

**2012 INFANT MORTALITY RATE
FOR THE
DISTRICT OF COLUMBIA**

Prepared by

**Data Management and Analysis Division
Center for Policy, Planning, and Evaluation
Department of Health**

**Government of the District of Columbia
Vincent C. Gray, Mayor**

**SEPTEMBER 25, 2014
FINAL**



ACKNOWLEDGMENTS

**Joxel Garcia, MD, MBA
Director
DC Department of Health**

**Fern M. Johnson-Clarke, PhD
Senior Deputy Director
Center for Policy, Planning and Evaluation**

Prepared by:

**Rowena Samala, MPH, Supervisory Statistician
Center for Policy, Planning and Evaluation**

Contributing Members:

**Monica Roundtree, Vital Statistics Specialist
Nikhil Roy, MSc, Statistician
George N.F. Siaway, PhD, Public Health Analyst/GIS Coordinator
Center for Policy, Planning and Evaluation**

**Karen P. Watts, RNC, FAHM, PMP
Bureau Chief, Perinatal and Infant Health
Keela S. Seales
Deputy Director, Strategic Planning, Policy, and Evaluation
Community Health Administration**

**Najma L. Roberts, Communications Director
Office of the Director**

**September 25, 2014
Final**

TABLE OF CONTENTS

	Page
EXECUTIVE SUMMARY	1
2011 TO 2012 COMPARISON HIGHLIGHTS.....	4
STATISTICAL OVERVIEW	5
FACTORS CONTRIBUTING TO INFANT MORTALITY	7
GEOGRAPHICAL DISTRIBUTION.....	17
CAUSES OF DEATH.....	28
FIVE-YEAR BIRTH AND INFANT DEATH TREND	31
DOH MATERNAL AND CHILD HEALTH PROGRAM ACTIVITIES.....	35
CURRENT REPRODUCTIVE HEALTH OUTCOMES ORIENTED PROGRAMS	35
HARNESSING GIS TECHNOLOGY FOR EVIDENCE-BASED DECISION MAKING IN INFANT MORTALITY	37
APPENDIX.....	42
REFERENCES.....	43
TECHNICALNOTES.....	44
DEFINITION OF TERMS.....	46
RATES AND RATIOS	47

TABLES

	Page
Table 1: Ten-Year Infant Mortality Trends District of Columbia Residents, 2003-2012.....	1
Table 2: Live Births, Infant Deaths and Infant Mortality by Race/Hispanic Origin District of Columbia Residents, 2011 and 2012.....	5
Table 3: Percent Distribution of Low Birth Weight Babies by Race of Mother District of Columbia Residents, 2011 and 2012.....	8
Table 4: Percent Distribution of Low Birth Weight Babies by Age of Mother District of Columbia Residents, 2011 and 2012.....	9
Table 5: Percent Distribution of Low Birth Weight Infant Deaths by Age of Mother and Time of Death, District of Columbia Residents, 2012.....	10
Table 6: Percent Distribution of Premature Babies by Race and Hispanic Origin of Mother, District of Columbia Residents, 2011 and 2012.....	11
Table 7: Number and Percentage of Births and Infant Deaths by Marital Status, District of Columbia Residents, 2008-2012.....	15
Table 8: Infant Mortality Rate Comparisons for Baltimore, the District of Columbia, Richmond and Detroit Cities, 2008-2012.....	18
Table 9: Indicators of Maternal and Child Health, and Infant Mortality by Ward District of Columbia Residents, 2012.....	19
Table 10: Births, Infant Deaths and Infant Mortality Rates by Ward District of Columbia Residents, 2011 and 2012.....	20
Table 11: Statistical Overview by Ward District of Columbia Residents, 2011.....	20
Table 12: Statistical Overview by Ward District of Columbia Residents, 2012.....	21
Table 13: Five-Year Infant Mortality Trend by Ward District of Columbia Residents, 2008-2012.....	21
Table 14: Leading Causes of Infant Death District of Columbia Residents, 2012.....	28
Table 15: Infant Deaths and Infant Mortality Rates for the 10 Leading Causes of Infant Death: United States, Preliminary, 2011.....	29
Table 16: Leading Causes of Neonatal Infant Death (N=61) District of Columbia Residents, 2012.....	30

FIGURES

	Page
Figure 1: District of Columbia and National Infant Mortality Rate, 2003-2012.....	2
Figure 2: Infant Mortality Rates for the District of Columbia, 2012 and the United States, Preliminary, 2011.....	3
Figure 3: Infant Mortality Rates by Race of Mother, District of Columbia, 2003-2012.....	6
Figure 4: Births by Birth Weight, Race and Hispanic Origin of Mother, 2012.....	9
Figure 5: Preterm Infant Deaths by Birth Weight, 2012.....	12
Figure 6: Disparities in Pre-Pregnancy Weight Status by Race/Ethnicity, District of Columbia, 2010-2012.....	13
Figure 7: Infant Mortality by Pre-Pregnancy Weight Status and Race/Ethnicity, District of Columbia, 2010-2012.....	14
Figure 8: Infant Mortality by Pre-Pregnancy Weight Status and Race/Ethnicity, District of Columbia, 2012.....	14
Figure 9: Births and Infant Deaths by Mother’s Insurance Type at Time of Delivery, District of Columbia, 2012.....	16
Figure 10: Births and Infant Deaths by Mother’s Race/Ethnicity and Insurance Type at Time of Delivery, District of Columbia, 2012.....	17
Figure 11: Births by Race and Hispanic Origin of Mother, 2008-2012.....	31
Figure 12: Infant Deaths by Race and Hispanic Origin of Mother, 2008-2012.....	31
Figure 13: Leading Causes of Infant Death by Race and Hispanic Origin of Mother, District of Columbia, 2008-2012.....	32
Figure 14: Leading Causes of Infant Death to Non-Hispanic Black Mothers, 2008-2012....	33
Figure 15: Leading Causes of Infant Death to Non-Hispanic White Mothers, 2008-2012....	33
Figure 16: Leading Causes of Infant Death to Hispanic Mothers, 2008-2012.....	34

MAPS

Map 1: Rates of Infant Mortality by Ward, District of Columbia, 2012.....	22
Map 2: Rates of Live Births to DC Residents by Ward, District of Columbia, 2012.....	23
Map 3: Percentage of Low Birth Weight Live Births by Ward, District of Columbia, 2012.....	24
Map 4: Percentage of Preterm Births by Ward, District of Columbia, 2012.....	25
Map 5: Percentage of Births with Prenatal Care Beginning First Trimester by Ward, District of Columbia, 2012.....	26
Map 6: Percentage of Teen Births (15-19 years) by Ward, District of Columbia, 2012.....	27
Map 7: Prediction Map Based on Infant Mortality by Zip Code and Ward, District of Columbia, 2009-2011.....	38
Map 8: Prediction Standard Error Map Based on Infant Mortality by Zip Code and Ward, District of Columbia, 2009-2011.....	38
Map 9: Optimized Hot Spot Analysis of Infant Mortality by Zip Code and Ward, District of Columbia, 2012.....	39
Map 10: Infant Mortality and Lifestage Groups by Zip Code and Ward, District of Columbia, 2012.....	41

2012 INFANT MORTALITY RATE

Executive Summary

For every 1,000 live births to District of Columbia residents in 2012, approximately eight infants died before reaching their first birthday. In 2012, there were 74 infant deaths in the District, resulting in an infant mortality rate (IMR) of 7.9 per 1,000 live births, a 27.5 percent decline since 2008. There were 26 fewer infant deaths in 2012 compared to 2008; however, there were 236 more live births in 2012 compared to 2008. Table 1 and Figure 1 present a ten-year summary of these statistics.

