

August 2019

CDPH data report

Maternal Morbidity & Mortality In Chicago



**HEALTHY
CHICAGO**

CHICAGO DEPARTMENT OF PUBLIC HEALTH

Executive Summary

Pregnant and postpartum women in the United States, especially women of color, are experiencing adverse outcomes related to pregnancy at increasing rates.

In this report, Chicago Department of Public Health (CDPH) provides Chicago-specific data to complement the statewide [Illinois Maternal Morbidity and Mortality Report](#). Data are presented on severe maternal morbidity and pregnancy-associated mortality among Chicago residents, along with specific rates by demographic subgroups.

Severe maternal morbidity

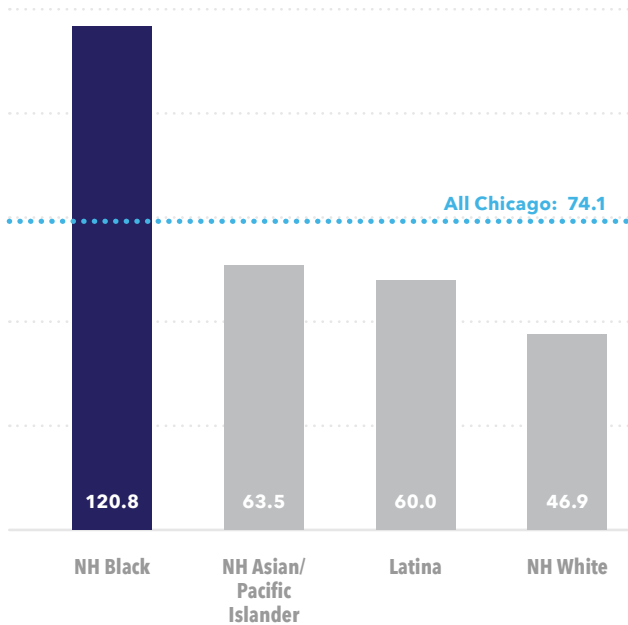
is defined as experiencing one of a collection of diagnoses and procedures occurring at the time of delivery that are likely to cause both short-term and long-term consequences to the mother's health.

Pregnancy-associated mortality

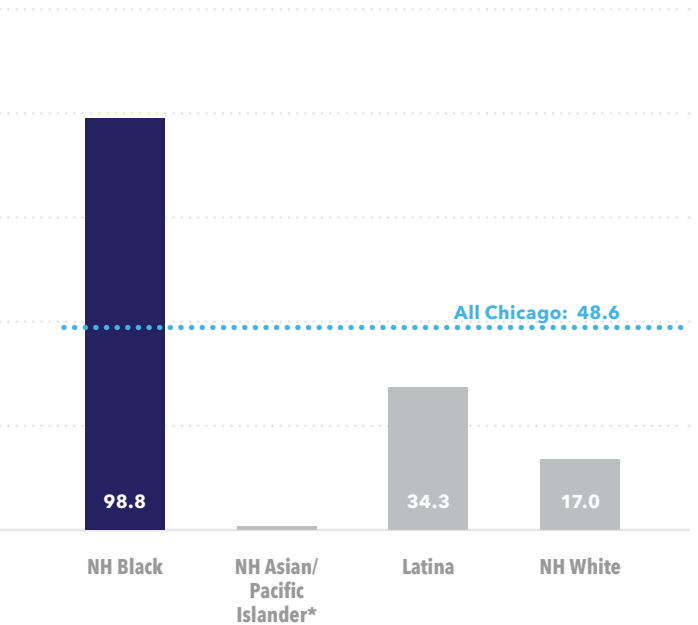
is defined as the death of the mother occurring during pregnancy or up to one year after the end of a pregnancy, regardless of the cause of death.

Consistent with national and state trends, in Chicago non-Hispanic Black women and women living in communities with higher economic hardship, or worse economic conditions, bear the largest burden of maternal morbidity and mortality. To improve maternal health outcomes, interventions must address not only the immediate health of the mother, but also health and living conditions throughout her life.

Non-Hispanic Black women have the highest rates of severe maternal morbidity (per 10,000 deliveries).



Non-Hispanic Black women have the highest pregnancy-associated mortality ratios (per 100,000 births).



*Rates are not calculated for counts less than 5.



Key Findings

Severe Maternal Morbidity, 2016–2017

- ★ For the two years combined, 527 Chicago women experienced severe maternal morbidity, a rate of 74.1 per 10,000 deliveries.
- ★ The severe maternal morbidity rate for non-Hispanic Black women (120.8 per 10,000 deliveries) was over 2.5 times higher than for non-Hispanic White women (46.9 per 10,000 deliveries) and about twice as high as Latinas (60.0 per 10,000 deliveries) or non-Hispanic Asian/Pacific Islander women (63.5 per 10,000 deliveries).
- ★ The severe maternal morbidity rate was highest for women aged 40–49 (139.0 per 10,000 deliveries), followed by women aged 14–19 (98.7 per 10,000 deliveries).
- ★ Women living in communities with high economic hardship have the highest severe maternal morbidity rates (91.5 per 10,000 deliveries).

Pregnancy-Associated Mortality, 2011–2016

- ★ A total of 116 Chicago women died during or within one year of pregnancy, a pregnancy-associated mortality ratio of 48.6 per 100,000 births.
- ★ The pregnancy-associated mortality ratio was almost six times higher for non-Hispanic Black women (98.8 per 100,000 births) compared to non-Hispanic White women (17.0 per 100,000 births) and two times higher for Latina women (34.3 per 100,000 births) than non-Hispanic White women.
- ★ Women living in communities with high economic hardship have the highest pregnancy-associated mortality ratio (62.7 per 100,000 births).
- ★ Among non-Hispanic Black women, 78% of deaths were due to natural causes, higher than the proportion for Latina (54%) and non-Hispanic White (50%) women.



Table of Contents

1

Introduction

- 02 Executive Summary
 - 03 Key Findings
 - 06 Introduction
-

2

Maternal Morbidity and Mortality in Chicago

- 07 Severe Maternal Morbidity
 - 11 Pregnancy-Associated Mortality
 - 17 Pregnancy-Related Mortality
 - 18 Conclusions
 - 18 References
 - 19 List of Tables
-

3

Methodology

- 25 Data Sources
- 26 Technical Notes

Introduction

Pregnancy can be one of the most exciting experiences in a family's life. While most pregnancies result in healthy mothers and babies, many women experience adverse outcomes during or after pregnancy. Each woman's body responds to pregnancy uniquely, but social and environmental factors—including racism, toxic stress, and access to care—also have great influence over a woman's health. With the realization that pregnant and postpartum women in the United States, especially women of color, are experiencing adverse outcomes at increasing rates, more attention is being focused on maternal health and the disparities seen.¹

In October 2018, the Illinois Department of Public Health (IDPH) released its first report on maternal morbidity and mortality in Illinois.² The Chicago Department of Public Health (CDPH) is building on that report with an analysis of Chicago-specific data. We present data here on severe maternal morbidity and pregnancy-associated mortality among Chicago residents, along with specific rates by demographic subgroups.

Severe Maternal Morbidity

is defined as experiencing one of a collection of diagnoses and procedures occurring at the time of delivery that are likely to cause both short-term and long-term consequences to the mother's health.³

Pregnancy-associated mortality

is defined as the death of the mother occurring during pregnancy or up to one year after the end of a pregnancy, regardless of the cause of death.⁴

In addition to racial-ethnic differences, those living in communities with greater economic hardship (i.e., worse economic conditions based on factors such as housing, income, unemployment, and education level) are also disproportionately affected by severe maternal morbidity and pregnancy-associated mortality. Moreover, unlike birth rates, maternal morbidity and mortality has not been declining.

While it is important to describe the adverse health outcomes that occur to mothers, a focus on maternal health should begin before a woman becomes pregnant. Factors beyond just what occurs during a woman's pregnancy contribute to the disparities described within this report. Ensuring that women have access to quality care and improving social, economic, educational, and environmental determinants throughout the entire course of their lives can have an impact on a their health during pregnancy.

The number of babies born to Chicago mothers has been decreasing. During the time period covered by this report, about 38,000 babies were born annually. Birth rates are similar for non-Hispanic Black and White mothers. However, as presented in this report, adverse maternal health outcomes are not equally distributed; non-Hispanic Black women have the highest rates of both severe maternal morbidity and pregnancy-associated mortality.



