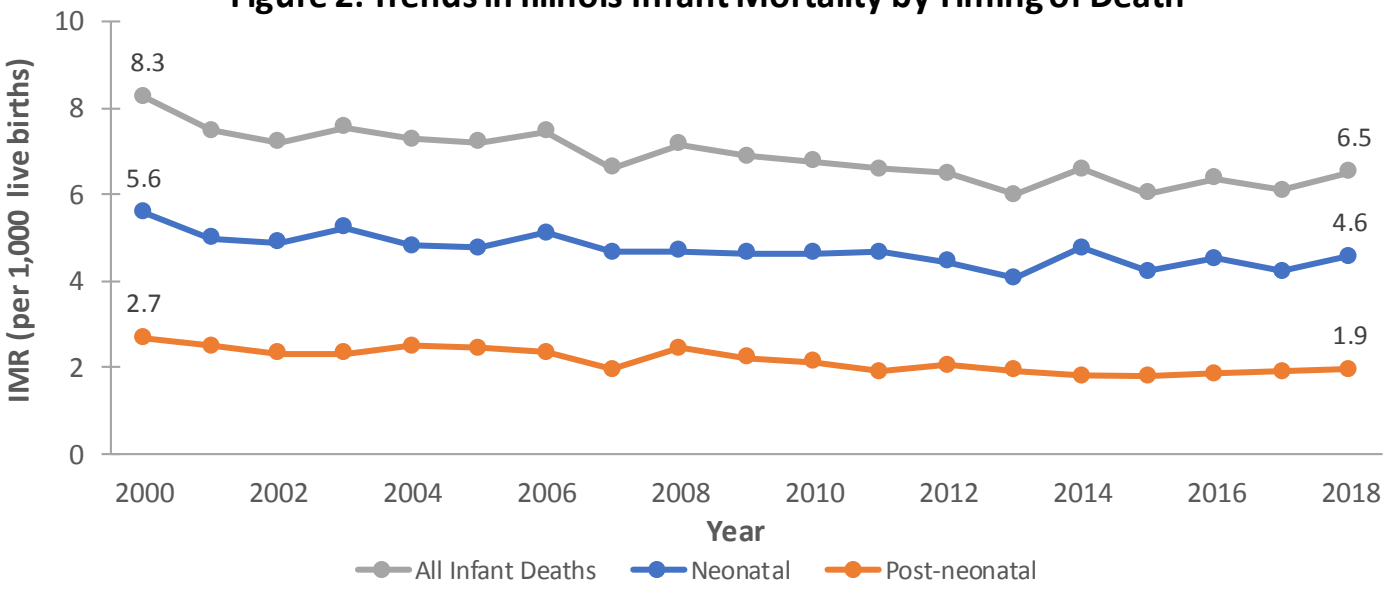
Neonatal mortality: the death of an infant between 0-27 days after birth.

Post-neonatal mortality: the death of an infant between days 28-364 after birth.

In 2018, out of approximately 145,000 live-born Illinois infants, there were 943 infants who died before their first birthday.

The overall infant mortality rate for Illinois infants decreased 22% between 2000 and 2018 (Figure 2). During the same time period, neonatal mortality rates decreased by 18% and post-neonatal mortality rates decreased by 27%. Since 2000, approximately two-thirds of all infant deaths occurred during the neonatal period. (*see Appendix 3 for details*)

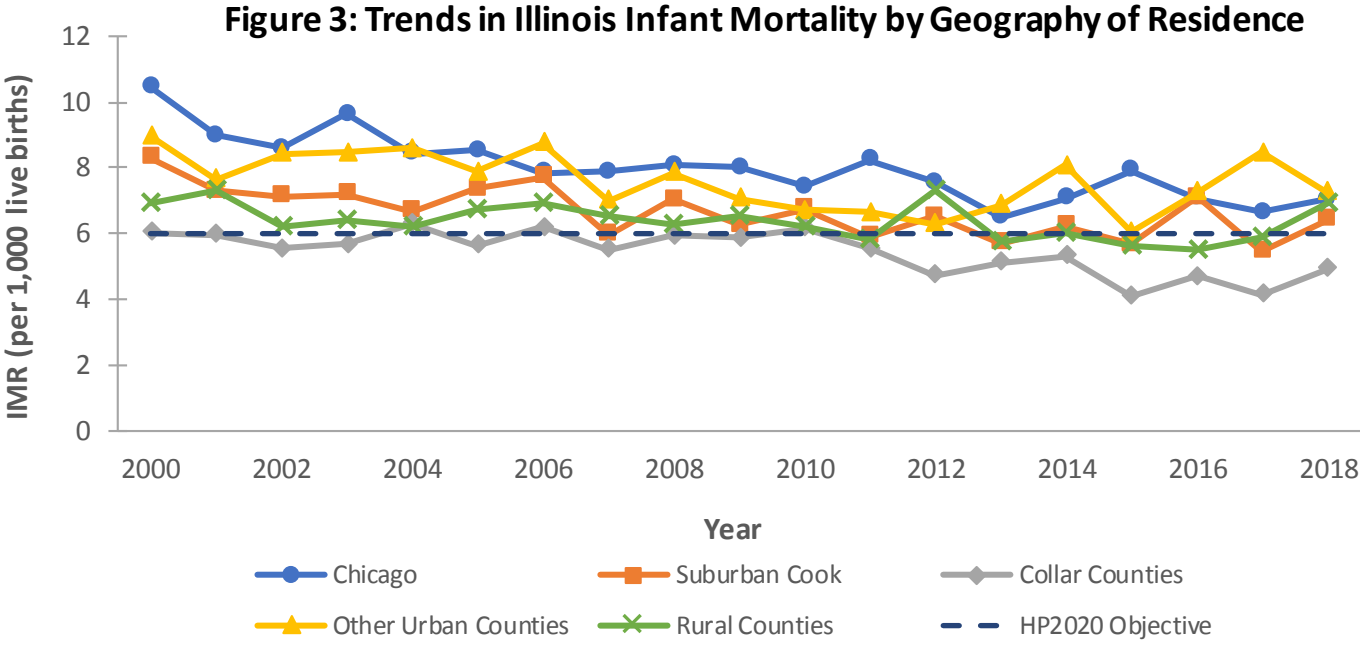
Figure 2: Trends in Illinois Infant Mortality by Timing of Death



Between 2000 and 2018, infant mortality rates decreased across all geographic areas (Figure 3). The infant mortality rate decreased most rapidly among Chicago residents, declining 33% over this time period. In comparison, the infant mortality rate decreased 23% for suburban Cook County residents, 18% for the "collar" county residents, and 19% for residents of other urban counties outside the Chicago area and did not significantly decrease for residents of rural counties. (*Definitions for these county groupings are available in Appendix 1)*

During most of the period from 2000 to 2018, residents of Chicago and other urban counties had the highest infant mortality rates, while residents of the collar counties surrounding Cook County had the lowest infant mortality rate. (*see Appendix 3 for details*)

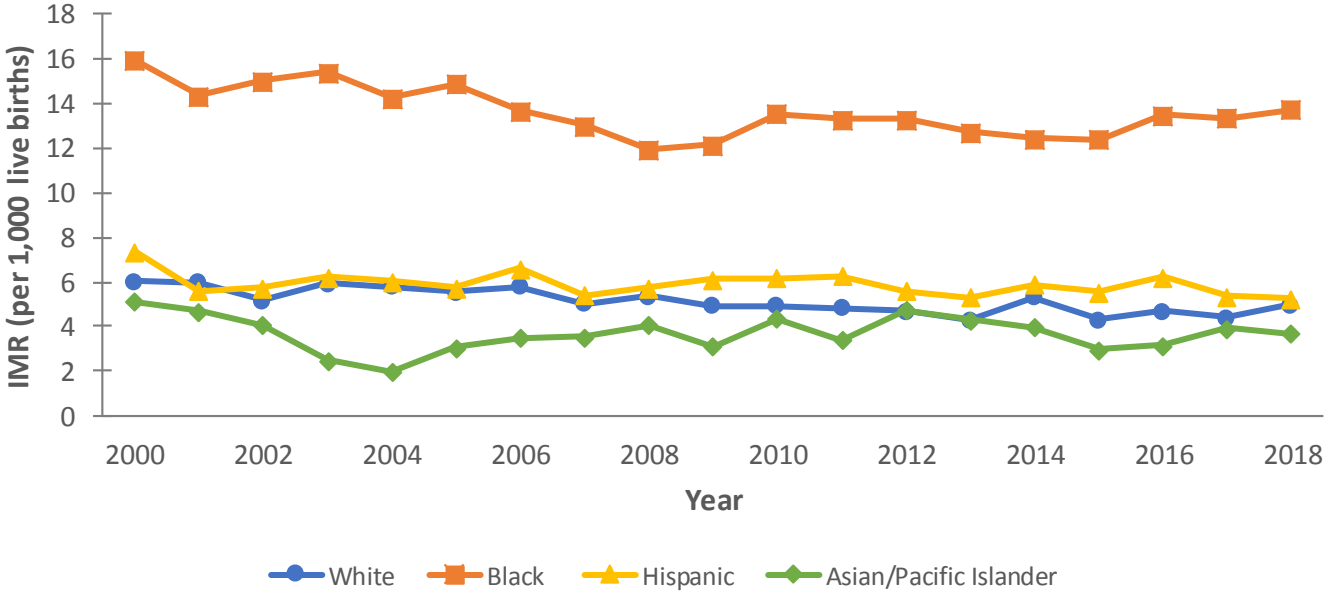
Figure 3: Trends in Illinois Infant Mortality by Geography of Residence



Illinois has long-standing racial disparities in infant mortality. Across all years during 2000-2018, Black infants had an infant mortality rate two to three times as high as White, Hispanic, and Asian/Pacific Islander infants.