Table 1: Ten-Year Infant Mortality Trends			
District of Columbia Residents, 2003-2012			
Year	Births	Infant Deaths	Infant Mortality Rate*
2003	7,616	78	10.2
2004	7,937	94	11.8
2005	7,940	108	13.6
2006	8,522	96	11.3
2007	8,870	116	13.1
2008	9,134	100	10.9
2009	9,008	89	9.9
2010	9,156	73	8.0
2011	9,289	69	7.4
2012	9,370	74	7.9

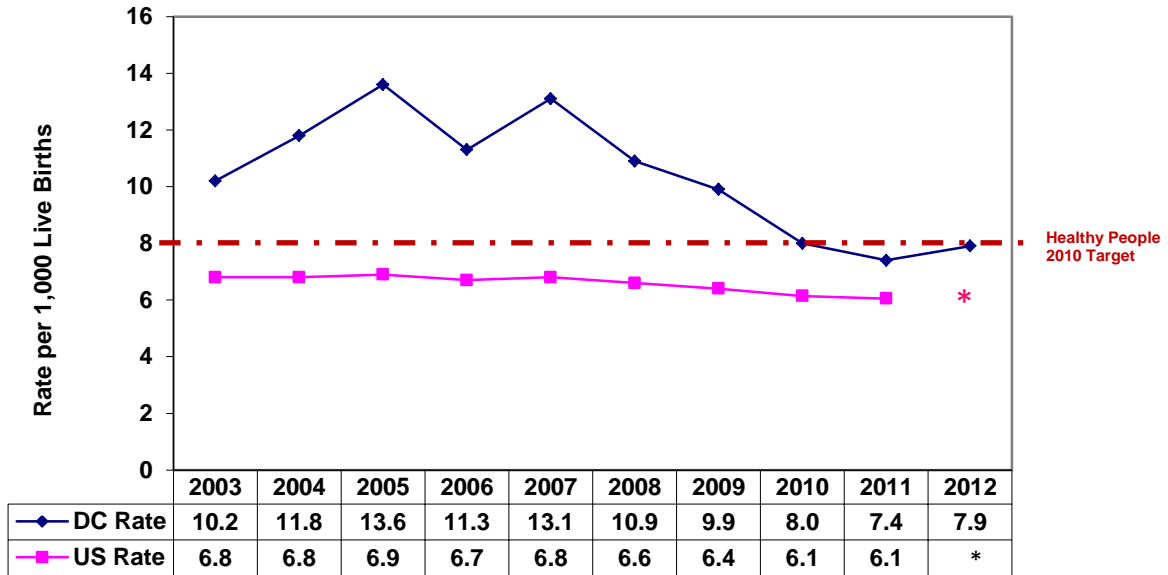
* Per 1,000 live births

Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.

The declining trend observed in IMR depicts the District's nearly decade long path to achieving its Healthy People 2010 objective of reducing infant mortality to no more than 8 per 1,000 live births (Figure 1), a rate which slightly declined to 7.9 per 1,000 in 2012. This overall reduction in IMRs in the District may be explained by large declines in infant deaths to black mothers. Among blacks, the IMR fell from 16.5 in 2008 to 12.3 in 2012 (Figure 3), a 25.5 percent decrease over the 5-year period. Interestingly, the IMR among whites fluctuated within the past 5 years, ending with a 6.2 percent increase from 3.2 in 2008 to 3.4 in 2012. Figure 3 illustrates the racial disparity in IMRs in the District from 2003 to 2012.

Infant mortality rates in the District fluctuated from 2003 to 2007, however, a stable downward trend was observed from 2007 through 2012. In 2007, the District of Columbia Department of Health (DOH) released the Infant Mortality Action Plan, a comprehensive 5-year road map on the efforts to reduce the infant mortality rate in the District. There are three major foci of effort: (1) to increase the capacity of home visitation for pregnant women; (2) to enhance collaboration within DOH and between other agencies; and (3) to increase coordination between the government and community organizations.

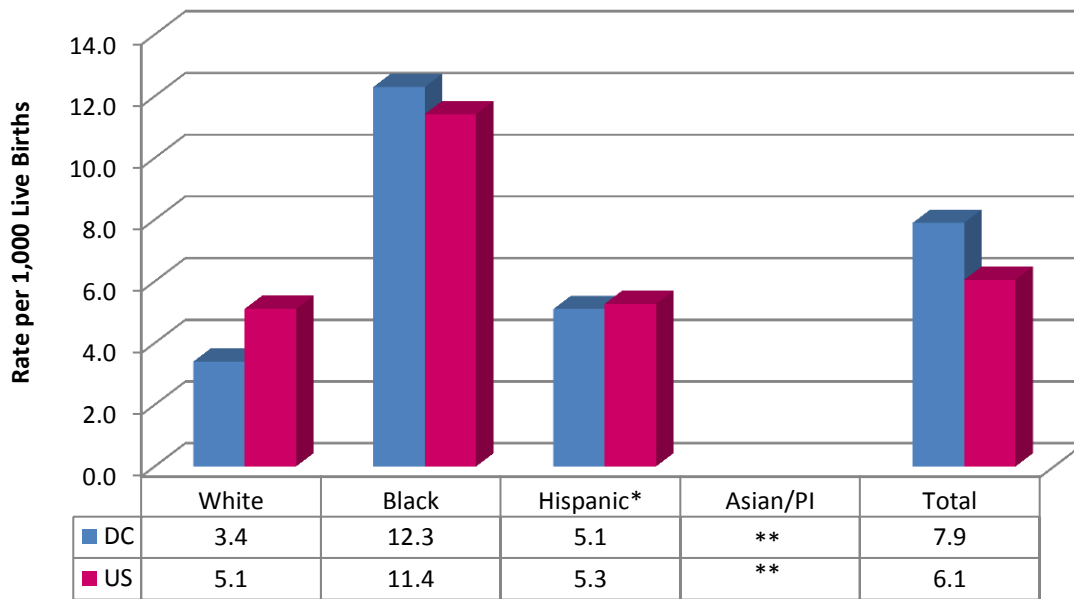
Figure 1. District of Columbia and National Infant Mortality Rate, 2003-2012



Sources: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health. National Center for Health Statistics (NCHS).

*National infant mortality data unavailable for 2012.

**Figure 2: Infant Mortality Rates for the District of Columbia, 2012
and the United States, Preliminary 2011**



*Hispanics include persons of all Hispanic origin of any race.

**Rates not computed due to small number of infant deaths and, therefore, are likely to be unstable.

Sources: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health. National Center for Health Statistics: http://www.cdc.gov/nchs/data/nvsr/nvsr61/nvsr61_06.pdf

Note: National infant mortality data unavailable for 2012.