Severe Maternal Morbidity

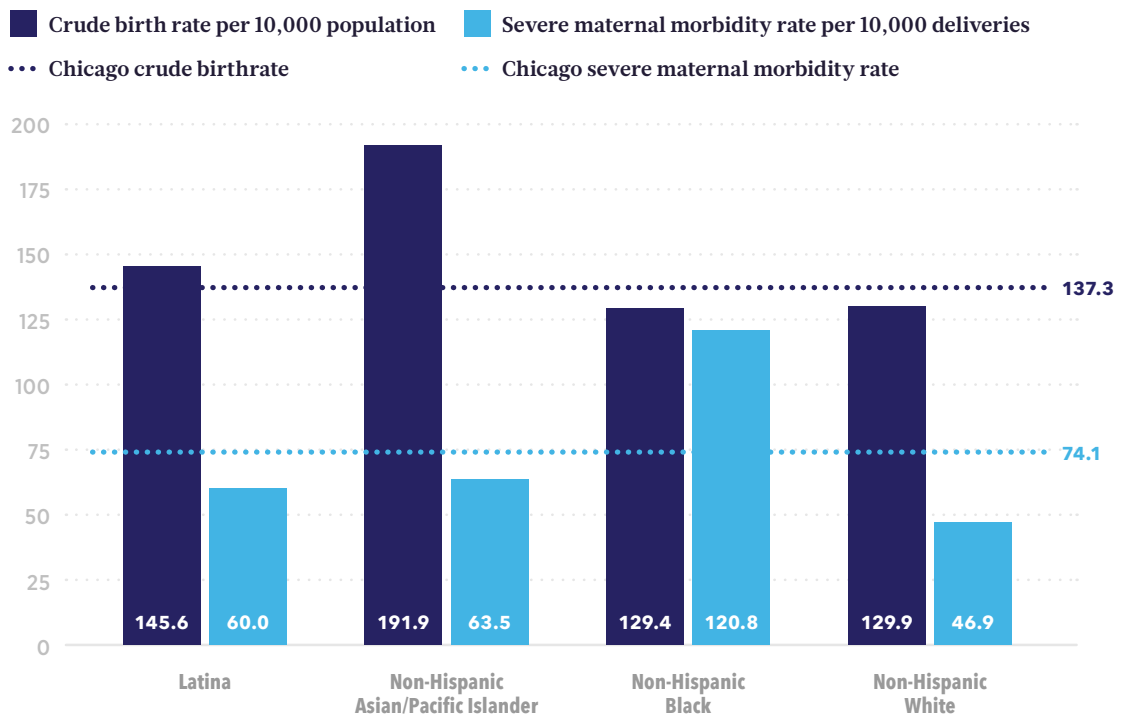
Severe maternal morbidity is defined as experiencing one or more of a collection of diagnoses and procedures occurring at the time of delivery that are likely to cause both short-term and long-term consequences to the mother's health. Severe maternal morbidity cases are often considered "near miss" cases for maternal mortality.

Hospital discharge data were used for this analysis. Due to changes made in October 2015 to the codes used to identify the reported indicators, this analysis only includes data from 2016–2017. A full list of indicators and the corresponding Chicago rates can be found in Table 1 at the end of this report.

- ★ More than 71,000 hospital deliveries to Chicago women occurred during 2016 and 2017 combined. Of these, 527 mothers experienced severe maternal morbidity, a rate of 74.1 per 10,000 deliveries [FIGURE 1, TABLE 2](#). This rate was about 45% higher than the rate for the state of Illinois (51.4 per 10,000 deliveries).²
- ★ The five most frequently experienced severe maternal morbidity indicators accounted for 62% of all morbidity and included disseminated intravascular coagulation, acute renal failure, hysterectomy, sepsis and adult respiratory distress syndrome ([TABLE A, TABLE 1](#)). More than a quarter (26%) of women with severe maternal morbidity had more than one diagnosis or procedure ([TABLE 4](#)).
- ★ Non-Hispanic Black women experience severe maternal morbidity at a significantly higher rate than all other race-ethnicity groups despite having similar birth rates ([FIGURE 1, TABLE 3](#)).
- ★ Women aged 35 years and older were more likely to experience severe maternal morbidity than women aged 25–34 years ([FIGURE 2, TABLE 2](#)).
- ★ Women for whom Medicaid was the delivery payment source are significantly more likely than those who used private insurance to experience severe maternal morbidity ([TABLE 2](#)).
- ★ The rate of severe maternal morbidity for women living in zip codes with high economic hardship, or worse community economic conditions, was significantly higher than the rate for women living in zip codes of low or medium economic hardship ([FIGURE 3, FIGURE 4, TABLE 2](#)).

Figure 1

SEVERE MATERNAL MORBIDITY AND CRUDE BIRTH RATES BY RACE-ETHNICITY, CHICAGO, 2016-2017



SOURCES: Hospital Discharge Data, Division of Patient Safety and Quality, Illinois Department of Public Health; Birth and Death Certificate Data Files, Division of Vital Records, Illinois Department of Public Health

Table A

FIVE MOST FREQUENT CAUSES OF SEVERE MATERNAL MORBIDITY, CHICAGO 2016-2017

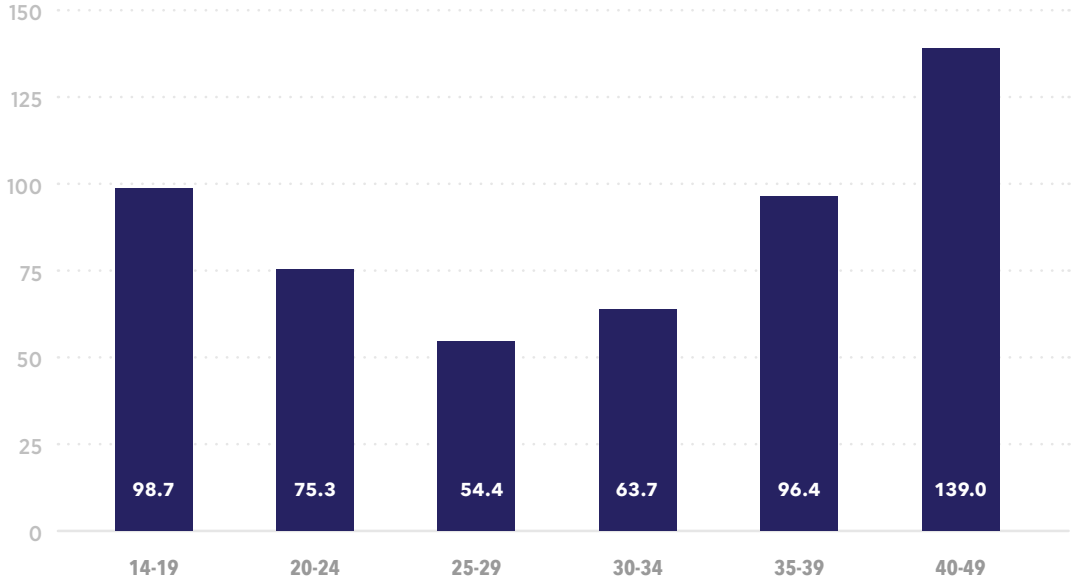
SEVERE MATERNAL MORBIDITY INDICATOR	NUMBER OF DELIVERIES	RATE PER 10,000 DELIVERIES	DESCRIPTION*
Disseminated Intravascular Coagulation (DIC)	133	18.7	Blood clots that form inside blood vessels
Acute Renal Failure	108	15.2	The kidneys cannot filter waste from the body (kidney failure)
Hysterectomy	96	13.5	Removal of a woman's uterus
Sepsis	91	12.8	Whole-body immune response to an infection, including inflammation
Adult Respiratory Distress Syndrome	61	8.6	Fluid builds up in the lungs and blocks oxygen from going to the organs (respiratory failure)

SOURCE: Hospital Discharge Data, Division of Patient Safety and Quality, Illinois Department of Public Health

*As defined in: Illinois Department of Public Health. *Illinois Maternal Morbidity and Mortality Report*. October 2018.

Figure 2

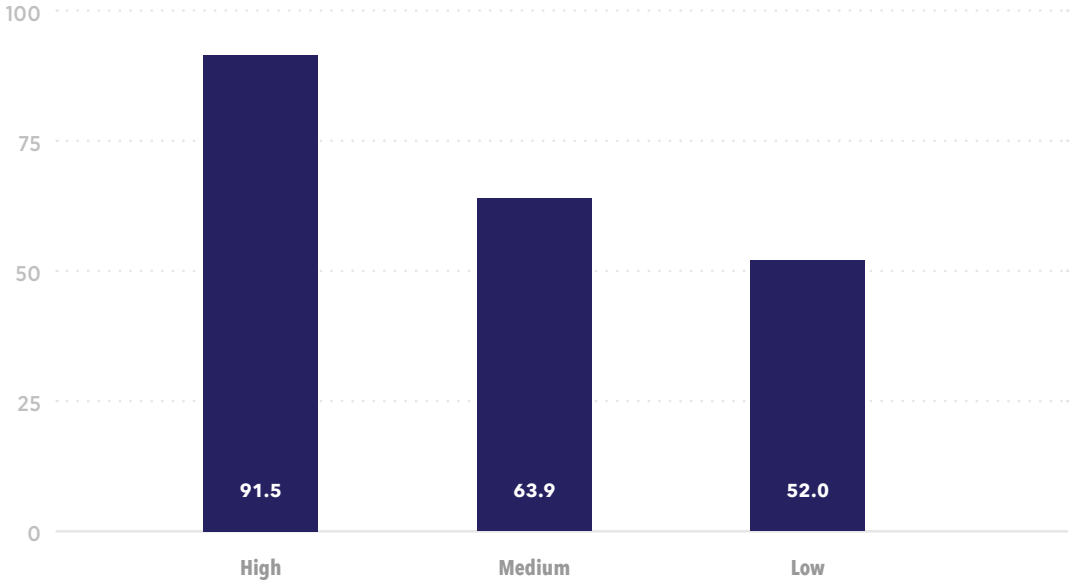
SEVERE MATERNAL MORBIDITY RATE Per 10,000 deliveries by maternal age group, Chicago 2016–2017