In addition, trends across racial/ethnic groups have varied. The infant mortality rates for White, Hispanic, and Asian/Pacific Islander infants decreased by 18%, 29%, and 28% respectively between 2000 and 2018. In contrast, the infant mortality rate for Black infants decreased 25% between 2000 and 2008 but did not substantially change since 2008.

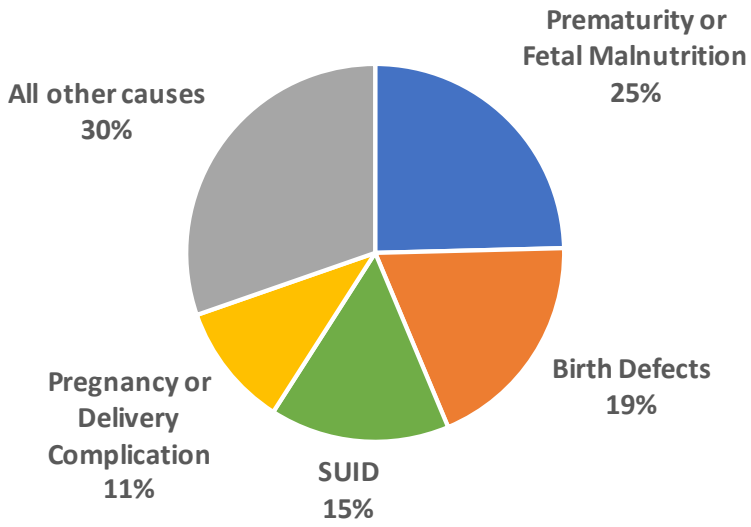
Figure 4: Trends in Infant Mortality Rate by Race/Ethnicity



Leading Causes of Death

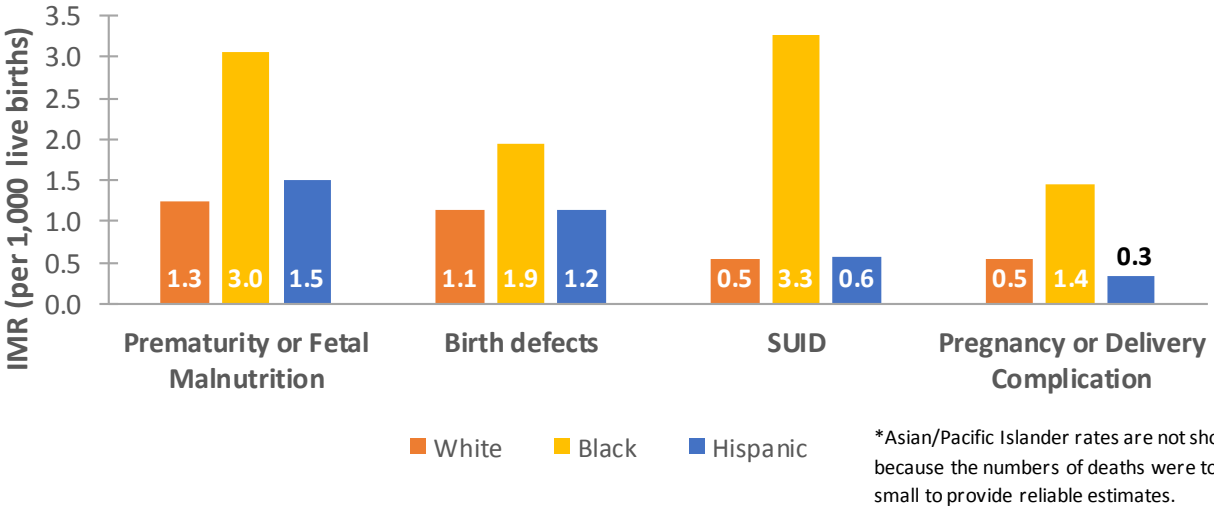
The leading causes of death among infants in 2018 were prematurity or fetal malnutrition, birth defects, sudden unexpected infant death (SUID),[1] and pregnancy or delivery complications (Figure 5).

Figure 5: Leading Causes of Infant Deaths in Illinois, 2018



Black infants have the highest IMR across all four of the leading causes of infant death (Figure 6). The infant mortality rates across racial/ethnic groups were most similar for birth defects; for birth defects, Black infants were about 1.7 times as likely to die as White infants. The largest racial/ethnic disparity was for SUID deaths, for which Black infants were six times as likely to die as White infants.

Figure 6: Leading Causes of Infant Deaths in Illinois by Race/Ethnicity, 2018

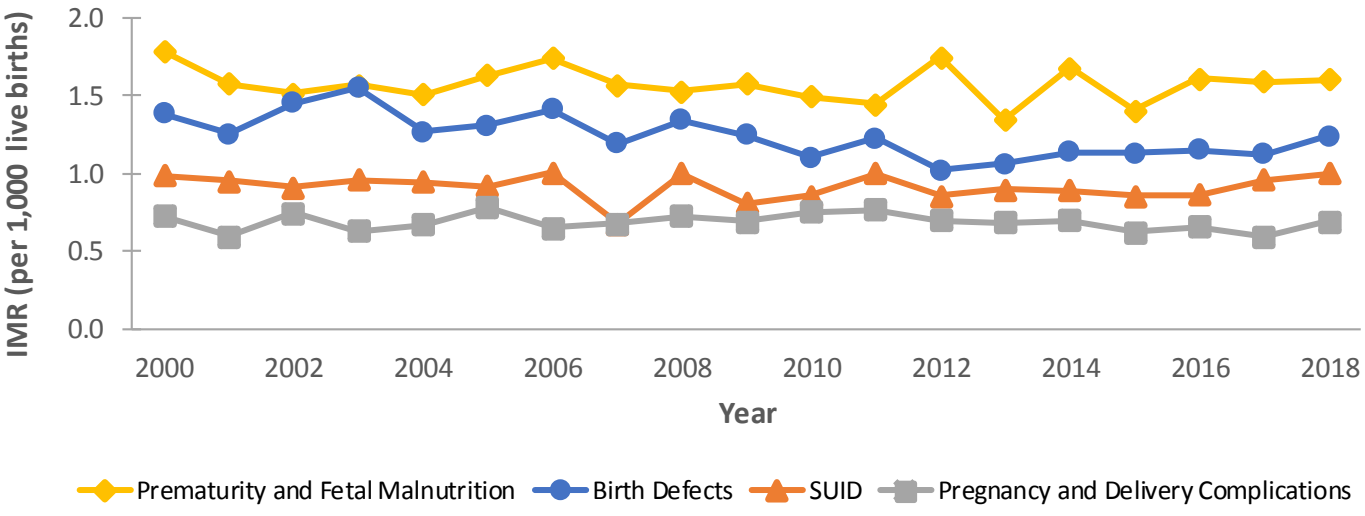


*Asian/Pacific Islander rates are not shown because the numbers of deaths were too small to provide reliable estimates.