2011 to 2012 Comparison Highlights

- The number of infant deaths increased from 69 in 2011 to 74 in 2012, an increase of 7.2 percent.
- The overall infant mortality rate (IMR) for the District increased by 6.8 percent from a rate of 7.4 per 1,000 live births in 2011 to 7.9 per 1,000 live births in 2012.
- From 2011 to 2012, infant mortality rates decreased in Wards 2, 4 and 5 but increased in Wards 1, 3, 6, 7 and 8 (Table 10).
- Death to infants younger than 28 days increased from a rate of 5.8 per 1,000 live births in 2011 to 6.5 per 1,000 live births in 2012, an increase of 12 percent. (54 neonatal deaths in 2011 and 61 in 2012.)
- The post-neonatal death rate (deaths occurring from 28 days to under 1 year of age) decreased by 14.1 percent, from 1.6 per 1,000 live births in 2011 to 1.4 in 2012. (15 post-neonatal deaths in 2011 and 13 in 2012.)
- The infant death rate to non-Hispanic black mothers increased from 11.7 per 1,000 live births in 2011 to 12.4 per 1,000 live births in 2012 (Table 2), an increase of 6 percent.
- The infant death rate to non-Hispanic white mothers was 1.5 per 1,000 live births in 2011 and 2.5 for 2012, an increase of 66.7 percent (Table 2).
- The infant death rate to Hispanic mothers decreased by 1.9 percent from 5.2 per 1,000 live births in 2011 (Table 2) to 5.1 per 1,000 live births in 2012.
- The number of infant deaths that resulted from multiple births increased by 55.6 percent from 9 in 2011 to 14 in 2012.
- There were 3 maternal deaths in 2012, compared to 4 in 2011.
- The proportion of births to teen mothers (15-19 years of age) decreased by 11 percent from 2011 to 2012. (790 births to teen mothers in 2012).
- In 2012, a third of all infant deaths (33.3 percent) in the District were to mothers who were obese. The IMR for infants born to obese non-Hispanic black mothers (15.7 per 1,000) was almost double the overall IMR for the District (7.9 per 1,000).
- In 2012, infants born to women on Medicaid insurance accounted for 43.2 percent of all deliveries. Infant deaths disproportionately occurred to mothers who used Medicaid insurance at the time of delivery compared to those with private insurance, at 48.6 percent vs. 23.0 percent, respectively.

Statistical Overview

In 2012, there were 9,370 live births and 74 infant deaths to District of Columbia residents (Table 1). This resulted in an IMR of 7.9 deaths for every 1,000 live births. In 2011, there were 9,289 live births and 69 infant deaths. The IMR for 2011 was 7.4 deaths per 1,000 live births. There was a 6.8 percent increase in the IMR from 2011 to 2012. There were 5 more infant deaths in 2012 than in 2011. Ward 8 had the highest IMR at 14.9 deaths per 1,000 live births (Table 10).

Of the 74 infant deaths that occurred in 2012, 61 (or 82.4 percent) occurred during the neonatal period (under 28 days of life). The neonatal death rate increased by 12 percent from 5.8 per 1,000 live births in 2011 to 6.5 per 1,000 live births in 2012. The neonatal period is important relative to efforts to reduce infant mortality. Many of the causes of infant deaths during this period may be mitigated or prevented with preconception and prenatal care.

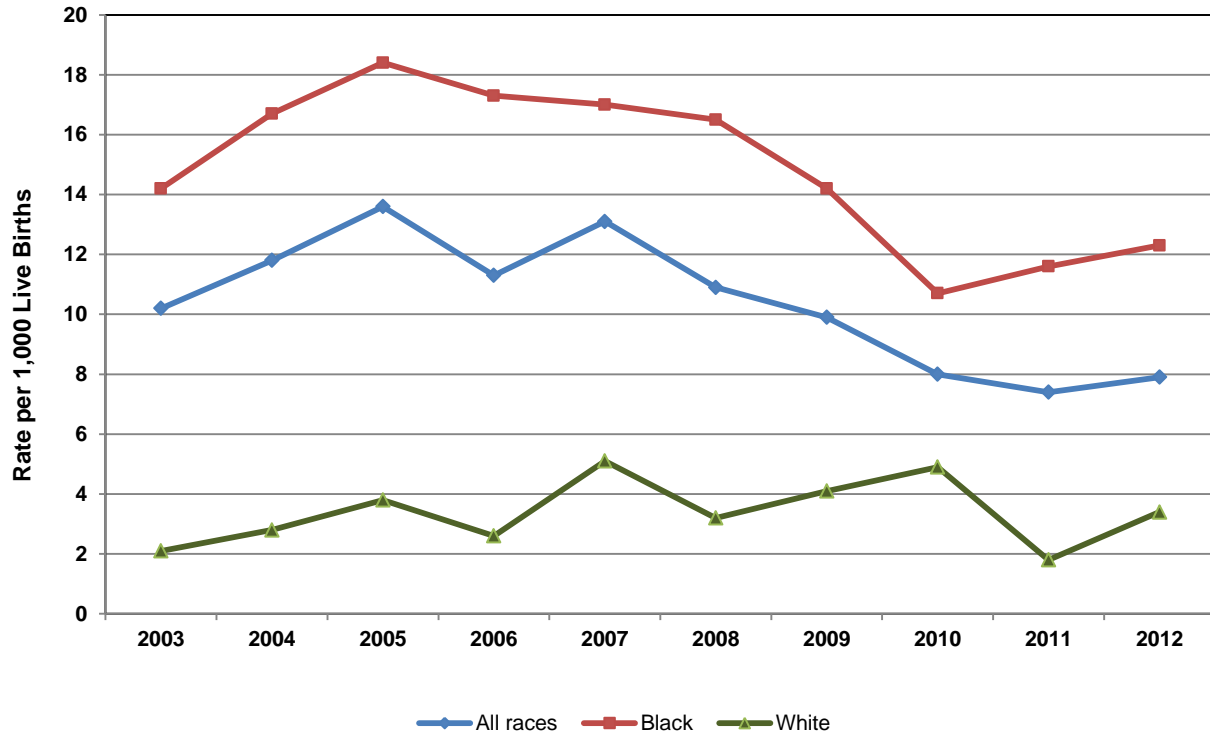
Table 2: Live Births, Infant Deaths and Infant Mortality by Race/Hispanic Origin of Mother District of Columbia Residents, 2011 & 2012						
Race/Ethnicity	Live Births		Infant Deaths		Infant Mortality Rate¹	
	2011	2012	2011	2012	2011	2012
Total	9,289	9,370	69	74	7.4	7.9
Black	4,903	4,816	57	59	11.6	12.3
White	2,843	2,974	5	10	1.8	3.4
Asian/Other	1,032	1,225	2	3	1.9	2.4
Total	9,289	9,370	69	74	7.4	7.9
Non-Hispanic						
Black	4,784	4,757	56	59	11.7	12.4
White	2,611	2,755	4	7	1.5	2.5
Hispanic ²	1,358	1,370	7	7	5.2	5.1

Notes: ¹ Per 1,000 live births

² Hispanics include persons of all Hispanic origin of any race.

Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.

Figure 3. Infant Mortality Rates by Race of Mother, District of Columbia, 2003-2012



Sources: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.
 Note: Data for Hispanic and Asian/Pacific Islander were excluded due to rate variability and small numbers.

Factors Contributing to Infant Mortality

Vital statistics over the years have indicated that factors such as low birth weight, lack of adequate prenatal care, and prematurity are associated with infant mortality. Other factors such as race/ethnicity, maternal age, pre-pregnancy overweight or obesity, and marital status may also be associated with infant mortality.

Low Birth Weight

In 2012, the percentage of low birth weight infants (those weighing under 2,500 grams or 5.5 pounds) in the District was 9.7 percent compared to 10.5 percent in 2011 (Tables 3 and 4). This represents approximately an 8 percent decrease in low birth weight infants. About one in fifteen low birth weight infants died before their first birthday (Tables 3 and 5).