SOURCE: Hospital Discharge Data, Division of Patient Safety and Quality, Illinois Department of Public Health

Figure 3

SEVERE MATERNAL MORBIDITY RATE Per 10,000 deliveries by economic hardship level, Chicago 2016–2017



SOURCE: Hospital Discharge Data, Division of Patient Safety and Quality, Illinois Department of Public Health; American Community Survey Data, United States Census Bureau



Pregnancy-Associated Mortality

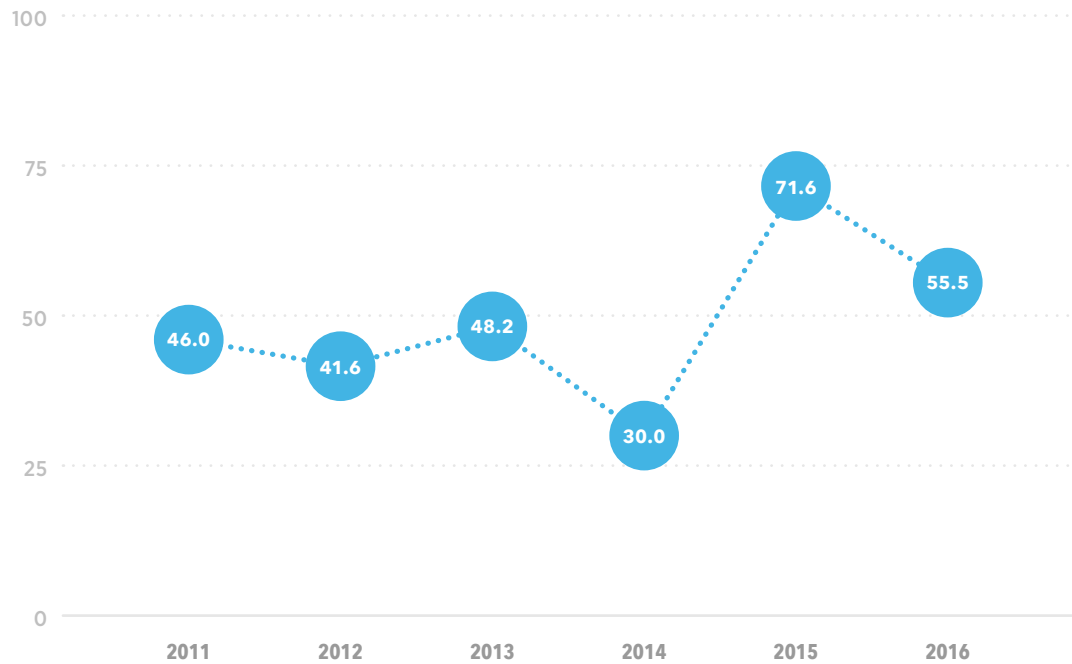
Pregnancy-associated mortality is defined as the death of a woman during pregnancy or within one year of a pregnancy from any cause. IDPH shared with CDPH the death certificate numbers for deaths they determined to be pregnancy-associated among residents of Chicago for 2011–2016. The process used to identify these deaths is described in detail in the IDPH report.² Please note: *The maternal mortality data in this report cannot be compared to national rates due to differences in methodologies.*

Demographics

- ★ A total of 116 Chicago women experienced a pregnancy-associated death from 2011 to 2016 combined, for a pregnancy-associated mortality ratio of 48.6 per 100,000 live births (TABLE 5). Chicago's pregnancy-associated mortality ratio is only slightly higher than Illinois' (46.6 per 100,000 live births.)²
- ★ Between 2011 and 2016, an average of 19 women per year died during or within one year of pregnancy. The lowest number of deaths (12) occurred in 2014 and the highest number (28) occurred in 2015. Annual pregnancy-associated mortality ratios were not significantly different over time (FIGURE 5, TABLE 6).
- ★ Large disparities exist between pregnancy-associated mortality ratios for demographic groups. Despite having similar birth rates, non-Hispanic Black women die during or within one year of pregnancy almost six times more often than non-Hispanic White women; Latina women were twice as likely as non-Hispanic White women to die (FIGURE 7, TABLE 5, TABLE 7).
- ★ Unlike severe maternal morbidity, there are no significant differences in pregnancy-associated mortality ratios among women of different age groups (TABLE 5).
- ★ Women with a high school education or less were at increased risk of pregnancy-associated mortality compared to women with more than a high school education (FIGURE 6, TABLE 5).
- ★ Women living in community areas of high and medium economic hardship were more likely to experience pregnancy-associated mortality than women living in community areas of low economic hardship (FIGURE 8, TABLE 5).

Figure 5

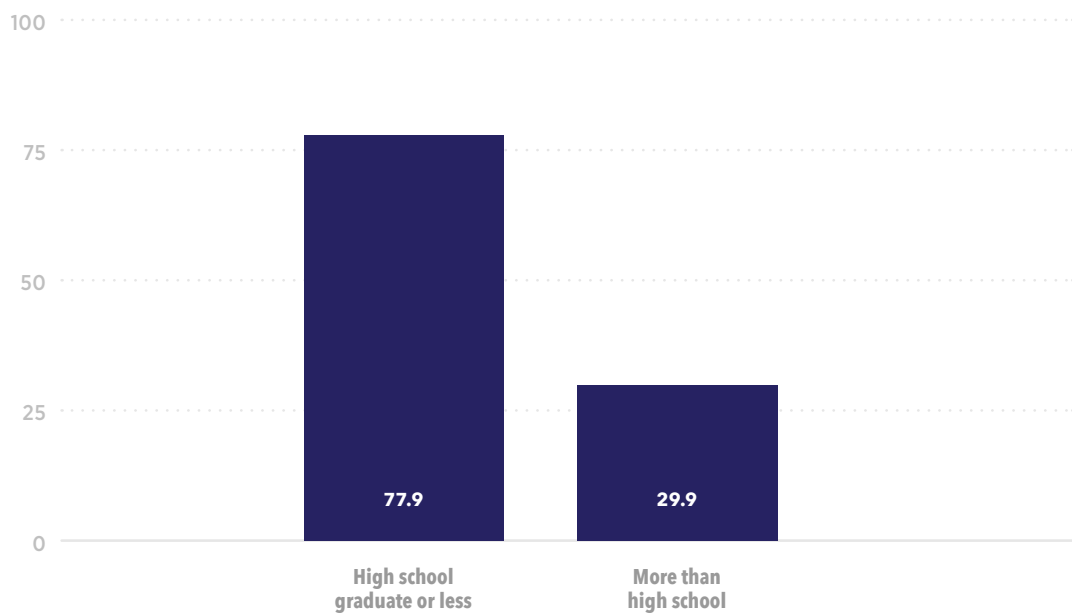
PREGNANCY-ASSOCIATED MORTALITY RATIO Per 100,000 births, Chicago 2011-2016



SOURCE: Death Certificate Data Files, Division of Vital Records, Illinois Department of Public Health

Figure 6

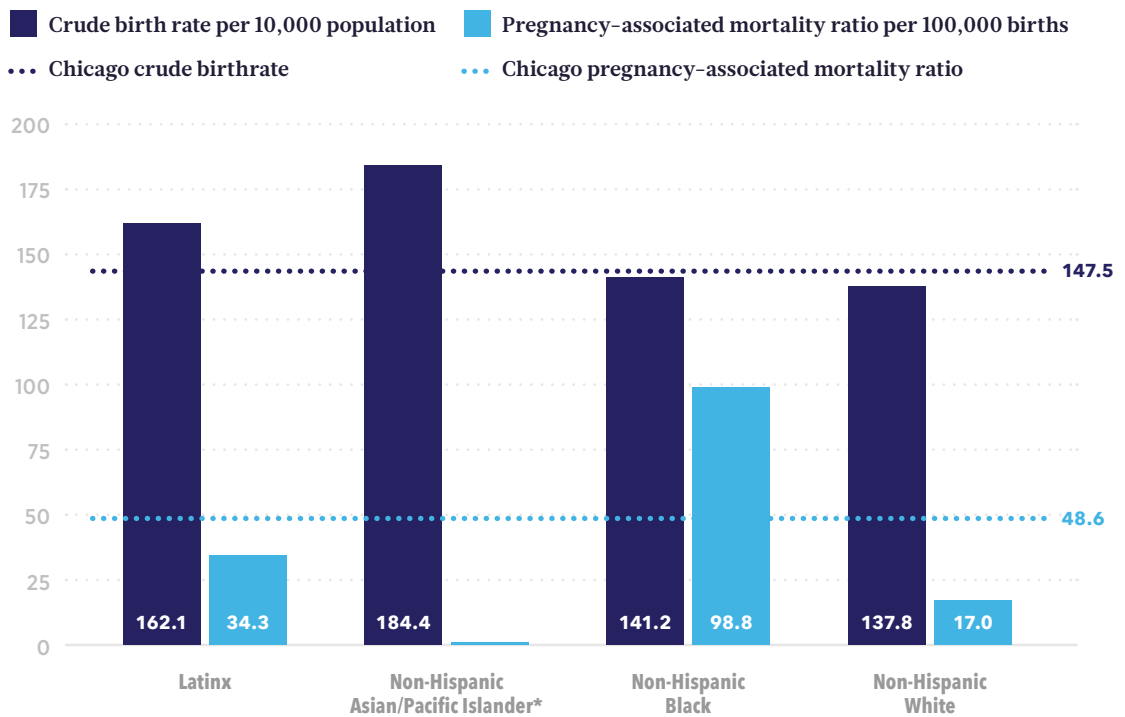
PREGNANCY-ASSOCIATED MORTALITY RATIO Per 100,000 births by education level, Chicago 2011-2016