[1] *Sudden unexpected infant death (SUID) is a death of an infant in which the cause of death was not obvious before investigation, including sudden infant death syndrome, accidental suffocation in bed, and unknown causes.*

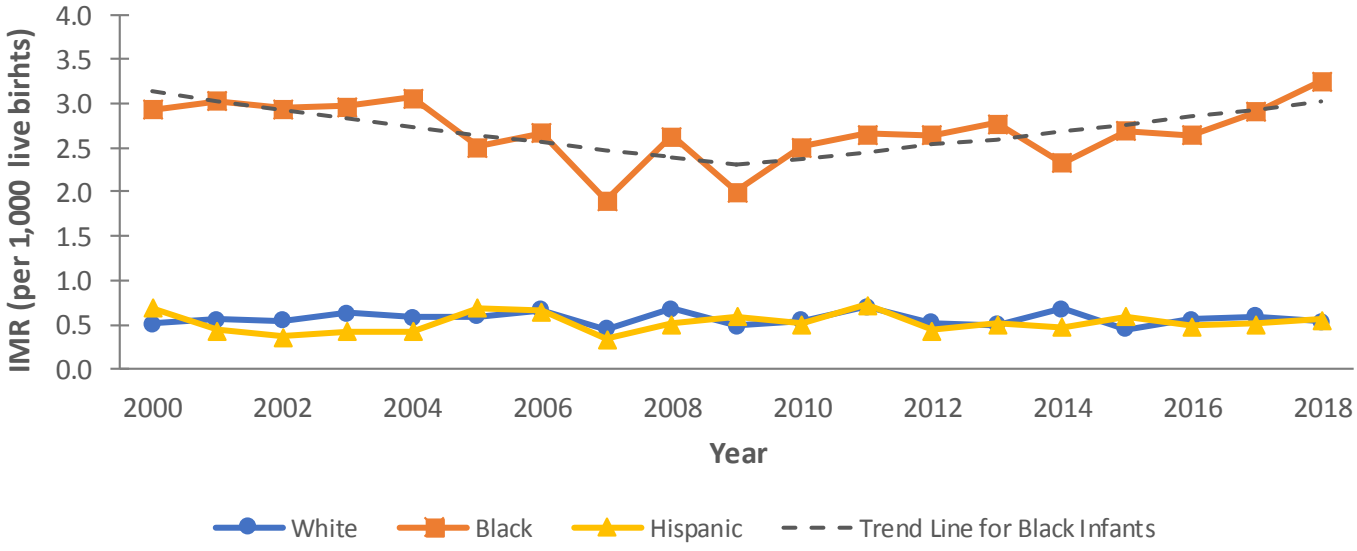
The cause-specific infant mortality rates for the top four causes of infant death have generally remained steady since 2000. The only cause with a significant decrease in infant mortality rate over time is birth defects, which decreased 10% between 2000 and 2018. The other three top causes – prematurity and fetal malnutrition, SUID, and pregnancy and delivery complications – did not show significant declines over this period.

Figure 7: Trends in Illinois Infant Mortality for the Leading Causes of Death



While the overall SUID rate in Illinois remained steady over time, this masks a concerning SUID trend among Black infants (Figure 8). Though the SUID rate among Black infants decreased during 2000-2009, the SUID rate increased by 38% during 2009-2018, bringing the SUID rate among Black infants to its highest level since 2000. In contrast, the SUID rate among White and Hispanic infants did not change significantly during this period.

Figure 8: Trends in Sudden Unexpected Infant Death by Race/Ethnicity



Risk Factors and Risk Markers

To examine risk factors and risk markers for infant mortality in Illinois, linked data files were used to study maternal and infant characteristics of all infants born during 2017-2018 (birth cohorts). Infant mortality rates of different sub-groups were compared to identify groups at higher risk of infant mortality (Figure 9).

Maternal Age: Infants born to women less than 20 years old had a higher infant mortality rate than those born to older women.

Race/Ethnicity: Infants born to Black women had the highest infant mortality rate of all racial groups.

Maternal Education: The infant mortality rate decreased as mother's education level increased.

Geography of Residence: Infants living in urban areas outside of Chicago had the highest infant mortality rate compared to other regions of the state.

Payer for Delivery: The infant mortality rate was highest among women covered by Medicaid, compared to women covered by private insurance or other payment plans.

Mother's Country of Birth: The infant mortality rate was higher among infants whose mothers were born in the United States compared to infants whose mothers were born outside the United States.

Previous Live Births: The infant mortality rate was higher among infants whose mothers had already birthed three or more previous children.

Previous Poor Pregnancy Outcome: The infant mortality rate was higher among mothers who had a previous negative pregnancy outcome, such as prior preterm birth, perinatal death, or intrauterine growth restriction for fetus/infant.

Mother's Preexisting Chronic Health Conditions: The infant mortality rate was higher among infants born to women with a preexisting chronic condition (i.e., obesity, diabetes, or hypertension) prior to becoming pregnant.

Prenatal Smoking Status: The infant mortality rate was higher among infants born to women who smoked cigarettes during pregnancy than those born to women who did not smoke cigarettes during pregnancy.

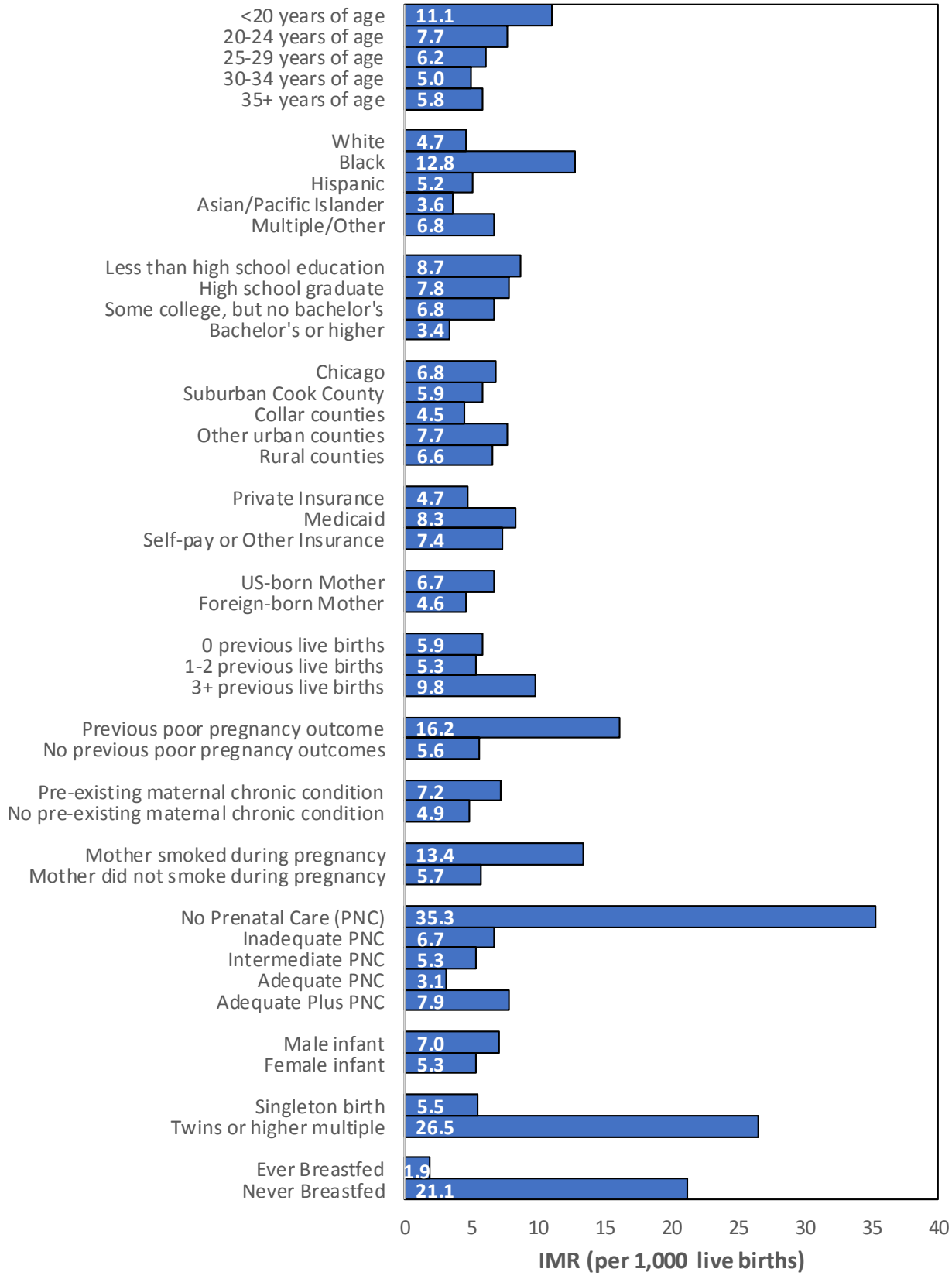
Prenatal Care: The infant mortality rate was highest among infants born to women who did not receive any prenatal care. The infant mortality rate decreased as adequacy of prenatal care increased. The exception was women who received "adequate plus" prenatal care (more than the expected number of prenatal care visits). These women likely had higher-risk pregnancies, leading them to receive more prenatal care than is typical, but also contributing to increased risk for infant mortality.

Infant's Sex: Male infants had a higher infant mortality rate than female infants.

Plurality: The infant mortality rate was higher for twin or higher multiple births than singleton births.

Breastfeeding: The infant mortality rate was higher for infants who were never breastfed than for infants who were breastfed.