Very Low Birth Weight

A 20 percent decrease was seen among very low birth weight (under 1,500 grams) newborns between 2011 and 2012; **very low birth weight** births decreased from 2.2 percent to 1.8 percent, while **moderately low birth weight** (1,500–2,499 grams) births decreased from 8.3 percent to 7.9 percent (data not shown). Birth weight is an important predictor of early death and long-term disability^{1,2,3}. The lower the birth weight, the greater the risk of poor birth outcomes. In 2012, about one in three (29.3 percent) of all very low birth weight infants compared with less than 1 percent of normal weight infants (2,500 and more grams) did not survive their first year of life.

The rate of very low birth weight births slightly decreased for non-Hispanic black infants from 2011 to 2012 (from 2.9 percent to 2.6 percent); very low birth weight births also decreased for non-Hispanic white infants (from 0.9 percent to 0.8 percent) and Hispanic infants (from 2.1 percent to 1.4 percent).

Low Birth Weight and Race and Hispanic Origin of Mother

The percentage of low birth weight babies born to all black mothers decreased from 13.7 percent in 2011 to 12.1 percent in 2012 (Table 3). Conversely, there was a small increase in low birth weight babies born to all white mothers, from 6.3 percent in 2011 to 6.5 percent in 2012. Among Asian and Pacific Islander mothers, the percentage of low birth weight babies increased from 7.5 percent in 2011 to 8.3 percent in 2012. Figure 4 shows the distribution of total births by infant birth weight and race and Hispanic origin of mother.

The rate of low birth weight births increased by 3.6 percent among babies born to Hispanic mothers (8.2 percent in 2011 to 8.5 percent in 2012). Non-Hispanic white low birth weight births increased slightly from 6.1 percent in 2011 to 6.3 percent in 2012. Non-Hispanic black low birth weight births decreased by 11 percent from 13.6 percent to 12.1 percent for 2011 to 2012.

**Table 3: Percent Distribution of Low Birth Weight¹ Babies
by Race and Hispanic Origin of Mother
District of Columbia Residents, 2011 and 2012**

Race/Hispanic Origin	2011	2012	Percent Change
Total Births for All Races	9,289	9,370	0.9
- Number Low Birth Weight	973	906	
- Percentage LBW among all Births	10.5%	9.7%	-7.7
Total Births to Black* Mothers	4,903	4,816	-1.8
- Number Low Birth Weight	671	583	
- Percentage LBW among Births to Black Mothers	13.7%	12.1%	-11.5
Total Births to White* Mothers	2,843	2,974	4.6
- Number Low Birth Weight	178	194	
- Percentage LBW among Births to White Mothers	6.3%	6.5%	4.2
Total Births to Asian and Pacific Islander Mothers	402	411	2.2
- Number Low Birth Weight	30	34	
- Percentage LBW among Births to Asian and Pacific Islander Mothers	7.5%	8.3%	10.9
Total Births to Hispanic/Latina Mothers	1,358	1,370	0.9
- Number of Low Birth Weight	111	116	
- Percentage LBW among Births to Hispanic Mothers	8.2%	8.5%	3.6

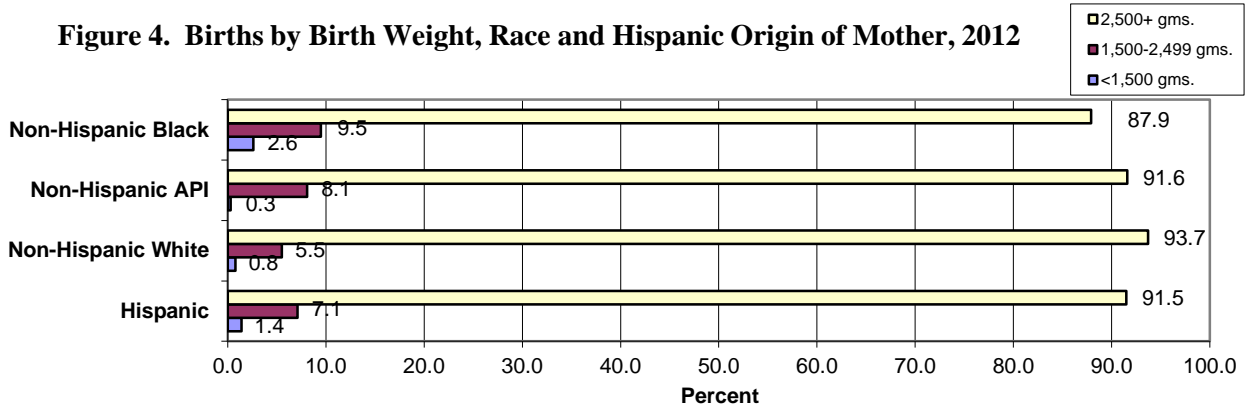
*Includes mothers of Hispanic origin.

Notes: ¹ Low Birth Weight means under 2,500 grams or 5lbs. 8oz.

² Number does not add up due to exclusion of other races and unknown.

Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.

Figure 4. Births by Birth Weight, Race and Hispanic Origin of Mother, 2012



Note: API refers to Asian and Pacific Islanders.

Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.

Low Birth Weight and Age of Mother

In the District of Columbia, the percentage of low birth weight infants born to all mothers under 20 years of age decreased from 12.7 percent in 2011 to 10.1 percent in 2012 to (Table 4). Likewise, the percentage of low birth weight babies born to all mothers 20 years of age and older decreased from 10.2 percent in 2011 to 9.6 percent in 2012.

	2011	2012	Percent Change
Total Births for All Ages	9,289	9,370	0.9
- Number of Low Birth Weight	973	906	
- Percentage of Low Birth Weight	10.5%	9.7%	-7.7
Total Births to Mothers Under 20 Years of Age	908	796	-12.3
- Number of Low Birth Weight	115	80	
- Percentage of Low Birth Weight among mothers < 20 years old	12.7%	10.1%	-20.6
Total Births to Mothers 20 Years of Age and Older	8,381	8,574	2.3
- Number of Low Birth Weight	858	826	
- Percentage of Low Birth Weight among mothers ≥20 years old	10.2%	9.6%	-5.9
Total Births to Mothers Whose Age is Unknown ²	0	0	-
- Number of Low Birth Weight	0	0	
- Percentage of Low Birth Weight			

Notes: ¹ Low Birth Weight means under 2,500 grams or 5lbs. 8oz.

² Mother's age is computed from date of birth to date of delivery. If date of birth is not reported, then mother's age is reported as unknown.

Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.

Low Birth Weight and Infant Deaths by Age of Mother

Of the 906 low birth weight births, 59 infants (6.5 percent) died in 2012. A total of 43 infants (58.1 percent of all 74 infant deaths) died to mothers 20-29 years of age in 2012. Thirty-five of these 43 infants (81.4 percent) were low birth weight. Almost 30 percent of all infant deaths (n=22) occurred to mothers aged 30-39 years; 6.8 percent of all infant deaths were to mothers aged below 20 years (Table 5).

Low Birth Weight and Infant Deaths by Race of Mother

Of the 74 infant deaths, 59 (79.7 percent) were low birth weight infants (53 died during the neonatal period and 6 in the post-neonatal period). Three out of five (60 percent) infant deaths to white mothers were born weighing under 2,500 grams. Forty-eight of the 59 (81.4 percent) infant deaths to black mothers were low birth weight babies. All seven (100 percent) infant deaths to mothers of Hispanic origin were also low birth weight (data not shown).