SOURCE: Death Certificate Data Files, Division of Vital Records, Illinois Department of Public Health

Figure 7

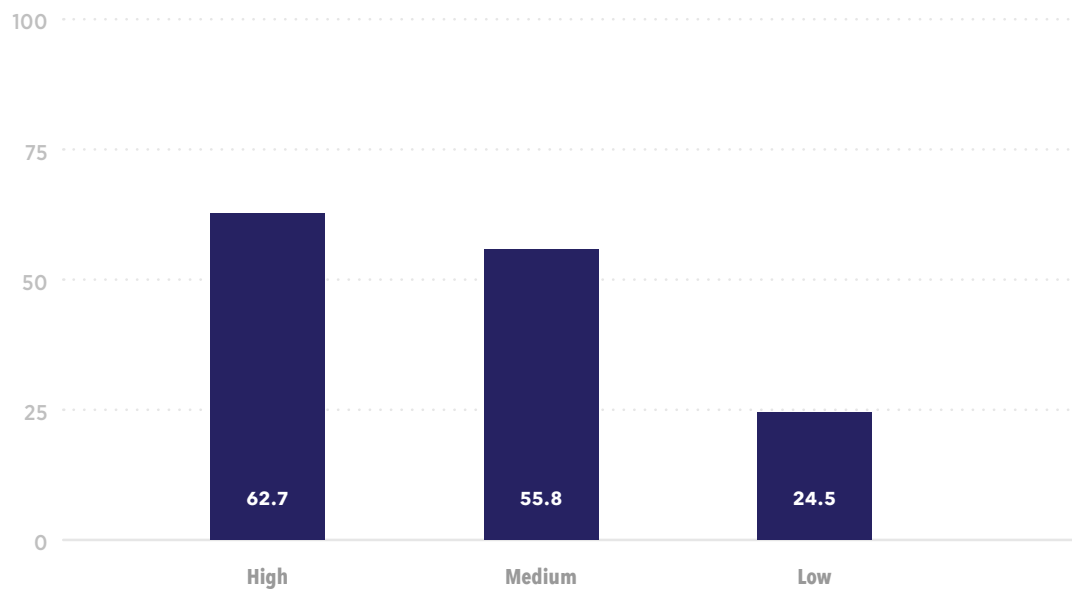
PREGNANCY-ASSOCIATED MORTALITY RATIO AND CRUDE BIRTH RATE BY RACE-ETHNICITY, CHICAGO, 2011-2016



SOURCE: Death Certificate Data Files, Division of Vital Records, Illinois Department of Public Health *Rates are not calculated for counts less than 5.

Figure 8

PREGNANCY-ASSOCIATED MORTALITY RATIO Per 100,000 births by economic hardship level, Chicago 2011-2016

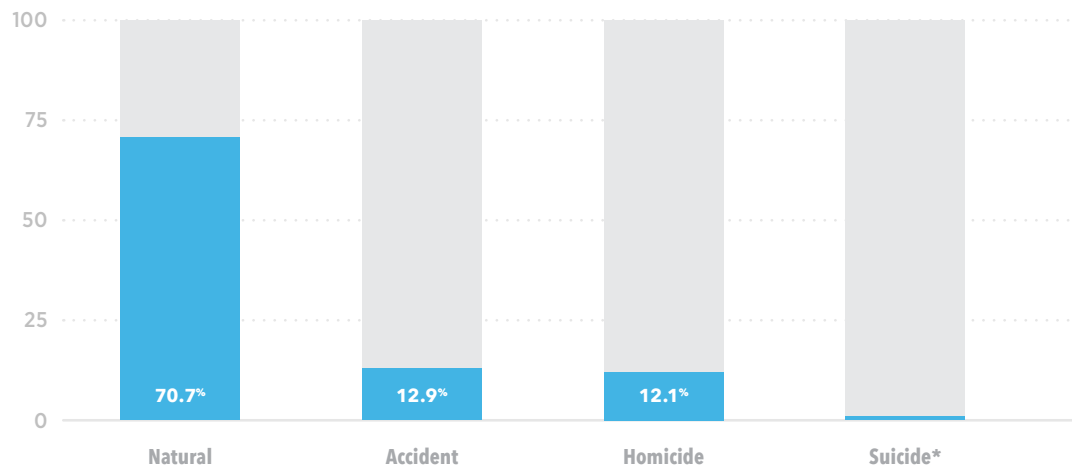


SOURCE: Death Certificate Data Files, Division of Vital Records, Illinois Department of Public Health; American Community Survey Data, United States Census Bureau

Manner and Timing of Death

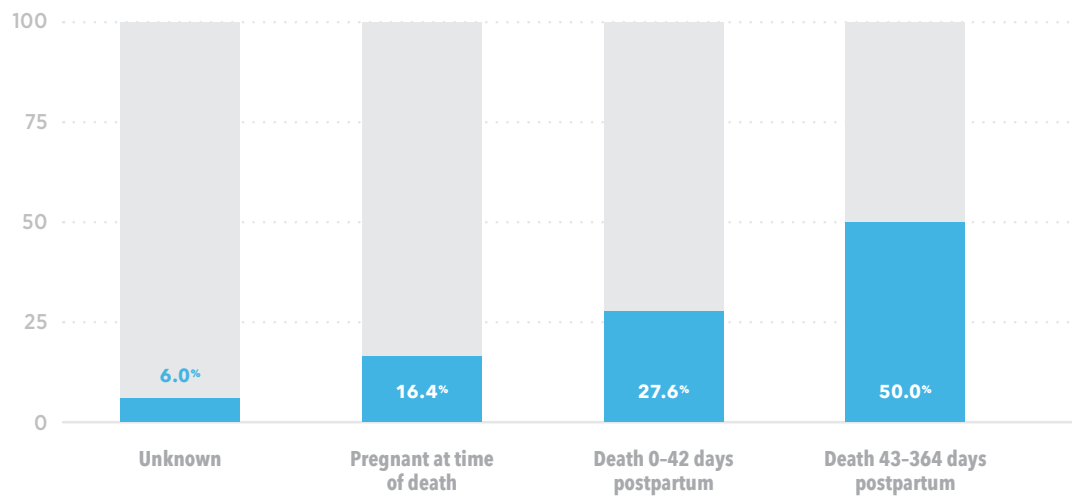
- ★ The majority of pregnancy-associated deaths were due to natural causes (71%), followed by accidents (13%) and homicide (12%) (FIGURE 9, TABLE 8). Among non-Hispanic Black women, 78% of deaths were due to natural causes. This is higher than the proportion for Latina (54%) and non-Hispanic White (50%) women.
- ★ Maternal mortality has traditionally focused on the immediate postpartum period, within 42 days of delivery.⁵ Among Chicago mothers, 78% of pregnancy-associated deaths occurred after delivery; 28% occurred within the immediate postpartum period and 50% occurred more than 42 days after delivery. (FIGURE 10, TABLE 8).

Figure 9 **PERCENTAGE OF PREGNANCY-ASSOCIATED DEATHS**
By manner of death, Chicago 2011-2016



SOURCE: Death Certificate Data Files, Division of Vital Records, Illinois Department of Public Health *Rates are not calculated for counts less than 5.