Figure 9: Illinois Infant Mortality Rate by Maternal and Infant Characteristics, 2017-2018 Birth Cohorts

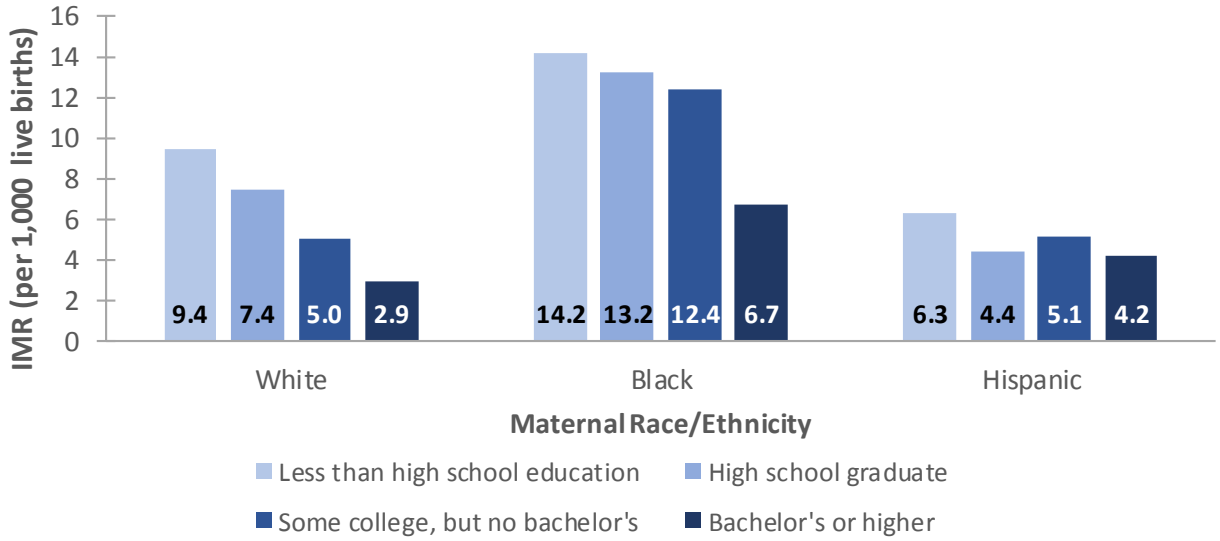


Racial/Ethnic Inequities

Previous sections of this report have highlighted ways that infant mortality differs by racial groups in Illinois. These differences are not explained by biological differences across races. For example, previous studies have shown that foreign-born Black women have better birth outcomes than U.S.-born Black women. Additionally, racial differences are not due solely to health care factors. Although health care quality has improved in Illinois, racial disparities in infant mortality have remained constant. This implies that there are important upstream factors disproportionately experienced by Black women. This section will explore more detailed data to understand what is driving the inequitable outcomes between Black and White infants.

One possible explanation for the differences in infant mortality by race/ethnicity is the existence of population differences in socioeconomic factors, like poverty or education. To explore this hypothesis, Figure 10 shows infant mortality rates by the combination of race/ethnicity and maternal education. Within every race/ethnicity, infant mortality generally is lower at higher education levels. However, infants born to Black women are more likely to die than White and Hispanic infants at every level of maternal education. The IMR among infants born to Black women with a bachelor's degree or higher is closest to the IMR of infants born to White women with a high school degree.

Figure 10: Illinois Infant Mortality Rate by Race/Ethnicity and Maternal Education Level, 2017-2018



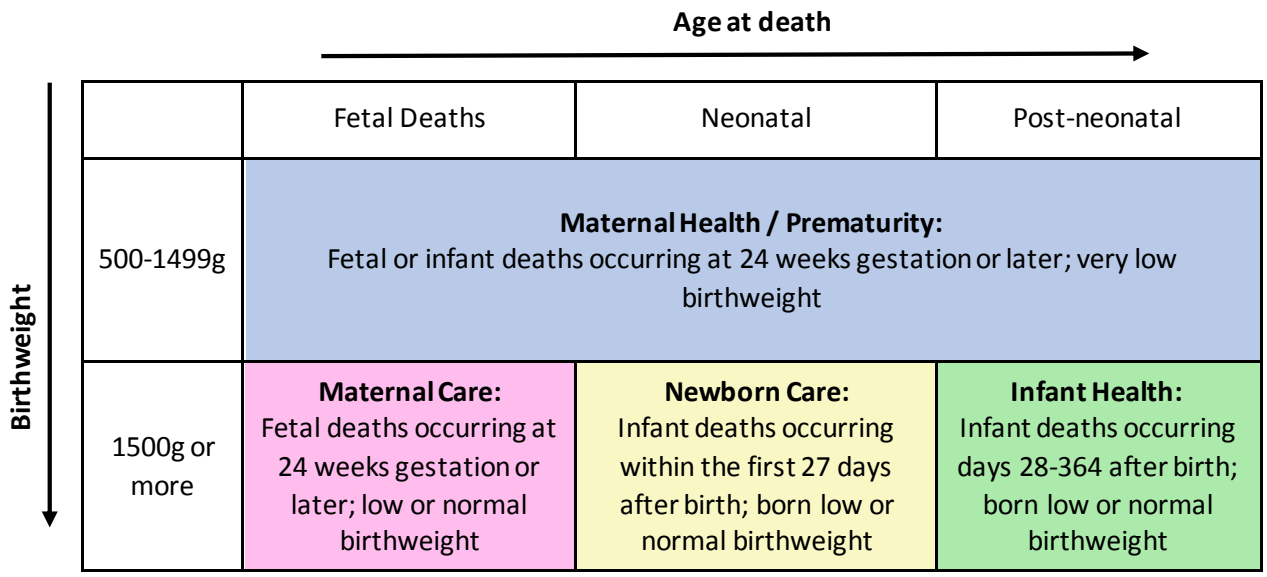
In fact, the relative Black-White disparity in infant mortality increases at higher maternal education levels. Among women with less than a high school education, infants born to Black women are about 50% more likely to die as infants born to White women. But among women with a bachelor's degree or higher, infants born to Black women are 130% more likely to die as infants born to White women. The fact that relative disparities widen at higher socioeconomic levels suggests that chronic stress, environmental factors, and other social systems are influencing inequities in infant mortality. Experiences across a woman's whole life course affect her reproductive health and the health of her children, and it is important to better understand the root causes of inequities. The analyses on the following pages continues to explore the reasons for Illinois' racial inequities in infant mortality.

Perinatal Periods of Risk Analysis

The Perinatal Periods of Risk (PPOR) analysis is an analytical framework developed by CityMatCH (www.citymatch.org) to analyze disparities in fetal and infant death. This approach can help clarify how fetal and infant mortality differs between groups and identify opportunities for intervention.

In a PPOR analysis, a "reference" population – typically the group with the best birth outcomes – is compared to a "target" population – typically the group with the worst birth outcomes. Fetal and infant deaths for these two populations are broken down into four "periods of risk" (Figure 11). Differences between the reference and target groups are examined within each period of risk to identify actions steps that could reduce overall disparities.

Figure 11. Perinatal Periods of Risk Description



For this analysis, infants born to Black women were the target population, due to this group having the highest infant mortality rate in Illinois. Infants born to White women who were at least 20 years old and who had at least 13 years of education at the time of their infant's birth were chosen as the reference group because this demographic had the lowest IMR compared to other groups. For the rest of this section this reference group will be referred to as "low-risk White" fetuses and infants. This analysis was restricted to residents with a fetus/infant at least 24 weeks gestation and at least 500 grams at delivery.

The total fetal-infant mortality rate among low-risk White women was 3.6 per 1,000 live births: 1.1 in the maternal health/prematurity period, 1.0 in the maternal care period, 0.9 in the newborn care period, and 0.6 in the infant health period (Table 1a).

The total fetal-infant mortality rate among Black women was 12.1 per 1,000 live births: 4.1 in the maternal health/prematurity period, 3.0 in the maternal care period, 1.5 in the newborn care period, and 3.5 in the infant health period (Table 1b).

Table 1a: Fetal and Infant Mortality by Perinatal Period of Risk, among Low-Risk White Fetuses and Infants, 2017-2018

(among Illinois White women with at least 20 years of age, with more than a high school education)

	Fetal Deaths	Neonatal	Post-neonatal
Birthweight 500-1499 grams	**Maternal Health/Prematurity** (127 deaths / 120,532 total births + fetal deaths) * 1,000 **= 1.1 deaths per 1,000**		
Birthweight 1500 grams or more	**Maternal Care** (117 / 120,532) * 1,000 **= 1.0 per 1,000**	**Newborn Care** (113 / 120,532) * 1,000 **= 0.9 per 1,000**	**Infant Health** (71 / 120,532) * 1,000 **= 0.6 per 1,000**

Table 1b: Fetal and Infant Mortality by Perinatal Period of Risk, among Black Fetuses and Infants, 2017-2018

(among Illinois Black women)

	Fetal Deaths	Neonatal	Post-neonatal
Birthweight 500-1499 grams	**Maternal Health/Prematurity** (203 deaths / 49,501 total births + fetal deaths) * 1,000 **= 4.1 deaths per 1,000**		
Birthweight 1500 grams or more	**Maternal Care** (148 / 49,501) * 1,000 **= 3.0 per 1,000**	**Newborn Care** (75 / 49,501) * 1,000 **= 1.5 per 1,000**	**Infant Health** (175 / 49,501) * 1,000 **= 3.5 per 1,000**

For all periods of risk, the fetal-infant mortality rate was higher for Black women than for low-risk White women. The maternal health/prematurity period of risk had the highest mortality rate for both populations, but also had the largest difference in mortality rates between the two populations.