Of the 59 low birth weight infants, 48 (81.4 percent) were very low birth weight and 11 were moderately low birth weight (18.6 percent).

Table 5: Percent Distribution of Low Birth Weight Infant Deaths by Age of Mother and Time of Death District of Columbia Residents, 2012							
Age of Mother	Infant Deaths	Percent Deaths*	LBW Deaths	%LBW Deaths**	Time of Infant Death		
					Total LBW	Neonatal	Post-neonatal
Total	74	100.0	59	79.7	59	53	6
< 20 years	5	6.8	5	100.0	5	4	1
20-24 years	24	32.4	19	79.2	19	16	3
25-29 years	19	25.7	16	84.2	16	15	1
30-34 years	15	20.3	10	66.7	10	9	1
35-39 years	7	9.5	6	85.7	6	6	0
≥ 40 years	4	5.4	3	75.0	3	3	0
Unknown age	0	0	0	0	0	0	0

*Percentage based on all infant deaths (N=74).

**Percentage based on total deaths in each age group.

Note: LBW means low birth weight (under 2,500 grams or 5lbs. 8 oz.).

Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.

Prematurity

Prematurity leads to low birth weight and infant mortality. Table 6 shows the percentages of all premature births (less than 37 weeks gestation) for 2011-2012. Premature births in the District decreased from 11 percent in 2011 to 9.9 percent in 2012. Preterm births have decreased across all racial groups in 2012, with the largest drop of 14.4 percent among white mothers. Approximately 11.9 percent of non-Hispanic black mothers delivered preterm babies compared

to 7 percent non-Hispanic white mothers and 9.7 percent Hispanic/Latina mothers.

About 65 percent of all preterm births occurred between 34-36 weeks gestation. Fifty-six of the 74 (75.7 percent) infants who died in 2012 were preterm. Of these preterm infant deaths, 48 (85.7 percent) weighed under 1,500 grams (Figure 5). Almost 86 percent of preterm infants died to mothers ages 15-34.

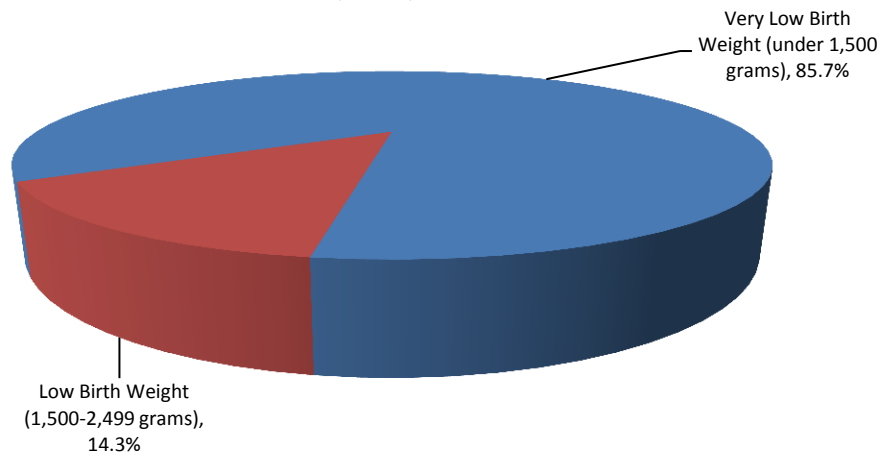
Table 6. Percent Distribution of Premature Babies by Race and Hispanic Origin of Mother District of Columbia Residents, 2011 and 2012			
Race/Hispanic Origin	2011	2012	Percent Change
Total Births for All Races	9,289	9,370	
-Number of Premature Babies	1,021	926	
-Percent Premature Babies	11.0%	9.9%	-10.1
Total Births to Black* Mothers	4,903	4,816	
-Number of Premature Babies to Black Mothers	646	574	
-Percent Premature Babies to Black Mothers	13.2%	11.9%	-9.5
Total Births to White* Mothers	2,843	2,974	
-Number of Premature Babies to White Mothers	238	213	
-Percent Premature Babies to White Mothers	8.4%	7.2%	-14.4
Total Births to Asian and Pacific Islander (API) Mothers	402	411	
-Number of Premature Babies to API Mothers	28	26	
-Percent Premature Babies to API Mothers	7.0%	6.3%	-9.2
Total Births to Hispanic Mothers	1,358	1,370	
-Number of Premature Babies to Hispanic Mothers	131	133	
-Percent Premature Babies to Hispanic Mothers	9.6%	9.7%	0.6

* Includes mothers of Hispanic origin.

Note: Premature births mean births under 37 weeks of gestation.

Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.

**Figure 5. Preterm Infant Deaths by Birth Weight, 2012
(n=56)**



Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.

Entry Into Prenatal Care

Early, high-quality prenatal care (PNC) is one of the cornerstones of a safe motherhood program, which begins before conception, continues with appropriate PNC and protection from pregnancy complications, and maximizes healthy outcomes for infants and mothers⁴. Women who receive late (third trimester of pregnancy⁵) or no PNC do not receive timely preventive care or education and are at risk for having undetected complications of pregnancy that can result in severe maternal morbidity and sometimes death^{6,7}.

It is important to note that births for which prenatal care began was unknown were subtracted from the total number of births before percentages were computed. Based on this computation, 65 percent of District resident mothers who gave birth in 2012 began prenatal care in the first trimester of pregnancy (Table 9). More than 81 percent of white mothers who gave birth in 2012 had timely entry into prenatal care compared to 64 percent of Hispanic mothers and 54 percent of black mothers (data not shown).

About 8 percent of mothers began care late or had no prenatal care at all. About 70 percent of these were black women.