Figure 10 **PERCENTAGE OF PREGNANCY-ASSOCIATED DEATHS**
By timing of death, Chicago 2011-2016



SOURCE: Death Certificate Data Files, Division of Vital Records, Illinois Department of Public Health

Birth Certificate Data: Maternal Health and Birth Outcomes

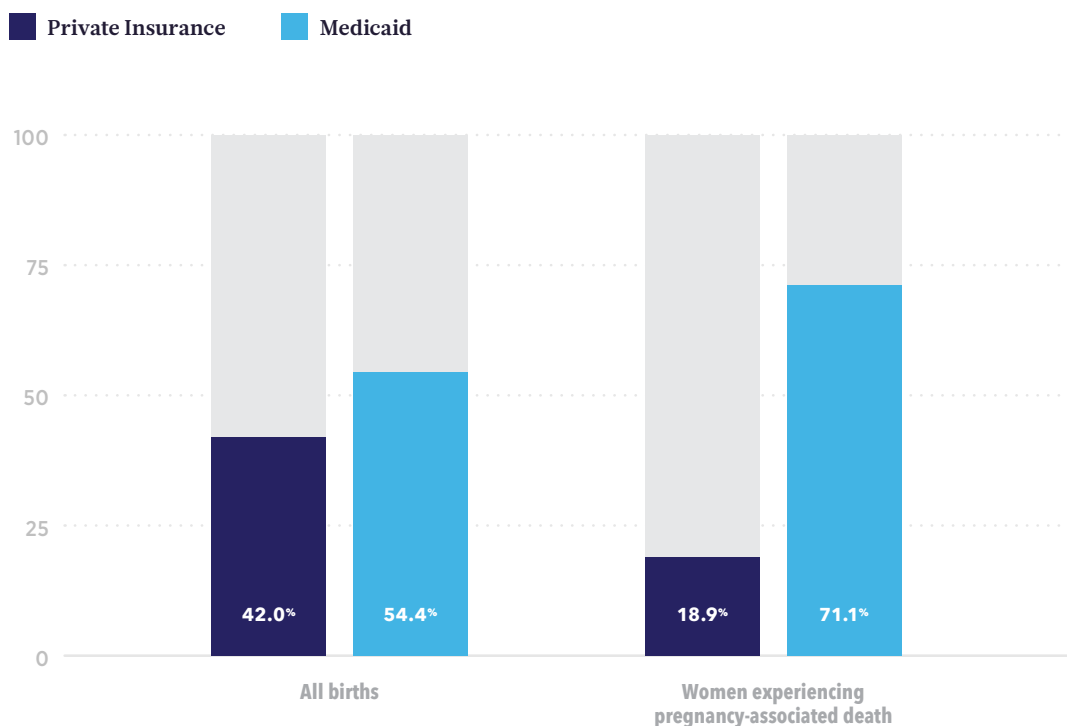
Of the 116 maternal mortality cases, 90 had a live birth for which CDPH was able to link the death certificate to a birth certificate (77.6%). The remaining twenty-six deaths (e.g., those occurring during pregnancy or after miscarriage) were not linked to a birth certificate (22.4%).

- ★ Medicaid (71%) and private insurance (19%) are the two most common insurance payors among women who experienced a pregnancy-associated death. Among all births, Medicaid accounts for 54% of births and private insurance accounts for 42%. Women covered by Medicaid were nearly three times more likely to experience a pregnancy-associated death than women with private insurance (FIGURE 11, TABLE 9).
- ★ Chronic diseases, including obesity, hypertension, and diabetes, can increase the risk of a woman experiencing adverse outcomes during pregnancy.⁶ There were no significant differences in pre-pregnancy BMI, hypertension, and diabetes between women who experienced a pregnancy-associated death and all women who delivered babies in Chicago (TABLE 10).
- ★ Among the women who experienced a pregnancy-associated death, 84% received any prenatal care, which is significantly lower than the percentage of all Chicago births, where 96% of women received any prenatal care (FIGURE 12, TABLE 11).
- ★ Close to half (49%) of women who experienced pregnancy-associated death received adequate prenatal care based on their trimester of first visit and number of visits. In contrast, among all women who delivered babies in Chicago, 64% received adequate prenatal care (FIGURE 12, TABLE 11).
- ★ The percentage of births that were preterm (37%) and low birthweight (33%) was significantly higher among women who experienced pregnancy-associated mortality than among all births in Chicago, 11% and 10% respectively (FIGURE 13, TABLE 12).

Figure 11

PERCENTAGE OF DELIVERY PAYMENT SOURCE

By maternal outcome, Chicago, 2011–2016



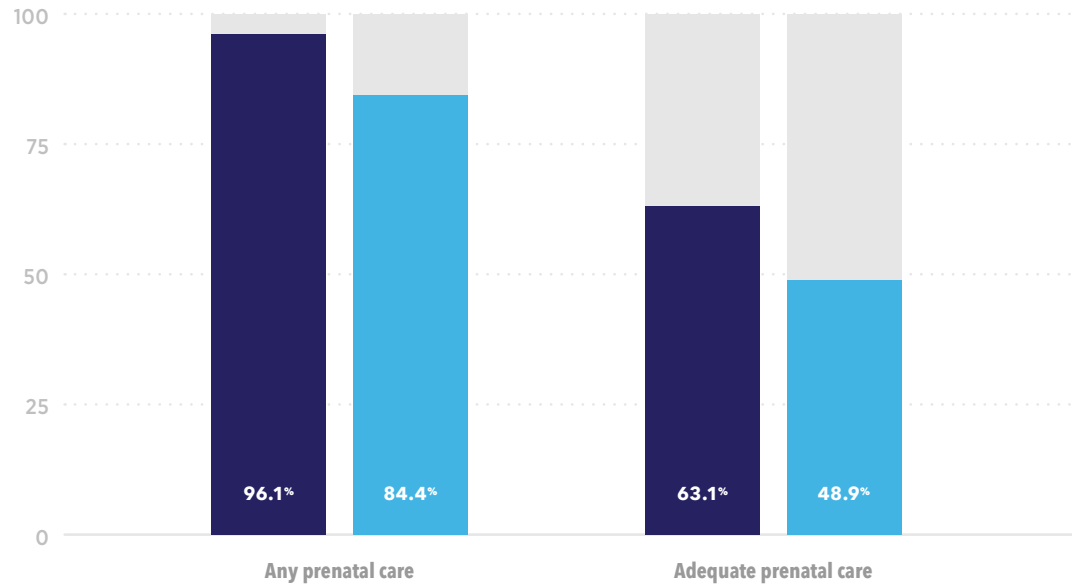
SOURCE: Birth Certificate Data Files, Division of Vital Records, Illinois Department of Public Health

Figure 12

PERCENTAGE OF BIRTHS RECEIVING ANY PRENATAL CARE AND ADEQUATE PRENATAL CARE

By maternal outcome, Chicago, 2011–2016

■ All births ■ Births to women experiencing a pregnancy-associated death



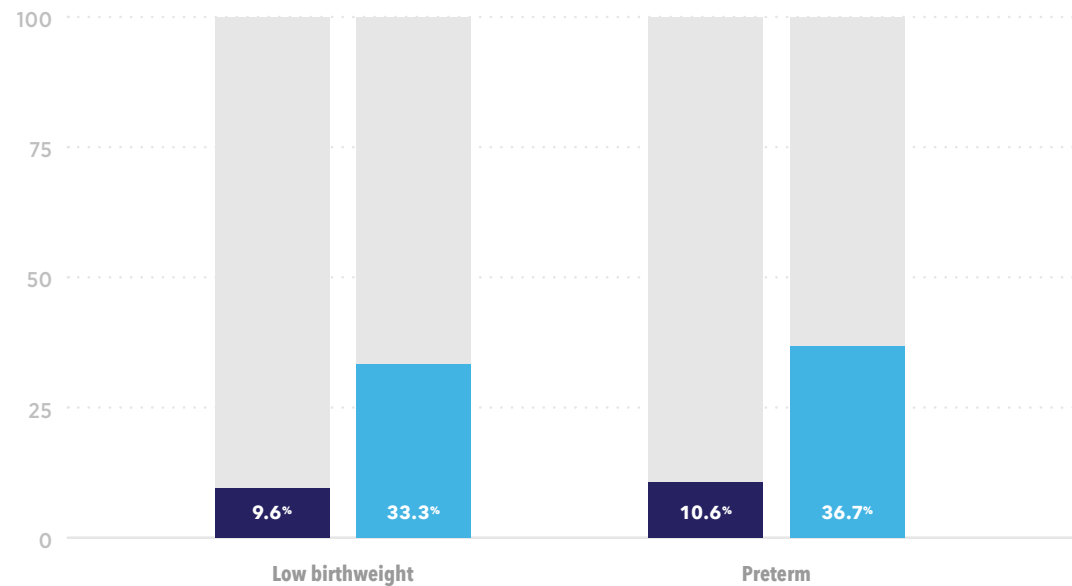
SOURCE: Birth Certificate Data Files, Division of Vital Records, Illinois Department of Public Health

Figure 13

PERCENTAGE OF BIRTHS THAT WERE LOW BIRTHWEIGHT AND PRETERM

By maternal outcome, Chicago, 2011–2016

■ All births ■ Births to women experiencing a pregnancy-associated death



SOURCE: Birth Certificate Data Files, Division of Vital Records, Illinois Department of Public Health

Pregnancy-Related Mortality

Pregnancy-related deaths are a subset of pregnancy-associated deaths. Pregnancy-related mortality is determined after review to be due to a pregnancy complication, a chain of events initiated by the pregnancy, or the aggravation of an unrelated condition by the physiological effects of pregnancy.⁴ In Illinois, two committees are tasked with reviewing pregnancy-associated deaths to determine whether they are pregnancy-related.² The Maternal Mortality Review Committee on Violent Deaths (MMRC-V) reviews deaths related to suicide, homicide, and drug overdoses and the Maternal Mortality Review Committee (MMRC) reviews all other deaths. Representatives of CDPH sit on both the MMRC and MMRC-V, but all data are maintained by IDPH.