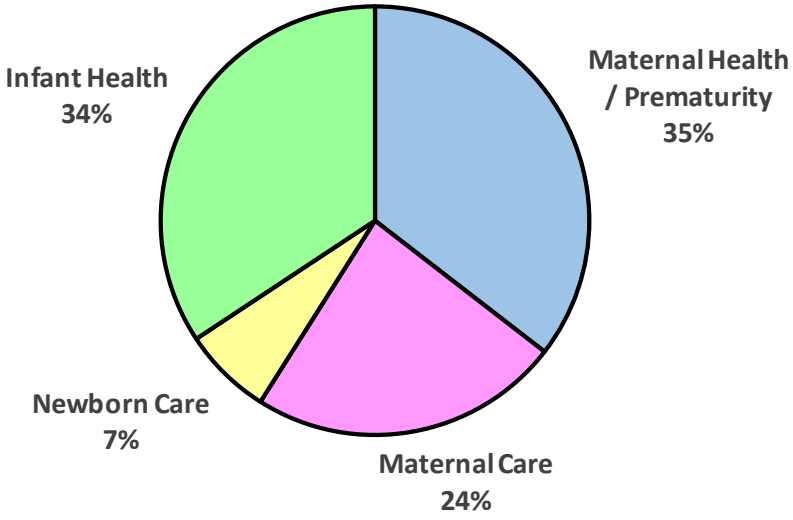
The excess mortality rate is the difference in fetal-infant rates between Black women and low-risk White women. The excess number of deaths is the number of Black fetuses and infants who would have survived if Black women had similar fetal-infant mortality rates to low-risk White women. In the 2017-2018 cohort, the overall *excess* mortality rate among Black fetuses and infants was 8.6 deaths per 1,000 live births, which translates to an average excess of 212 Black fetal and infant deaths per year.

Table 2 shows how the excess mortality rates and excess death counts are broken down across the four periods of risk. The excess mortality rate among Black fetuses and infants was the greatest for the maternal health/prematurity period of risk, which had an excess mortality rate of 3.0 deaths per 1,000, or 75 excess Black deaths per year. The infant health period of risk had the second highest excess mortality rate of 2.9 deaths per 1,000, or 73 excess Black deaths per year. The maternal care period of risk had the third highest excess mortality rate of 2.0 deaths per 1,000, or 50 excess Black deaths per year. The newborn care period of risk had the lowest excess mortality, at 0.6 deaths per 1,000 or 14 excess Black deaths per year.

Table 2: Excess Mortality Among Black Fetuses and Infants, 2017-2018 *(Illinois Black women compared to Low-Risk White women)*			
	Fetal Deaths	Neonatal	Post-neonatal
Birthweight 500-1499 grams	**Maternal Health/Prematurity** Excess mortality rate = 3.0 deaths per 1,000 **Excess number of deaths = 75 deaths per year**		
Birthweight 1500 grams or more	**Maternal Care** 2.0 per 1,000 **50 deaths per year**	**Newborn Care** 0.6 per 1,000 **14 deaths per year**	**Infant Health** 2.9 per 1,000 **73 deaths per year**

Put another way, of the total excess Black fetal-infant mortality, 35% occurs in the maternal health/prematurity period of risk, 34% occurs in the infant health period of risk, 24% occurs in the maternal care period of risk, and 7% occurs in the newborn care period of risk (Figure 12).

Figure 12: Contribution of Perinatal Periods of Risk to Excess Black Fetal-Infant Mortality, 2017-2018



The breakdown of deaths by these periods of risk highlights opportunities for reducing racial disparities in fetal and infant mortality rates. Each period of risk has a set of targets for action that are recommended for infant mortality prevention.

Deaths occurring in the maternal health/prematurity period of risk are heavily influenced by the woman's health prior to pregnancy. In the PPOR framework, suggested focus areas to address this period of risk include pre-/inter-conceptional health, unintended pregnancy, prenatal smoking and drug use, and specialized perinatal care for very low birth weight infants. While these health topics could be improved through increased access to health services, such as primary care, contraception, and substance use treatment, there are many complicated factors that determine the extent to which

quality health care services are available and accessible to women in Illinois. Segregation and housing policies have negatively impacted Black communities by reducing the availability of health care services. For example, the north side of Chicago, which is more racially and culturally diverse, has close to 10 times as many health care providers available as Black communities on the south side.[2] For women who have to travel farther to receive necessary care, transportation and child care can act as additional barriers to getting needed health care. Focusing on increasing the availability and use of health services would not necessarily benefit all women equitably. To truly address disparities in this period of risk, interventions cannot focus only on health care services, but must address the systemic factors that influence a woman's ability to be healthy and to have a healthy pregnancy, including poverty, education/literacy, discrimination, and systemic racism.

Deaths in the infant health period of risk are largely related to infant safe sleep and other injuries (such as assault/homicide and motor vehicle accidents). The PPOR framework suggests that prevention effort for the infant health period could focus on infant safe sleep, breastfeeding, injury prevention, and infant access to a medical home. These deaths are discussed in more detail on page 16.

Further exploration of the deaths in these periods of risk can more specifically inform prevention efforts within specific communities throughout the state. The next two sections provide spotlights on more specific data related to the maternal health/prematurity and infant health periods of risk.

Spotlight: County Prematurity Rates

The maternal health/prematurity period of risk had the highest fetal-infant mortality rate for both PPOR populations and the largest disparity between Black and low-risk White infants. To inform prevention effort at a more local level, county-level preterm births were analyzed for the last 5 years. The preterm rates in counties during 2014-2018 ranged from 6.6% in Stark County to 14.4% in Schuyler County (Figure 13).

Because prematurity rates vary by race/ethnicity and education level, some of the county-level differences in preterm birth rates may be related to the characteristics of the population in the county. Statistical methods can be applied to predict the preterm birth rate of each county based on what would be expected for their population, based on the state rates for different demographic groups. This analysis allows identification of counties that are doing better than anticipated, and therefore may be able to share specific interventions, contextual factors, or local assets that have helped lower the prematurity rate. This population adjustment can also help identify areas with higher preterm birth rates than predicted; these counties may benefit from a more thorough analysis to identify clinical and community opportunities for prematurity prevention.

Predicted rates of preterm births were calculated for each county using statewide data from 2014-2018 , adjusted for the maternal race/ethnicity and education level for live births to county residents (more details provided in Appendix 2). These predicted rates were compared to the actual rates of preterm birth for each county, and statistical tests were applied to identify counties with rates lower or higher than predicted.

[2] Henricks, K., Lewis, A. E., Arenas, I., & Lewis, D. G. (2018). A tale of three cities: The state of racial justice in Chicago report. Retrieved from http://stateofracialjusticechicago.com/wp-content/uploads/IRRPP_StateOfRacialJusticeReport-1.pdf

The following counties had preterm birth rates significantly lower than predicted for their county's population:

- Cook
- DuPage
- Fayette
- Whiteside

These counties may have lessons to share about what is going well in their communities that supports lower rates of prematurity. Other counties may be able to learn from their experiences in considering how to reduce prematurity rates.

In contrast, the following counties had preterm birth rates significantly higher than predicted for that county's population:

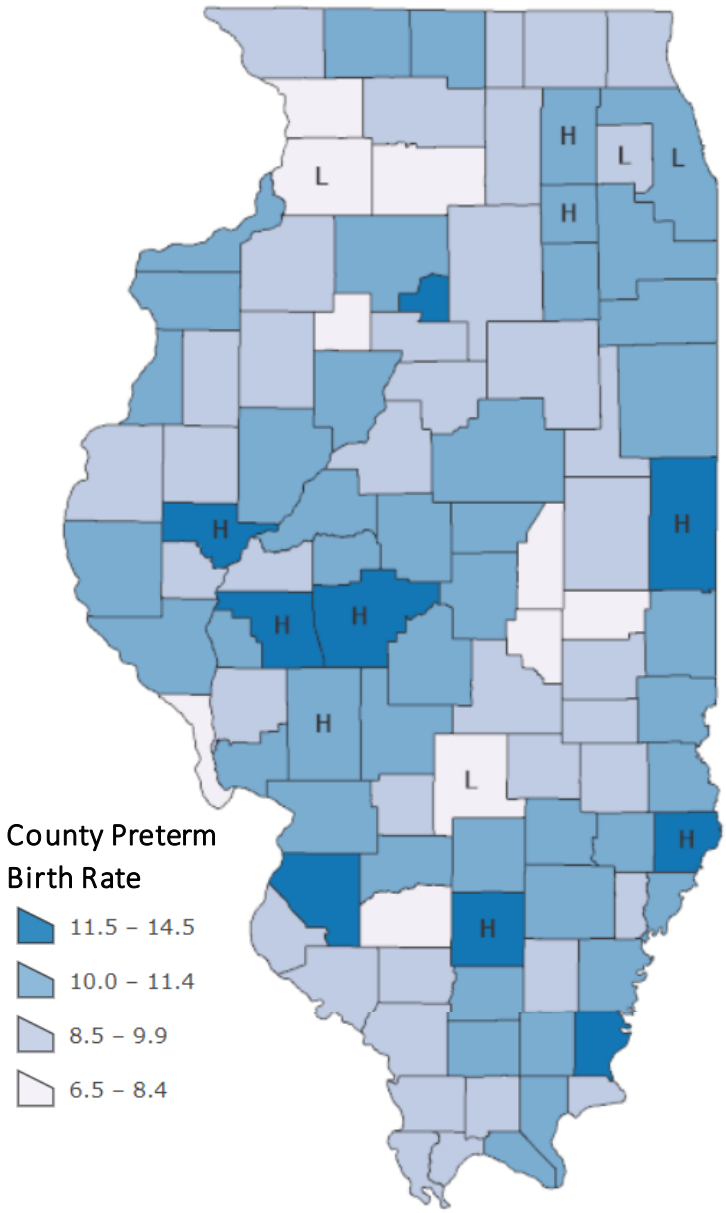
- Jefferson
- Kane
- Kendall
- Lawrence
- Macoupin
- Morgan
- Sangamon
- Schuyler
- Vermilion