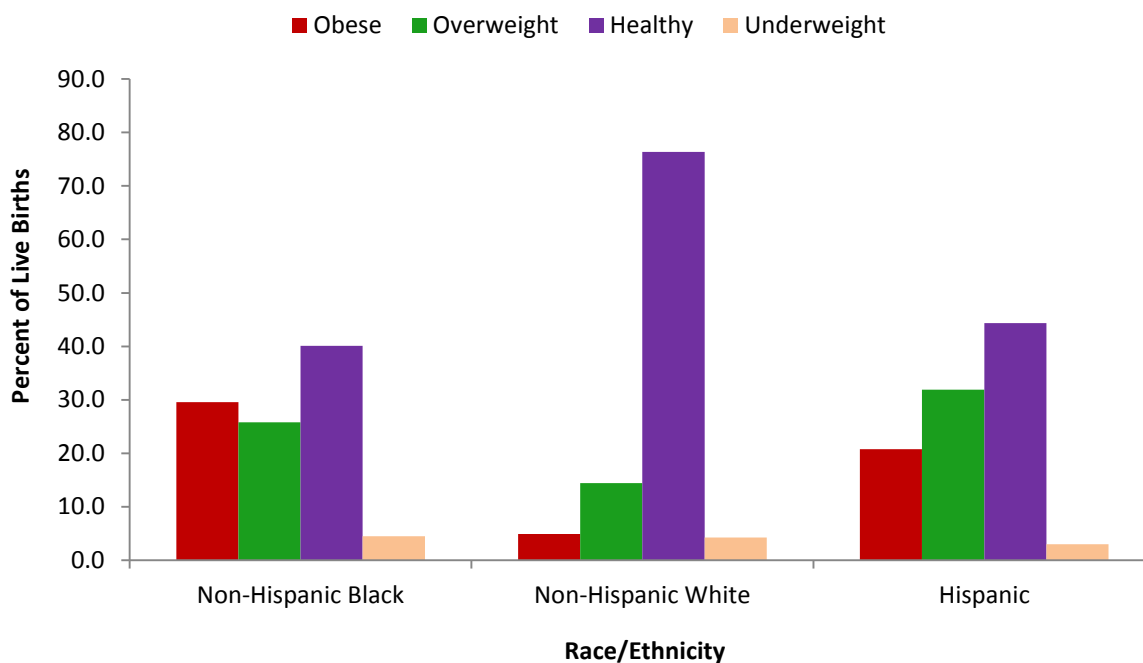
Pre-Pregnancy Weight Status

Body Mass Index (BMI) is calculated using height and weight and is a fairly reliable indicator of body fat or weight status. A BMI less than 18.5 is considered underweight, 18.5 to 24.9 is healthy, 25 to 29.9 is considered overweight, and 30 or above indicates obesity⁸. Maternal pre-pregnancy overweight and obesity increase risk for adverse pregnancy and birth outcomes, including infant death^{9,10,11}.

Data on maternal pre-pregnancy weight was collected in the District of Columbia birth certificate beginning in February 2009, allowing for the calculation of maternal BMI for the first time. Pre-pregnancy BMI was calculated using the following formula: pre-pregnancy weight (lb) x 703 / height (sq. in). Records with unknown or invalid values for mothers' height or pre-pregnancy weight were excluded from this analysis.

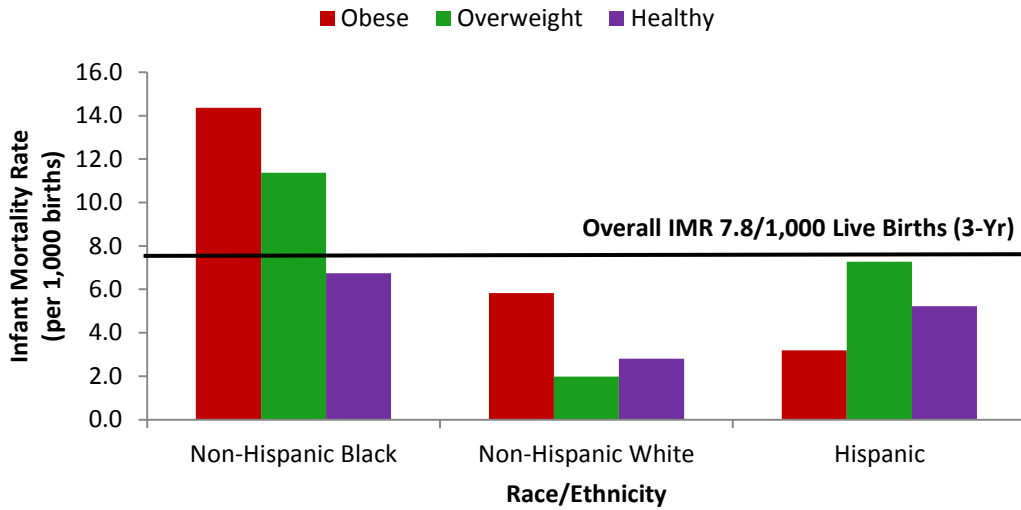
From 2010 to 2012, 52.6 percent of District of Columbia women who gave birth to a live infant had healthy weight prior to pregnancy, 43 percent were either overweight or obese before their pregnancy, and 4.5 percent were underweight. Non-Hispanic black and Hispanic mothers in DC were more likely to be overweight or obese (55.4 percent and 52.7 percent, respectively) than non-Hispanic white mothers (19.3 percent) (Figure 6). It should be noted that maternal height and weight reported in birth certificates may be underestimated and subject to biases when self-reported data are used.

Figure 6. Disparities in Pre-pregnancy Weight Status by Race/Ethnicity, District of Columbia, 2010-2012



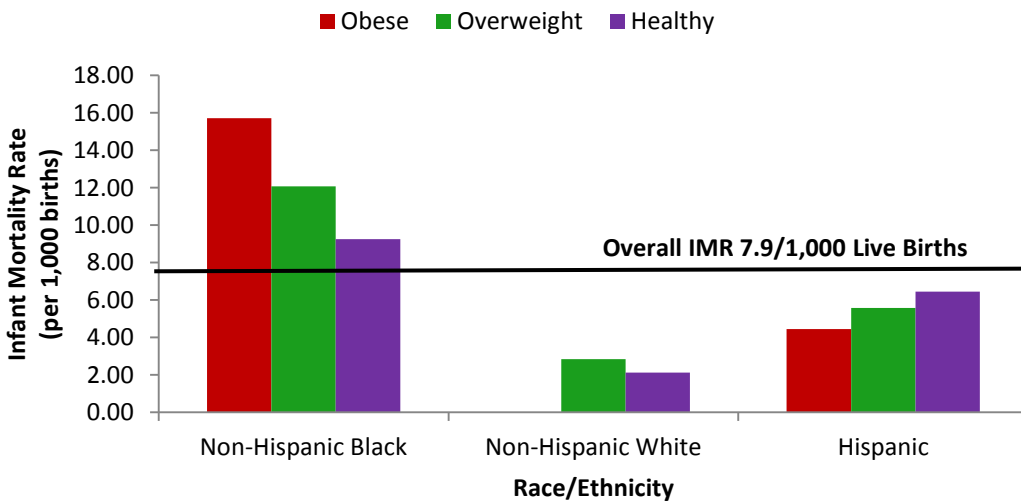
Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.

Figure 7. Infant Mortality by Pre-pregnancy Weight Status and Race/Ethnicity, District of Columbia, 2010-2012



Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.

Figure 8. Infant Mortality by Pre-pregnancy Weight Status and Race/Ethnicity, District of Columbia, 2012



Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.

Overall, the highest IMR observed for 2010 to 2012 was among obese mothers followed by overweight mothers. However, associations between maternal obesity and IMR differed by maternal race/ethnicity (Figure 7). Among infants born to obese mothers, the highest IMR was among non-Hispanic blacks at 14.4 per 1,000 births. Mothers who were obese and non-Hispanic white or obese and Hispanic had lower IMR of 5.8 and 3.2 per 1,000 births, respectively. Among infants born to overweight mothers, non-Hispanic blacks and Hispanics had the highest rates, 11.4 and 7.3, respectively.

In 2012, a third (33.3 percent) of all infant deaths in the District were among infants born to mothers who were obese. A correlation between maternal obesity, infant mortality, and maternal race/ethnicity was observed among mothers who were obese and with high rates of infant mortality. The highest IMR was among infants born to obese non-Hispanic black mothers at 15.7 per 1,000 live births (Figure 8) —almost double the overall infant mortality rate for the District in 2012 (7.9 per 1,000 live births), and higher than the overall IMR for non-Hispanic black mothers (12.4 per 1,000 live births). There were only 3 infant deaths to obese/overweight Hispanic mothers, so rates may be unstable due to small numbers. There were no infant deaths to obese non-Hispanic white mothers in 2012.

Marital Status

The proportion of births to unmarried women decreased in 2012 to 51.1 percent compared with 53.4 percent in 2011, a 4.3 percent decrease. Of the 4,788 (51.1 percent) births to unmarried women in 2012, 16 percent were to teens below 20 years old. Almost 89 percent of births to women aged 20-24 years and 59.6 percent of births to women aged 25-29 years were to unmarried women (data not shown).