IDPH shared with CDPH the information about pregnancy-related deaths for 2015, the first year of data available under a new review process. Though CDPH believes in the importance of sharing these data, we suggest interpreting the results of this section with caution due to small numbers.

In Chicago in 2015, there were 28 pregnancy-associated deaths. Of these, 10 (35.7%) were determined to be pregnancy-related. For four cases, the MMRCs could not determine whether or not the deaths were pregnancy-related. Nine of the pregnancy related deaths were determined to be due to medical causes; one death was due to violence.



Conclusions

Consistent with national and state trends, this report shows that stark racial and socioeconomic disparities in maternal morbidity and mortality exist in Chicago. Specifically, the risk of poor maternal health outcomes is greatest among Chicago's non-Hispanic Black mothers and those living in communities with higher economic hardship.

CDPH agrees with the recommendations of Illinois' MMRC and MMRC-V, as outlined in the Illinois Maternal Morbidity and Mortality Report.² These recommendations are aimed at hospitals, healthcare providers, health insurance plans, managed care organizations, and the State of Illinois. Moreover, CDPH recognizes that strategies only addressing healthcare-related factors will not be enough. Chicago needs to address upstream social determinants of health including the intersection of racism and educational, economic, environmental, structural and institutional inequities to improve the health of women throughout their life course.

This will in turn impact the inequitable distribution of maternal morbidity and mortality in Chicago.

The findings of this report underscore CDPH's mission to promote and improve health by engaging residents, communities and partners in establishing and implementing policies and services that prioritize residents and communities with the greatest need, and our shared vision for health equity. By analyzing and sharing these data, CDPH seeks to provide new insights and useful information to our partners in the larger public health system who are working with us to develop the programs, policies and systems needed to improve maternal health for all Chicago women.

References

1. Maternal Health Task Force at the Harvard Chan School Center of Excellence in Maternal and Child Health. *Maternal Health in the United States*. <https://www.mhtf.org/topics/maternal-health-in-the-united-states/>. Accessed 6/10/2019.
2. Illinois Department of Public Health. *Illinois Maternal Morbidity and Mortality Report*. October 2018.
3. Centers for Disease Control and Prevention. *Severe Maternal Morbidity in the United States*. <https://www.cdc.gov/reproductivehealth/maternalinfanthealth/severematernalmorbidity.html#icd>. Accessed 6/10/2019.
4. Review to Action. *Definitions*. <https://reviewtoaction.org/learn/definitions>. Accessed 6/10/2019.
5. World Health Organization. *Maternal mortality ratio (per 100,000 live births)*. <https://www.who.int/healthinfo/statistics/indmaternalmortality/en/>. Accessed 6/19/2019.
6. Association of Maternal & Child Health Programs. *AMCHP Fact Sheet: MCH & Chronic Disease*. September 2008. <http://www.amchp.org/programsandtopics/womens-health/resources/Documents/Chronic-Disease-Fact-Sheet.pdf>. Accessed 6/10/2019.
7. Kotelchuck M. *An evaluation of the Kessner Adequacy of Prenatal Care Index and a proposed Adequacy of Prenatal Care Utilization Index*. *Am J Public Health*. 1994; 84(9):1414-20.
8. National Center for Health Statistics. *User Guide to the 2009 Natality Public Use File*. Hyattsville, Maryland: National Center for Health Statistics. Annual product 2010. ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Dataset_Documentation/DVS/natality/UserGuide20ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Dataset_Documentation/DVS/natality/UserGuide2009.pdf. Accessed 6/19/2019.
9. Callaghan WM, Creanga AA, Kuklina EV. *Severe maternal morbidity among delivery and postpartum hospitalizations in the United States*. *Obstet Gynecol*. 2012; 120(5):1029-36.
10. Montiel LM, Nathan RP, Wright DJ. *An Update on Urban Hardship*. Albany, New York: The Nelson A Rockefeller Institute of Government. August 2004.

List of Tables

Table 1	Severe maternal morbidity by indicator (diagnosis or procedure), Chicago, 2016-2017	Table 7	Crude birth rate by race-ethnicity and economic hardship, Chicago, 2011-2016
Table 2	Severe maternal morbidity by demographic and socioeconomic subgroups, Chicago, 2016-17	Table 8	Manner and timing of pregnancy-associated death, Chicago, 2011-2016
Table 3	Crude birth rate by race-ethnicity, Chicago, 2016-17	Table 9	Delivery payment source, Chicago 2011-2016
Table 4	Presence of multiple severe maternal morbidity indicators, Chicago, 2016-2017	Table 10	Chronic diseases among mothers, Chicago, 2011-2016
Table 5	Pregnancy-associated mortality by demographic and socioeconomic subgroups, Chicago, 2011-16	Table 11	Prenatal care, Chicago, 2011-2016
Table 6	Pregnancy-associated mortality by year, Chicago, 2011-16	Table 12	Birth outcomes, Chicago, 2011-2016

TABLE 1 Severe maternal morbidity by indicator (diagnosis or procedure), Chicago, 2016-2017

	NUMBER OF CASES	RATE PER 10,000 DELIVERIES	95% CONFIDENCE INTERVAL
Disseminated Intravascular Coagulation	133	18.7	15.5 - 21.9
Acute Renal Failure	108	15.2	12.3 - 18.1
Hysterectomy	96	13.5	10.9 - 16.5
Sepsis	91	12.8	10.3 - 15.7
Adult Respiratory Distress Syndrome	61	8.6	6.6 - 11.0
Shock	57	8.0	6.1 - 10.4
Ventilation	55	7.7	5.8 - 10.0
Pulmonary Edema/Acute Heart Failure	51	7.2	5.4 - 9.5
Eclampsia	48	6.7	4.9 - 8.9
Sickle Cell Disease with Crisis	25	3.5	2.3 - 5.2
Thrombotic Embolism	22	3.1	1.9 - 4.7
Puerperal Cerebrovascular Disorders/CVA/Stroke	18	2.5	1.5 - 4.0
Cardiac Arrest/ Ventricular Fibrillation/ General Heart Failure	5	0.7	0.2 - 1.6
Conversion of Cardiac Rhythm	5	0.7	0.2 - 1.6
Temporary Tracheostomy	5	0.7	0.2 - 1.6
Acute Myocardial Infarction	3	*	*
Aneurysm	3	*	*
Severe Anesthesia Complications	3	*	*
Amniotic Fluid Embolism	1	*	*
Heart Failure/Arrest during Surgery or Procedure	0	--	--

TABLE 2 Severe maternal morbidity by demographic and socioeconomic subgroups, Chicago, 2016-17

	NUMBER OF CASES	RATE PER 10,000 DELIVERIES	95% CONFIDENCE INTERVAL
Chicago	527	74.1	67.8 - 80.4
RACE-ETHNICITY			
Latina	105	60.0	48.5 - 71.5
Non-Hispanic Asian/Pacific Islander	28	63.5	42.2 - 91.8
Non-Hispanic Black	242	120.8	105.6 - 136.0
Non-Hispanic White	93	46.9	37.9 - 57.5
Other/Not Given	59	63.2	48.1 - 81.5
AGE			
14 - 19	39	98.7	70.2 - 134.9
20 - 24	96	75.3	61.0 - 92.0
25 - 29	94	54.4	44.0 - 66.6
30 - 34	140	63.7	53.1 - 74.3
35 - 39	119	96.4	79.1 - 113.7
40 - 49	39	139.0	98.8 - 190.0
ECONOMIC HARDSHIP LEVEL			
Low	70	52.0	40.5 - 65.7
Medium	163	63.9	54.1 - 73.7
High	294	91.5	81.0 - 102.0
DELIVERY PAYMENT SOURCE			
Private Insurance	265	65.3	57.4 - 73.2
Medicaid	235	85.4	74.5 - 96.3

SOURCE: Hospital Discharge Data, Division of Patient Safety and Quality, Illinois Department of Public Health; American Community Survey Data, United States Census Bureau

TABLE 3 Crude birth rate by race-ethnicity, Chicago, 2016-17

	NUMBER OF BIRTHS	RATE PER 10,000 POPULATION	95% CONFIDENCE INTERVAL
Chicago	74,035	137.3	136.3 - 138.3
RACE-ETHNICITY			
Latina	22,675	145.6	143.7 - 147.5
Non-Hispanic Asian/Pacific Islander	5,583	191.9	186.9 - 196.9
Non-Hispanic Black	22,573	129.4	127.7 - 131.1
Non-Hispanic White	22,208	129.9	128.2 - 131.6