Many of these counties had high rates of preterm birth overall, but also had an even higher rate than predicted. These counties could benefit from more in-depth analyses to shed light on the factors influencing prematurity in their communities, which could lead to targeted action plans to reduce preterm birth rates.

This analysis provides a starting point for local communities to begin exploring prematurity and its impact on their population.

More information about the findings from this analysis are available in Appendix 4.

Figure 13. Percent of Preterm Births by County, 2014-2018



H = Higher percent of preterm births than predicted

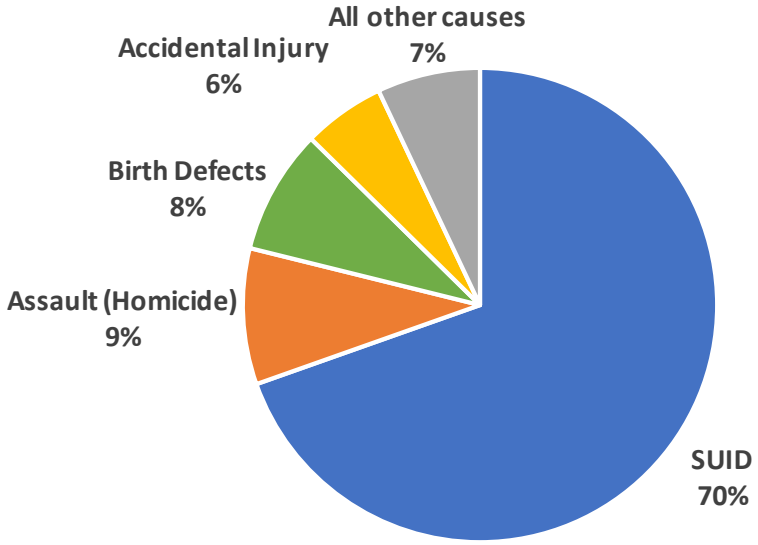
L = Lower percent of preterm births than predicted

Spotlight: Infant Health Period of Risk

To focus on addressing the most preventable deaths among Black infants, the infant health period of risk was further analyzed. Cause-specific IMRs were compared for Black and low-risk White infants who were at least 1500 grams and survived into the post-neonatal period (day 28 of life).

There are four causes of deaths that account for 93% of the excess mortality among Black infants during the infant health period of risk (Figure 14). SUID was the major contributor to Black excess mortality in this period of risk; SUID alone accounted for 70% of the excess "infant health" deaths among Black infants. Other causes that contributed to excess mortality for Black infants in the post-neonatal period were assault (homicide) (9%), birth defects (8%), accidental injury (6%), but the combined effect of these causes was dwarfed by SUID.

Figure 14. Leading Causes of Excess Black Mortality During the Infant Health Period of Risk, 2017-2018



This demonstrates that the largest opportunity for reducing disparities during the infant health period of risk is SUID prevention for Black infants. Most SUID deaths are sleep-related deaths, including sudden infant death syndrome and accidental suffocation while sleeping. Emphasizing that infants be placed to sleep alone, on their backs, and in an empty crib is an important public health message for all families. It is also important that families receive information about other SUID prevention strategies, such as breastfeeding and smoking cessation.

While educating families on safe sleep environments is important, this education alone may not be enough. It is also important to ensure families do not have barriers that prevent them from choosing safe sleep options, and to consider how cultural factors influence families' sleep choices for their infants. For example, financial barriers may prevent families from having a safe crib, or safety concerns may lead to the parent choosing to bed-share with their infant. Public health programs and clinical providers need to consider these social and cultural factors in health education and help families address their barriers to health.

Taking Action

The data in this report have demonstrated some progress in infant mortality reduction in Illinois over the last two decades, but not all populations are benefiting from this reduction. Inequities persist for Black infants, who are nearly three times as likely to die before their first birthday as White infants. In addition, deaths related to SUID are increasing among Black infants but not among any other group. The greatest opportunities for reduction of racial inequities in infant mortality lies in prematurity prevention and in SUID prevention for Black infants.

The Illinois Maternal and Child Health (Title V) program at the Illinois Department of Public Health supports various programs and initiatives to improve infant outcomes.

- The Perinatal Program oversees Illinois' regionalized perinatal hospital system by designating perinatal levels of care for birthing hospitals, monitoring hospital quality, and ensuring that high-risk pregnant women and infants receive care in facilities equipped to handle their medical needs.

- The Illinois Perinatal Quality Collaborative (ILPQC) implements improvement projects in birthing hospitals to ensure high-quality care for pregnant women and infants. In 2021, they will launch a Birth Equity Initiative to promote equitable hospital maternity and newborn care.

- The Chicago Department of Public Health is implementing *Chicago Family Connects*, a home visiting program that provides early postpartum support for all new mothers who live in Chicago.

- The Fetal and Infant Mortality Review (FIMR) program reviews fetal and infant deaths to identify opportunities to address social determinants of health and improve quality of care. The goal of FIMR is to implement community-based interventions and policies that help reduce infant mortality.

- The Illinois Task Force on Infant and Maternal Mortality Among African Americans seeks to address the impact of racism on pregnancy-related outcomes by identifying effective interventions and system changes that would improve outcomes for African-American women and infants.

In addition, other state agencies, such as the Illinois Department of Human Services and the Governor's Office of Early Childhood Development, support families through case management and home visiting programs for infants and young children.

Future studies should continue to expand upon the data analyses described in this report, such as analyzing factors associated with preterm birth and infant safe sleep behaviors. By better understanding the factors contributing to preterm births and SUID, Illinois may be able to reduce deaths due to these causes, in addition to reducing the excess mortality experienced by Black infants.

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Appendix 1: Definitions

Fetal and Infant Mortality

Fetal mortality: the death of a fetus (at least 20 weeks gestation) prior to delivery.

Infant mortality: the death of an infant before their first birthday.

Neonatal mortality: the death of an infant between 0-27 days after birth.

Post-neonatal mortality: the death of an infant between days 28-364 after birth.

Infant Mortality Rate (IMR): the number of infant deaths before their first birthday per 1,000 live births among the population of interest.

Sudden Infant Death Syndrome (SIDS): the death of a seemingly healthy infant less than a year old which remains unexplained after a thorough case investigation.

Sudden Unexpected Infant Death (SUID): the sudden and unexpected death of an infant less than 1 year old in which the cause was not obvious before investigation (includes SIDS, accidental suffocation and strangulation in bed, and unknown cause).

Infant/Fetal Characteristics

Preterm: infant born with gestational age less than 37 weeks.

Full Term: infant born with gestational age of at least 37 weeks.

Very low birthweight: an infant's first recorded weight after birth less than 1500g.

Low birthweight: an infant's first recorded weight after birth less than 2500g.

Normal birthweight: an infant's first recorded weight after birth at least 2500g.

Maternal Characteristics

Pre-existing maternal chronic condition: presence of diabetes, chronic hypertension, or obesity prior to pregnancy.

Prenatal care: as defined by the Kotelchuck adequacy of prenatal care utilization index which classifies prenatal care into categories based on the timing of first prenatal care initiation and number of visits.

Previous poor pregnancy outcome: history of previous preterm birth and/or history of previous poor birth outcomes (i.e., previous infant death).

Smoking: refers to any cigarette smoking during pregnancy.

Race/Ethnicity

In this report race/ethnicity refers to either the mother's race and ethnicity fields on the birth certificate or infant's race and ethnicity fields on the death certificate, depending on what was available for analysis.

White: Non-Hispanic White

Black: Non-Hispanic Black

Hispanic: regardless of race designation

Asian/PI: Non-Hispanic Asian/Pacific Islander

Other/Multiple: refers to those identifying as other races or more than one race

Geography

Based on county and ZIP code of residence.