In 2012, 74.3 percent of infant deaths were to unmarried women, compared to 69.6 percent in 2011, an increase of 6.8 percent. Between 2008 and 2012, the majority of infant deaths were to unmarried women (Table 7). Table 9 shows the distribution of unmarried women by race and Hispanic origin of mother.

Year	Total Number of Births	Births to Unmarried Women		Births to Married Women		Total Infant Deaths	Infant Deaths to Unmarried Women		Infant Deaths to Married Women	
		Number of births	Percent	Number of Births	Percent		Number of Infant Deaths	Percent	Number of Infant Deaths	Percent
2012	9,370	4,788	51.1	4,537	48.4	74	55	74.3	17	23.0
2011	9,289	4,963	53.4	4,290	46.2	69	48	69.6	16	23.2
2010	9,156	5,008	54.7	4,093	44.7	73	50	68.5	23	31.5
2009	9,008	4,995	55.5	3,950	43.8	89	81	91.0	7	7.9
2008	9,134	5,278	57.8	3,846	42.2	100	81	81.0	17	17.0

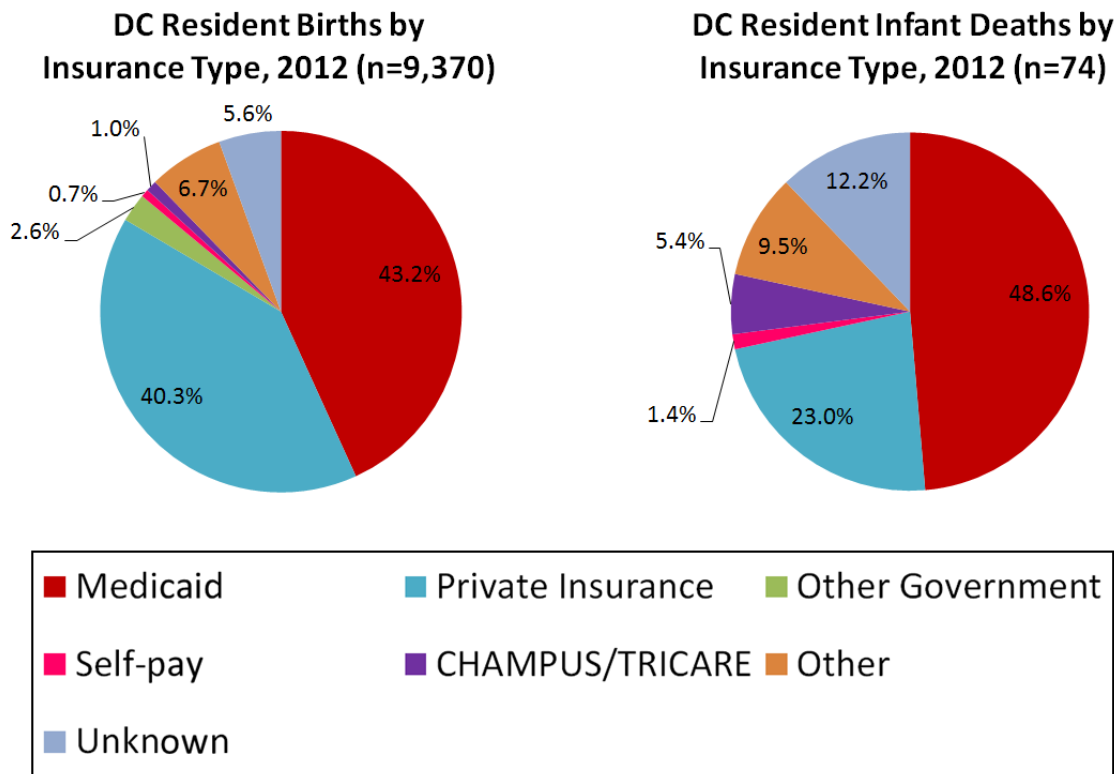
Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.

Health Insurance Type

Most women in the District have access to health care and insurance during pregnancy. Studies show that women with Medicaid-paid deliveries were more likely to experience risk factors during pregnancy such as depression, stress, and smoking, compared to women with private insurance¹². According to 2004 Pregnancy Risk Assessment Monitoring System (PRAMS) data from 26 states¹³, women on Medicaid had higher rates of smoking during the last 3 months of pregnancy than those with private insurance. Figures 9 and 10 show the breakdown of 2012 births and infant deaths in the District by insurance type and maternal race/ethnicity.

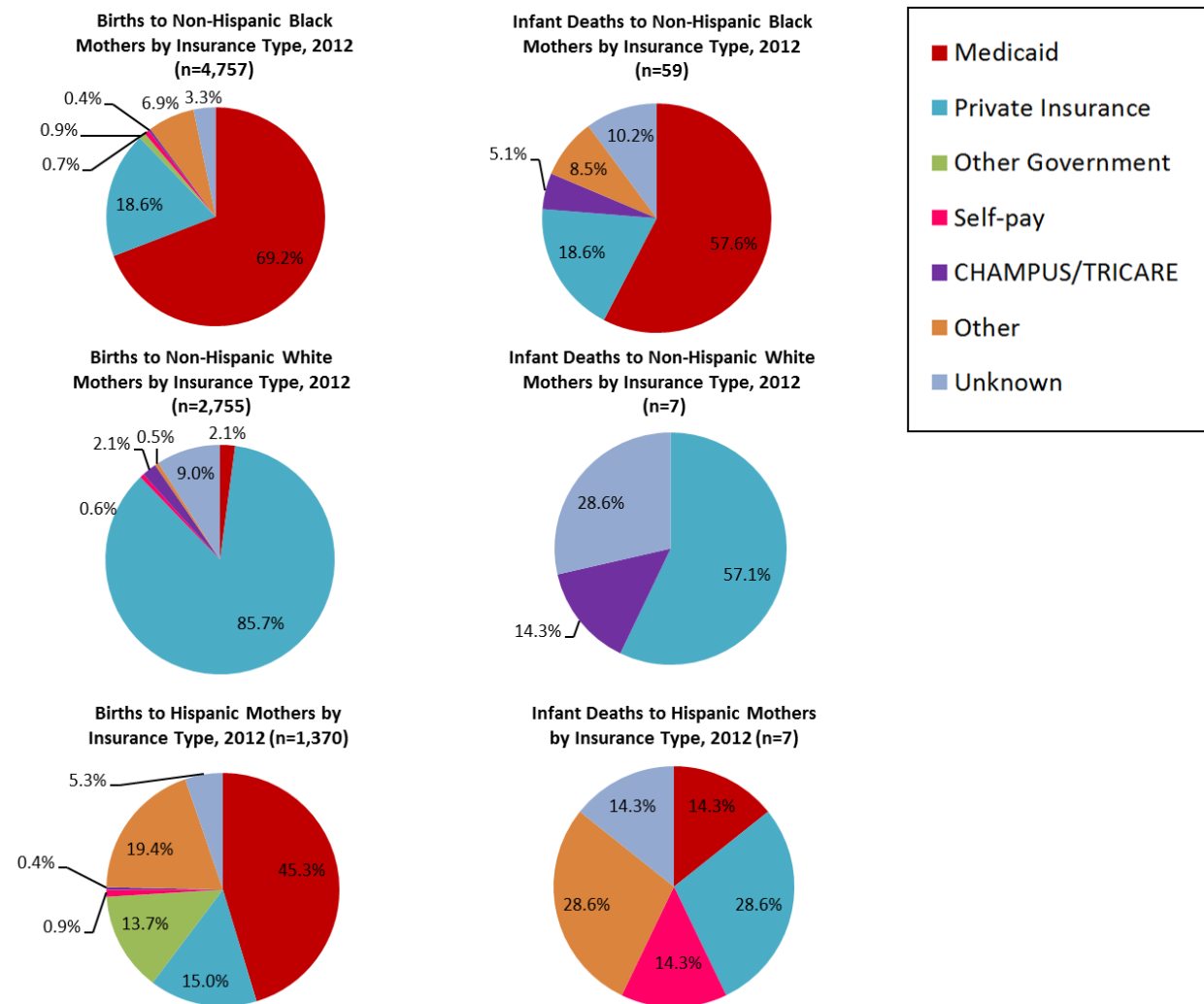
City-wide, 43.2 percent of deliveries were to Medicaid beneficiaries. Infant deaths disproportionately occurred to mothers who used Medicaid at the time of delivery compared to those with private insurance, 48.6 percent vs. 23.0 percent, respectively (Figure 9). Figure 10 shows that non-Hispanic black mothers were the highest Medicaid beneficiaries at 69.2 percent. Almost 58 percent of infants who died to non-Hispanic black mothers used Medicaid insurance as the principal source of payment at the time of delivery.