SOURCES: Birth Certificate Data Files, Division of Vital Records, Illinois Department of Public Health; US Census Bureau, 2010 Census

TABLE 4 Presence of multiple severe maternal morbidity indicators, Chicago, 2016-2017

NUMBER OF INDICATORS	NUMBER OF DELIVERIES	PERCENT OF SEVERE MATERNAL MORBIDITY DELIVERIES
1	392	74.4%
2	67	12.7%
3	39	7.4%
4	14	2.7%
5 or more	15	2.8%

SOURCE: Hospital Discharge Data, Division of Patient Safety and Quality, Illinois Department of Public Health

TABLE 5 Pregnancy-associated mortality by demographic and socioeconomic subgroups, Chicago, 2011-16

	NUMBER OF DEATHS	RATIO PER 100,000 BIRTHS	95% CONFIDENCE INTERVAL
Chicago	116	48.6	39.8 - 57.4
RACE-ETHNICITY			
Latina	26	34.3	22.4 - 50.3
Non-Hispanic Asian/Pacific Islander	4	*	*
Non-Hispanic Black	73	98.8	77.4 - 124.2
Non-Hispanic White	12	17.0	8.8 - 29.7
AGE			
14 - 19	9	46.7	21.4 - 88.7
20 - 24	27	56.9	37.5 - 82.8
25 - 29	27	48.0	31.6 - 69.8
30 - 34	21	30.3	18.8 - 46.3
35 - 39	23	62.0	39.9 - 93.0
40 - 49	9	97.8	44.7 - 185.7
EDUCATION LEVEL			
High school graduate or less	75	77.9	61.3 - 97.6
More than high school	41	29.9	21.5 - 40.6
ECONOMIC HARDSHIP LEVEL			
High	55	62.7	47.2 - 81.6
Medium	43	55.8	40.4 - 75.2
Low	18	24.5	14.5 - 38.7

SOURCE: Death Certificate Data Files, Division of Vital Records, Illinois Department of Public Health

*Suppressed, number less than 5.

TABLE 6 Pregnancy-associated mortality by year, Chicago, 2011-16

	NUMBER OF DEATHS	RATIO PER 100,000 BIRTHS	95% CONFIDENCE INTERVAL
2011	19	46.0	27.7 - 71.8
2012	17	41.6	24.2 - 66.6
2013	19	48.2	29.0 - 75.3
2014	12	30.0	15.5 - 52.4
2015	28	71.6	47.6 - 103.5
2016	21	55.4	34.3 - 84.7

SOURCES: Birth and Death Certificate Data Files, Division of Vital Records, Illinois Department of Public Health

TABLE 7 Crude birth rate by race-ethnicity, Chicago, 2011-2016

	NUMBER OF BIRTHS	RATE PER 100,000 POPULATION	95% CONFIDENCE INTERVAL
Chicago	238,630	1475.4	1469.5 - 1481.3
RACE-ETHNICITY			
Latina	75,747	1620.9	1609.4 - 1632.4
Non-Hispanic Asian/Pacific Islander	16,093	1843.9	1815.4 - 1872.4
Non-Hispanic Black	73,890	1411.8	1401.6 - 1422.0
Non-Hispanic White	70,647	1377.6	1367.4 - 1387.8

SOURCES: Birth Certificate Data Files, Division of Vital Records, Illinois Department of Public Health; US Census Bureau, 2010 Census

TABLE 8 Manner and timing of pregnancy-associated death, Chicago, 2011-2016

	NUMBER OF DEATHS	PERCENT OF DEATHS	95% CONFIDENCE INTERVAL
MANNER OF DEATH			
Natural	82	70.7%	62.4% - 79.0%
Accident	15	12.9%	6.8% - 19.0%
Homicide	14	12.1%	6.1% - 18.0%
Suicide	4	*	*
Could not be determined	1	*	*
NATURAL DEATHS BY RACE-ETHNICITY**			
Latina	14	53.8%	43.5% - 64.1%
Non-Hispanic Asian/Pacific Islander	4	*	*
Non-Hispanic Black	57	78.1%	69.5% - 86.6%
Non-Hispanic White	6	50.0%	39.7% - 60.3%
Unknown	1	*	*
TIMING OF DEATH			
Days 43-364 postpartum	58	50.0%	38.0% - 64.6%
Days 0-42 postpartum	32	27.6%	18.9% - 38.9%
Pregnant	19	16.4%	9.9% - 25.6%
Unknown	7	6.0%	2.4% - 12.4%

SOURCE: Death Certificate Data Files, Division of Vital Records, Illinois Department of Public Health *Suppressed, number less than 5. **Numbers for other manners of death are too small to report by race-ethnicity.

TABLE 9 Delivery payment source, Chicago 2011-2016

	ALL BIRTHS			WOMEN EXPERIENCING PREGNANCY-ASSOCIATED DEATH		
	NUMBER	PERCENT	95% CONFIDENCE INTERVAL	NUMBER	PERCENT	95% CONFIDENCE INTERVAL
Private Insurance				17	17.0	9.9 - 27.2
Medicaid				64	49.3	38.0 - 63.0
	NUMBER	PERCENT	95% CONFIDENCE INTERVAL	NUMBER	PERCENT	95% CONFIDENCE INTERVAL
Private Insurance	100,200	42.0%	31.8% - 52.2%	17	18.9%	10.8% - 27.0%
Medicaid	129,707	54.4%	44.1% - 64.6%	64	71.1%	61.7% - 80.5%

SOURCE: Birth Certificate Data Files, Division of Vital Records, Illinois Department of Public Health

TABLE 10 Chronic diseases among mothers, Chicago, 2011-2016

	ALL BIRTHS			WOMEN EXPERIENCING PREGNANCY-ASSOCIATED DEATH		
	NUMBER	PERCENT	95% CONFIDENCE INTERVAL	NUMBER	PERCENT	95% CONFIDENCE INTERVAL
PRE-PREGNANCY BODY MASS INDEX (BMI)						
Underweight (<18.5)	7,720	3.2%	3.2% - 3.3%	3	*	*
Normal (18.5 - 24.9)	98,677	41.4%	41.2% - 41.5%	23	25.6%	16.5% - 34.6%
Overweight (25.0 - 29.9)	58,269	24.4%	24.2% - 24.6%	16	17.8%	9.9% - 25.7%
Obese (≥30.0)	54,089	22.7%	22.5% - 22.8%	28	31.1%	21.5% - 40.7%
PRE-PREGNANCY HYPERTENSION						
Pre-Pregnancy Hypertension	13,116	5.5%	5.4% - 5.6%	7	7.8%	2.2% - 13.3%
DIABETES						
Gestational	11,741	4.9%	4.8% - 5.0%	8	8.9%	3.0% - 14.8%
Pre-pregnancy	2,044	0.9%	0.8% - 0.9%	3	*	*

SOURCE: Birth Certificate Data Files, Division of Vital Records, Illinois Department of Public Health *Suppressed, number less than 5.

TABLE 11 Prenatal care, Chicago, 2011-2016

	ALL BIRTHS			WOMEN EXPERIENCING PREGNANCY-ASSOCIATED DEATH		
	NUMBER	PERCENT	95% CONFIDENCE INTERVAL	NUMBER	PERCENT	95% CONFIDENCE INTERVAL
Any prenatal care	229,787	96.1%	96.0% - 96.2%	76	84.4%	77.0% - 91.9%
Adequate prenatal care	151,659	63.6%	63.4% - 63.7%	44	48.9%	38.6% - 59.2%

SOURCE: Birth Certificate Data Files, Division of Vital Records, Illinois Department of Public Health

TABLE 12 Birth outcomes, Chicago, 2011-2016

	ALL BIRTHS			WOMEN EXPERIENCING PREGNANCY-ASSOCIATED DEATH		
	NUMBER	PERCENT	95% CONFIDENCE INTERVAL	NUMBER	PERCENT	95% CONFIDENCE INTERVAL
Low Birthweight (< 2500 grams)	22,907	9.6%	9.5% - 9.7%	30	33.3%	23.6% - 43.1%
Preterm (< 37 weeks)	25,244	10.6%	10.5% - 10.7%	33	36.7%	26.7% - 46.6%

SOURCE: Birth Certificate Data Files, Division of Vital Records, Illinois Department of Public Health

Data Sources

Hospital Discharge Data, Division of Patient Safety and Quality, IDPH:

This dataset contains all discharges for inpatient hospitalizations that occurred among Chicago residents. Because the IDPH dataset provides information on hospital inpatient discharges and not individual persons, the counts and rates reported may not necessarily reflect rates per person; that is, persons who are hospitalized more than once in a year may be counted more than once. Hospital discharge records are processed and analyzed by a standardized system that is used in most countries throughout the world, the International Classification of Diseases (ICD) diagnosis and procedure codes. The system is periodically revised to reflect advances in medical knowledge and public health priorities. The ICD-10 is the most recent update, and is being used for hospital discharge records from 2016 to the present. IDPH specifically disclaims responsibility for any analysis, interpretations, or conclusions.