Cook County was divided into "**Chicago**" and "**Suburban Cook**"

Collar counties: counties surrounding Cook County, including Lake, McHenry, Kane, DuPage, and Will

Other Urban Counties: include Winnebago, DeKalb, Kendall, Kankakee, Rock Island, Peoria, Tazewell, McLean, Champaign, Macon, Sangamon, Madison, and St. Clair

Rural Counties: includes all other counties in Illinois

Appendix 2: Data Sources and Methods

Data Source

This report uses data from birth certificates, death certificates, and fetal death certificates from the IDPH Division of Vital Records. All vital records used in this report are certified/final data.

General Statistical Notes

- Analyses were limited to births and deaths for Illinois residents.
- All analyses were conducted in SAS version 9.4 and with a significance level of $p<0.05$ unless otherwise mentioned.

Cross-Sectional Infant Mortality Analyses

Analyses on pages 3-7 assessed infant mortality using **cross-sectional** data**.** This approach uses number of births during a calendar year and the number of infant deaths during that same year. In this type of analysis, infant death certificates are not linked to their corresponding birth certificates.

In cross-sectional analyses, IMR is defined as:

$$\frac{\#\ of\ infants\ who\ died\ during\ year\ A}{total\ \#\ of\ live\ births\ during\ year\ A} * 1{,}000$$

The following analyses were done using cross-sectional infant mortality data.

- Time trend analyses were conducted in Joinpoint Trend Analysis Software to test trends from 2000-2018 and identify timepoints when statistically significant changes in trends occurred.
- Cause of death information was compared by race/ethnicity.
- Map on page 17 was created in ArcGIS.

Cohort Infant Mortality Analyses

Analyses on pages 8-13 and 15 assessed infant mortality using **cohort** data. Cohort data compares infant mortality rates for a specific group of infants born during a given year; this approach requires infant death certificates to be linked to the corresponding birth certificates to identify infant deaths before their first birthdays. Cohort analysis allows for more in-depth examination of risk factors and risk markers for infant mortality because the birth certificate contains much more detailed demographic and medical information than the death certificate. h or various maternal characteristics.

In cohort analyses, IMR is defined as:

$$\frac{\#\ of\ infant\ born\ in\ year\ A\ who\ died\ within\ 1\ year}{total\ \#\ of\ live\ births\ during\ year\ A} * 1{,}000$$

The following analyses were done using birth cohort data of infants born in 2016 or 2017.

- Bivariate analyses were conducted to test whether certain maternal or infant characteristics were associated with infant mortality. The chi-square test statistic was used to test for statistical significance.
- Perinatal Periods of Risk (PPOR) is a method to identify opportunities to reduce fetal and infant death disparities within a population by analyzing birth weight and age at death simultaneously. A target population with high rates of infant mortality is compared with a reference population with low rates of infant mortality.

Prematurity Analysis

An analysis comparing each county's predicted and actual preterm birth rates was shown on page 14. The goal of this analysis was to identify counties with preterm birth rates significantly higher or lower than what would be expected based on the demographics of the county's population.

To predict preterm birth rates in each county based on the demographics of their population, this analysis adjusted for maternal race and education, which are known risk markers for preterm birth. Four mutually exclusive categories were created based on maternal race and education as shown below:

Category	Maternal Race	Maternal Education
1	Black	High school or less
2	Black	More than high school
3	Non-Black	High school or less
4	Non-Black	More than high school

Rates of preterm birth were calculated for each demographic category from the statewide data for 2014-2018 combined. The statewide preterm birth rates for the four categories were: 14.9% (Black, high school education or less), 13.8% (Black, more than high school), 10.0% (non-Black, high school or less), and 9.2% (non-Black, more than high school).

Predicted numbers of preterm births were calculated for each county by multiplying the state-level category-specific rates by the number of county-level births in each category and then summing the four values.

Predicted preterm rates were compared to the actual rates of preterm birth by county from 2014-2018. The z-score under the normal distribution was calculated for each county to test for statistically significant differences between predicted and actual preterm birth rates. A cut-off p-value of 0.10 was used to determine significance, enabling the analysis to identify more counties that deviated from anticipated rates than a more stringent p-value of 0.05 would have done.

Detailed data tables for the predicted and actual preterm birth rates for each Illinois county are available in Appendix 3.

Appendix 3: Detailed Tables for Infant Mortality Trend Analysis

Trends in Illinois Infant Mortality by Timing of Death *(corresponds to Figure 2)*

Year	Live Births	Infant Deaths	Infant Mortality Rate	Neonatal Deaths	Neonatal Mortality Rate	Post-Neonatal Deaths	Post-Neonatal Mortality Rate
2000	185,003	1,527	8.3	1,032	5.6	495	2.7
2001	184,020	1,378	7.5	918	5.0	460	2.5
2002	180,554	1,303	7.2	882	4.9	421	2.3
2003	182,389	1,379	7.6	953	5.2	426	2.3
2004	180,662	1,317	7.3	868	4.8	449	2.5
2005	178,863	1,291	7.2	854	4.8	437	2.4
2006	180,480	1,343	7.4	921	5.1	422	2.3
2007	180,528	1,194	6.6	843	4.7	351	1.9
2008	176,631	1,263	7.2	829	4.7	434	2.5
2009	171,072	1,176	6.9	796	4.7	380	2.2
2010	164,998	1,116	6.8	767	4.6	349	2.1
2011	161,234	1,062	6.6	753	4.7	309	1.9
2012	159,152	1,032	6.5	707	4.4	325	2.0
2013	156,918	942	6.0	639	4.1	303	1.9
2014	158,522	1,044	6.6	756	4.8	288	1.8
2015	158,101	952	6.0	667	4.2	285	1.8
2016	154,467	984	6.4	697	4.5	287	1.9
2017	149,390	912	6.1	629	4.2	283	1.9
2018	144,828	943	6.5	661	4.6	282	1.9

Trends in Illinois Infant Mortality by Geography of Residence *(corresponds to Figure 3)*

Year	Chicago			Suburban Cook County			Collar Counties			Other Urban Counties			Rural Counties		
	Live Births	Infant Deaths	Infant Mortality Rate	Live Births	Infant Deaths	Infant Mortality Rate	Live Births	Infant Deaths	Infant Mortality Rate	Live Births	Infant Deaths	Infant Mortality Rate	Live Births	Infant Deaths	Infant Mortality Rate
2000	50,885	532	10.5	34,618	287	8.3	44,203	266	6.0	29,224	262	9.0	26,073	180	6.9
2001	49,596	446	9.0	34,673	253	7.3	44,956	268	6.0	29,082	223	7.7	25,713	188	7.3
2002	47,958	412	8.6	33,609	240	7.1	44,631	248	5.6	29,170	246	8.4	25,186	157	6.2
2003	48,044	463	9.6	34,028	245	7.2	45,350	258	5.7	29,364	249	8.5	25,603	164	6.4
2004	46,567	393	8.4	33,401	223	6.7	45,445	286	6.3	29,736	256	8.6	25,513	159	6.2
2005	45,427	387	8.5	33,144	244	7.4	44,964	253	5.6	29,848	235	7.9	25,480	172	6.8
2006	45,843	360	7.9	33,481	258	7.7	44,460	275	6.2	30,923	271	8.8	25,773	179	6.9
2007	46,254	365	7.9	32,945	197	6.0	43,917	242	5.5	31,622	222	7.0	25,790	168	6.5
2008	45,389	367	8.1	32,328	228	7.1	42,400	252	5.9	31,139	244	7.8	25,375	160	6.3
2009	44,449	356	8.0	31,295	196	6.3	40,291	237	5.9	30,423	215	7.1	24,614	161	6.5
2010	42,805	318	7.4	30,190	204	6.8	38,444	237	6.2	29,446	198	6.7	24,113	150	6.2
2011	41,532	342	8.2	29,578	175	5.9	37,259	207	5.6	29,083	193	6.6	23,782	139	5.8
2012	40,985	310	7.6	29,250	191	6.5	36,650	173	4.7	28,817	181	6.3	23,450	171	7.3
2013	39,612	257	6.5	29,288	167	5.7	36,024	185	5.1	28,407	195	6.9	23,587	136	5.8
2014	40,137	284	7.1	29,389	183	6.2	36,678	195	5.3	28,630	231	8.1	23,688	143	6.0
2015	39,269	311	7.9	29,524	168	5.7	36,370	149	4.1	28,737	174	6.1	24,201	136	5.6
2016	37,999	269	7.1	28,760	204	7.1	36,098	170	4.7	27,843	202	7.3	23,767	131	5.5
2017	36,321	241	6.6	28,037	153	5.5	34,895	145	4.2	27,074	229	8.5	23,063	136	5.9
2018	34,857	245	7.0	26,930	173	6.4	34,041	168	4.9	26,526	193	7.3	22,474	156	6.9

Trends in Illinois Infant Mortality by Race/Ethnicity *(corresponds to Figure 4)*