Death Certificate Data Files, Division of Vital Records, IDPH:

Death files are received from IDPH. The death files contain most information from the death certificate for every death during a given calendar year. Death certificates are processed and analyzed by a standardized system that is used in most countries throughout the world, the International Classification of Diseases (ICD). The system is periodically revised to reflect advances in medical knowledge and public health priorities. The ICD-10 is the most recent update, and is being used for Illinois deaths effective with data from 1999 to the present.

Birth Certificate Data Files, Division of Vital Records, IDPH:

Birth files are received from IDPH. The birth files contain most information from the birth certificate for every birth to a Chicago resident during a given calendar year. The birth certificates provide information about the father, the mother, and the child.

Technical Notes

Adequate Prenatal Care:

The Adequacy of Prenatal Care Utilization Index (APNCU) uses information from the birth certificate on when prenatal care began and the number of prenatal care visits.⁷ Any prenatal care that began after 4 months or did not meet at least 80% of the American College of Obstetricians and Gynecologists recommendation for number of visits for a given gestation is considered to be inadequate. Details related to prenatal care received were missing from 19 (21.1%) birth certificates among our cases, making it impossible to calculate APNCU for those records.

Confidence intervals:

Confidence intervals are calculated following the guidance in the Detailed Technical Notes of the User Guide to the 2009 Natality Public Use File.⁸

Economic Hardship:

The Economic Hardship Index is a community level indicator composed of six indicators: crowded housing, poverty, unemployment, education level, dependent population and per capita income.¹⁰ Higher economic hardship is indicative of worse economic conditions. American Community Survey (ACS) 5-year estimates are used to calculate the index. Economic Hardship Index values for census tract or zip code of residence use data for the 5-year period ending with the year aligning to the year of hospitalization or death. For example, 2017 hardship uses ACS data for 2013–2017 and is matched to 2017 deaths. Due to table availability, the 2011 Economic Hardship Index uses 2012 index values.

Low birthweight:

An infant born weight less than 2500 grams, as reported on the birth certificate.

Manner of Death:

Determining a cause of death can be very difficult. CDPH used only the information on the death certificate to summarize the manner of death for pregnancy associated deaths; no verification based on chart review was done. The death certificates for 70.7% of pregnancy-associated deaths from 2011 to 2016 indicate an autopsy was performed to investigate the cause of death.

Maternal mortality:

Using only death certificates to identify women who experience pregnancy-associated mortality is insufficient because the woman's full history may not be available to the person completing the death certificate. To improve the sensitivity of identifying pregnancy-associated deaths, IDPH uses multiple methods recommended by the CDC to ensure that such deaths are accurately identified each year. This process is described in detail in the IDPH report.² IDPH shared with CDPH the death certificate numbers for deaths they determined to be pregnancy-associated among residents of Chicago for 2011–2016.

If CDPH had a birth certificate for the woman's most recent live birth, that record was linked to the death certificate. Linking with the birth certificate enables an examination of characteristics of the woman's pregnancy and delivery. Limitations to this analysis include that it relies on what data are available on the birth and death certificate, which at times is incomplete. Also, it is only possible to link birth and death records if the woman was a Chicago resident for both events. Even though it was not possible to determine the status of some cases for certain indicators due to missing or unknown information (e.g., prenatal care), cases with missing data were not removed from the denominator (i.e., all percentages use a denominator of 90).

Pregnancy-related mortality is determined after review to be due to a pregnancy complication, a chain of events initiated by the pregnancy, or the aggravation of an unrelated condition by the physiological effects of pregnancy.⁴ In Illinois, there are two committees tasked with reviewing pregnancy-associated death to determine whether they are pregnancy-related. The Maternal Mortality Review Committee on Violent Deaths (MMRC-V) reviews deaths related to suicide, homicide, and drug overdoses. The Maternal Mortality Review Committee (MMRC) reviews all other deaths.² A representative of CDPH sits on both the MMRC and MMRC-V, but all data are maintained by IDPH.

As part of a nationwide effort to standardize reporting of maternal mortality, the MMRC and MMRC-V review processes were updated beginning with the 2015 mortality data.² As a result, data for pregnancy-related deaths are not comparable with prior years.

Preterm:

Gestational age of less than 37 weeks, calculated from the date of mother's last menses to the child's birth date, as reported on the birth certificate. Gestational age was unknown on one birth certificate in our sample.

Severe maternal morbidity (SMM):

In this report, CDPH replicated the methodology IDPH used in its report.² Hospital discharge data from the IDPH Division of Patient Safety and Quality for 2016-2017 were aggregated and ICD-10 codes used to identify deliveries where the mother experienced a diagnosis or procedure defined as an SMM indicator (see table at right). Blood transfusions, while part of the CDC definition, were excluded in this analysis due to difficulty in ascertaining the information from the hospital discharge record. Length of hospital stay for deliveries of each type (vaginal, primary cesarean, and repeat cesarean) in the top 10% of their respective group was required to be considered SMM.¹⁰ For example, 90% of vaginal deliveries were accompanied by a hospital stay of 2 or fewer days, so a vaginal delivery with an SMM indicator had to be accompanied by a hospital stay of 3 or more days in order to be counted as an SMM case.

Rates for the city of Chicago overall and individual SMM indicators use as the denominator all deliveries in the hospital discharge dataset. For individual demographic subgroups, the denominator is only deliveries for that subgroup. For example, the SMM rate among non-Hispanic Black women uses as a denominator only deliveries to non-Hispanic Black women. Economic Hardship Index levels correspond to the zip code of residence for the year of delivery.

Reporting of SMM is subject to several limitations. SMM only applies to diagnoses or procedures that are present at the time of delivery. Subsequent hospitalizations and medical visits due to issues arising after delivery are not included in this analysis. As a result, SMM is considered an undercount of true maternal morbidity. Additionally, the data available are limited to those in the hospital discharge dataset; chart abstractions were not performed and the presence or absence of indicators is not verified.

Suppression criteria:

Rates, ratios and percentages are not calculated when the count is below 5, although the count will be reported.

Timing of Death:

Postpartum timing of death was determined from the child's date of birth for those records with a linked birth certificate. For those without a birth certificate (n=26), pregnant at death was determined from the pregnant at death field on the death certificate. If there was no indication on the death certificate whether or not the woman was pregnant at the time of death, the timing was counted as unknown.

Severe Maternal Morbidity Indicators**Diagnoses**

- Acute Myocardial Infarction
- Aneurysm
- Acute Renal Failure
- Adult Respiratory Distress Syndrome
- Amniotic Fluid Embolism
- Cardiac Arrest/ Ventricular Fibrillation
- Disseminated Intravascular Coagulation
- Eclampsia
- Heart Failure/ Arrest During Surgery or Procedure
- Puerperal Cerebrovascular Disorders
- Pulmonary Edema/ Acute Heart Failure
- Severe Anesthesia Complications
- Sepsis
- Shock
- Sickle Cell Disease With Crisis
- Air and Thrombotic Embolism

Procedures

- Conversion of Cardiac Rhythm
- Hysterectomy
- Temporary Tracheostomy
- Ventilation



Facebook [/ChicagoPublicHealth](#)

Twitter [@ChiPublicHealth](#)

Chicago Health Atlas chicagohealthatlas.org

CDPH data report

Maternal Morbidity and Mortality in Chicago

Chicago Department of Public Health Staff:

For their leadership in the development of this report:

Lauren Peretz

Kingsley Weaver, MPH

For Additional Contributions:

Allison Arwady, MD, MPH

Kirsti Bocskay, PhD, MPhil, MPH

Dana Harper

Sara Moffitt, MSW, MSGH

Sarah Parchem, MPH

Nik Prachand, MPH

Tamara Rushovich, MPH

Jennifer Seo, MD, JD

Jennifer Vidis, JD

Suggested Citation:

Chicago Department of Public Health. *CDPH Data Report: Maternal Morbidity & Mortality in Chicago*. City of Chicago, 2019.

Other Contributors:

Amanda Bennett, PhD, MPH, *Illinois Department of Public Health*

Arden Handler, DrPH, *University of Illinois School of Public Health*

Gina Lowell, MD, MPH, *Rush University Medical Center*

Lisa Masinter, MD, MPH, MS, *AllianceChicago*

Heidi Ortolaza-Alvear, MPP, MA, *EverThrive Illinois*

We would like to thank the Illinois Department of Public Health for sharing the data and methods that made this report possible.

Layout and Design:

Bigmouth Creative www.bigmouthcreative.com

CDPH complies with applicable City, State and Federal civil rights laws and does not discriminate on the basis of race, color, sex, gender identity, age, religion, disability, national origin, ancestry, sexual orientation, marital status, parental status, military status, source of income, credit history, criminal record or criminal history.