Year	Non-Hispanic White			Non-Hispanic Black			Hispanic			Asian / Pacific Islander		
	Live Births	Infant Deaths	Infant Mortality Rate	Live Births	Infant Deaths	Infant Mortality Rate	Live Births	Infant Deaths	Infant Mortality Rate	Live Births	Infant Deaths	Infant Mortality Rate
2000	103,167	624	6.0	34,026	542	15.9	39,285	290	7.4	8,038	41	5.1
2001	101,560	605	6.0	32,955	472	14.3	40,942	229	5.6	8,114	38	4.7
2002	99,253	515	5.2	31,566	474	15.0	40,990	235	5.7	8,350	34	4.1
2003	99,437	592	6.0	31,250	481	15.4	42,408	264	6.2	8,821	22	2.5
2004	97,759	565	5.8	30,667	437	14.2	42,562	257	6.0	9,098	18	2.0
2005	94,490	525	5.6	30,200	448	14.8	43,393	249	5.7	9,084	28	3.1
2006	95,061	552	5.8	31,136	426	13.7	44,316	292	6.6	9,422	33	3.5
2007	94,652	477	5.0	31,454	409	13.0	44,086	238	5.4	9,621	34	3.5
2008	92,525	495	5.3	30,782	367	11.9	42,744	246	5.8	9,840	40	4.1
2009	90,460	446	4.9	29,848	362	12.1	40,369	248	6.1	9,557	30	3.1
2010	86,827	429	4.9	27,493	371	13.5	37,321	230	6.2	9,133	40	4.4
2011	85,354	411	4.8	26,406	350	13.3	35,746	224	6.3	9,159	31	3.4
2012	84,583	395	4.7	26,439	351	13.3	34,758	195	5.6	9,471	45	4.8
2013	84,295	362	4.3	25,976	330	12.7	33,439	178	5.3	9,275	40	4.3
2014	84,674	451	5.3	26,162	325	12.4	33,784	198	5.9	9,569	38	4.0
2015	84,487	366	4.3	26,406	327	12.4	33,876	188	5.5	9,811	29	3.0
2016	81,732	383	4.7	25,357	342	13.5	32,618	203	6.2	10,057	32	3.2
2017	78,245	343	4.4	25,402	338	13.3	31,405	168	5.3	9,645	38	3.9
2018	76,717	382	5.0	24,271	333	13.7	30,351	160	5.3	9,471	35	3.7

Appendix 4: Detailed Tables for Predicted Preterm Birth Analyses

County Name	Number of Live Births 2014-2018	Predicted number of Preterm Births	Actual number of Preterm Births	Predicted Preterm Birth Percent	Actual Preterm Birth Percent	Statistically Higher (H) or Lower (L) than Predicted
Adams	4,099	398	435	9.7%	10.6%	
Alexander	391	46	38	11.7%	9.7%	
Bond	753	72	75	9.5%	10.0%	
Boone	2,888	279	260	9.7%	9.0%	
Brown	299	28	27	9.5%	9.0%	
Bureau	1,672	159	188	9.5%	11.2%	
Calhoun	229	22	19	9.5%	8.3%	
Carroll	703	67	51	9.5%	7.3%	
Cass	878	88	83	10.0%	9.5%	
Champaign	11,782	1,142	1,121	9.7%	9.5%	
Christian	1,685	161	180	9.6%	10.7%	
Clark	903	86	95	9.5%	10.5%	
Clay	783	75	89	9.6%	11.4%	
Clinton	2,115	199	223	9.4%	10.5%	
Coles	2,521	242	237	9.6%	9.4%	
Cook	331,223	34,146	33,140	10.3%	10.0%	L
Crawford	1,057	101	117	9.5%	11.1%	
Cumberland	623	59	55	9.4%	8.8%	
DeKalb	5,742	576	559	10.0%	9.7%	
De Witt	869	82	89	9.4%	10.2%	
Douglas	1,293	119	106	9.2%	8.2%	
DuPage	53,100	4,983	4,766	9.4%	9.0%	L
Edgar	882	85	98	9.6%	11.1%	
Edwards	394	37	37	9.5%	9.4%	
Effingham	2,306	217	221	9.4%	9.6%	
Fayette	1,222	117	87	9.6%	7.1%	L
Ford	738	69	73	9.4%	9.9%	
Franklin	2,384	228	260	9.6%	10.9%	
Fulton	1,724	165	192	9.6%	11.1%	
Gallatin	263	25	31	9.6%	11.8%	
Greene	665	63	64	9.5%	9.6%	
Grundy	2,989	284	321	9.5%	10.7%	
Hamilton	432	41	38	9.5%	8.8%	
Hancock	957	91	83	9.5%	8.7%	
Hardin	153	15	15	9.6%	9.8%	
Henderson	324	31	34	9.4%	10.5%	
Henry	2,617	252	248	9.6%	9.5%	
Iroquois	1,539	147	162	9.6%	10.5%	
Jackson	3,397	352	312	10.4%	9.2%	
Jasper	568	54	55	9.5%	9.7%	

County Name	Number of Live Births 2014-2018	Predicted number of Preterm Births	Actual number of Preterm Births	Predicted Preterm Birth Percent	Actual Preterm Birth Percent	Statistically Higher (H) or Lower (L) than Predicted
Jefferson	2,469	250	302	10.1%	12.2%	H
Jersey	1,046	99	106	9.5%	10.1%	
Jo Daviess	878	83	75	9.5%	8.5%	
Johnson	537	51	50	9.5%	9.3%	
Kane	32,913	3,223	3,372	9.8%	10.2%	H
Kankakee	6,530	688	691	10.5%	10.6%	
Kendall	7,860	752	820	9.6%	10.4%	H
Knox	2,846	287	280	10.1%	9.8%	
Lake	37,966	3,601	3,540	9.5%	9.3%	
LaSalle	6,048	581	580	9.6%	9.6%	
Lawrence	798	77	99	9.7%	12.4%	H
Lee	1,712	164	138	9.6%	8.1%	
Livingston	2,035	196	203	9.6%	10.0%	
Logan	1,521	146	167	9.6%	11.0%	
McDonough	1,377	135	122	9.8%	8.9%	
McHenry	15,796	1,467	1,447	9.3%	9.2%	
McLean	10,002	982	1,017	9.8%	10.2%	
Macon	6,630	712	762	10.7%	11.5%	
Macoupin	2,306	220	263	9.5%	11.4%	H
Madison	15,010	1,508	1,534	10.1%	10.2%	
Marion	2,459	242	270	9.8%	11.0%	
Marshall	631	60	57	9.6%	9.0%	
Mason	663	64	69	9.6%	10.4%	
Massac	787	77	86	9.7%	10.9%	
Menard	608	58	66	9.5%	10.9%	
Mercer	723	69	81	9.5%	11.2%	
Monroe	1,777	165	174	9.3%	9.8%	
Montgomery	1,486	142	163	9.6%	11.0%	
Morgan	1,805	178	230	9.9%	12.7%	H
Moultrie	929	87	70	9.4%	7.5%	
Ogle	2,661	254	251	9.5%	9.4%	
Peoria	13,027	1,421	1,460	10.9%	11.2%	
Perry	1,030	99	98	9.6%	9.5%	
Piatt	904	83	69	9.1%	7.6%	
Pike	963	92	102	9.6%	10.6%	
Pope	145	14	15	9.6%	10.3%	
Pulaski	320	35	30	10.9%	9.4%	
Putnam	249	24	29	9.5%	11.6%	
Randolph	1,668	163	160	9.8%	9.6%	
Richland	946	90	99	9.5%	10.5%	
Rock Island	8,991	933	922	10.4%	10.3%	
St. Clair	16,437	1,857	1,901	11.3%	11.6%	

County Name	Number of Live Births 2014-2018	Predicted number of Preterm Births	Actual number of Preterm Births	Predicted Preterm Birth Percent	Actual Preterm Birth Percent	Statistically Higher (H) or Lower (L) than Predicted
Saline	1,584	153	166	9.7%	10.5%	
Sangamon	11,332	1,180	1,398	10.4%	12.3%	H
Schuyler	305	30	44	9.8%	14.4%	H
Scott	240	23	25	9.5%	10.4%	
Shelby	1,239	117	119	9.4%	9.6%	
Stark	304	29	20	9.5%	6.6%	
Stephenson	2,473	255	276	10.3%	11.2%	
Tazewell	7,487	710	675	9.5%	9.0%	
Union	922	88	89	9.5%	9.7%	
Vermilion	4,962	521	677	10.5%	13.6%	H
Wabash	709	68	77	9.5%	10.9%	
Warren	1,068	105	98	9.8%	9.2%	
Washington	792	75	62	9.4%	7.8%	
Wayne	1,036	99	104	9.6%	10.0%	
White	765	73	87	9.6%	11.4%	
Whiteside	3,111	300	208	9.7%	6.7%	L
Will	38,307	3,784	3,899	9.9%	10.2%	
Williamson	3,905	379	393	9.7%	10.1%	
Winnebago	17,980	1,884	1,956	10.5%	10.9%	
Woodford	2,126	200	193	9.4%	9.1%	