Figure 9. Births and Infant Deaths by Mother’s Insurance Type at Time of Delivery, District of Columbia, 2012



Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.

Figure 10. Births and Infant Deaths by Mother’s Race/Ethnicity and Insurance Type at Time of Delivery, District of Columbia, 2012



Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.

Geographical Distribution

The District’s IMR is comparable to cities of similar size and population mix. Among the following four cities, the District’s rate has followed a downward trend and consistently ranked lowest in 2009, 2010, 2011, and 2012. The District tied with Richmond for lowest rate in 2008 (Table 8).

**Table 8: Infant Mortality Rate Comparisons for Baltimore,
the District of Columbia, Richmond and Detroit Cities, 2008-2012**

[Rates are Infant deaths per 1,000 live births]

City	2008	2009	2010	2011	2012
Baltimore City, Maryland ¹	12.1	13.5	11	10.5	9.7
Detroit City, Michigan ²	14.8	14.8	13.3	12.6	15.0
District of Columbia ³	10.9	9.9	8.0	7.4	7.9
Richmond, Virginia ⁴	10.9	12.2	12.8	8.7	10.5

Sources: ¹ Vital Statistics Administration, Department of Health and Mental Hygiene, Maryland.

² Vital Records & Health Data Development Section, Michigan Department of Community Health.

³ Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.

⁴ Virginia Department of Health, VA State Center for Health Statistics.

There are eight wards in the District which provide a basis for breaking down District-wide data into small geographical subdivisions for comparison and analyses. With very few individual-level socioeconomic data, ward-level statistics form a useful basis for evaluating health status indicators against demographic and environmental characteristics. Table 9 shows selected maternal and child health indicators and infant deaths by geographic areas or wards in the District of Columbia. In 2012, there was a decrease in the number of infants born in Wards 3 and 7 (Table 10). Further, the infant mortality breakdown by ward for 2012 shows a decline in the IMR for three wards (2, 4, and 5). The IMR increased in Wards 1, 3, 6, 7, and 8. Among the wards with increased IMRs in 2012, Ward 8 had the highest rate (almost double the city-wide rate), with a 24.4 percentage increase (from a rate of 12.0 per 1,000 live births in 2011 to 14.9 per 1,000 live births in 2012. Wards 2 and 3 had only 1 infant death in each ward in 2012. Caution should be exercised when interpreting percent changes in the IMR by ward, which are highly variable and do not meet standards of reliability or precision. Ward 4 had the largest meaningful decrease from 12 infant deaths in 2011 to 5 in 2012, a nearly 60 percent decrease in infant mortality rate. However, caution should be used when interpreting the rate and percentage change because of the very small numbers in Tables 10, 11, and 12. IMRs by ward from 2007 and 2012 are presented in Table 13. The geographic distribution of 2012 ward-level data for selected measures such as infant mortality, birth rates, low birth weight, preterm births, entry into prenatal care, and teen births in the District of Columbia are depicted in Maps 1, 2, 3, 4, 5, and 6, respectively.

**Table 9. Indicators of Maternal and Child Health, and Infant Mortality by Ward
District of Columbia Residents, 2012**

Indicators	DC	Ward 1	Ward 2	Ward 3	Ward 4	Ward 5	Ward 6	Ward 7	Ward 8
2010 Census Population ¹	632,323	80,072	83,979	81,075	79,626	78,087	80,493	74,682	74,308
Live Births Rate/1,000 pop ¹	9,370 14.8	1,196 14.9	643 7.7	820 10.1	1,479 18.6	1,113 14.3	1,276 15.9	1,156 15.5	1,675 22.5
Live Births									
Black	4,816	296	64	45	660	741	419	1,085	1,501
White	2,974	441	426	658	344	205	733	25	139
Hispanic ²	1,370	426	87	61	503	146	62	48	35
Births to Unmarried Women (Percent)	4,788 51.1	519 43.4	99 15.4	61 7.4	733 49.6	658 59.1	382 29.9	985 85.2	1,342 80.1
% Births to Unmarried Women									
Black	77.4	63.2	40.6	17.8	55.2	73.7	80.2	86.8	87.6
White	7.3	10.0	5.4	4.9	14.0	9.8	3.7	40.0	8.6
Hispanic ²	63.7	69.0	59.8	24.6	69.6	63.7	24.2	72.9	48.6
Births to Mothers age <20 yrs. (Percent)	796 8.5	60 5.0	14 2.2	3 0.4	77 5.2	113 10.2	67 5.2	196 17.0	266 15.9
Births to Mothers 15-19 yrs. (Percent)	790 8.4	59 4.9	14 2.2	3 0.4	77 5.2	113 10.2	67 5.3	192 16.6	265 15.8
Birth Rate/1,000 Women 15-19 yrs. ³	38.5	23.2	3.9	1.2	41.2	40.2	58.7	66.8	82.0
Low Birth Weight Live Births ⁴ (Percent)	906 9.7	101 8.4	47 7.3	60 7.3	117 7.9	102 9.2	101 7.9	173 15.0	204 12.2
% Low Birth Weight Births ⁴									
Black (Percent)	583 (12.1)	20 (6.8)	7 (10.9)	4 (8.9)	58 (8.8)	85 (11.5)	52 (12.4)	170 (15.7)	187 (12.5)
White (Percent)	194 (6.5)	36 (8.2)	20 (4.7)	50 (7.6)	26 (7.6)	7 (3.4)	40 (5.5)	1 (4)	13 (9.4)
Hispanic ² (Percent)	116 (8.5)	46 (10.8)	6 (6.9)	8 (13.1)	36 (7.2)	8 (5.5)	4 (6.5)	2 (4.2)	6 (17.1)
Low Birth Weight ⁴ to Mothers <20 yrs. (Percent)	80 10.0	3 5.0	3 21.4	0 -	9 11.7	13 11.5	7 10.4	20 10.2	25 9.4
% Preterm Births (<37 weeks gestation)	9.9	9.2	7.0	8.4	8.6	8.6	7.8	15.1	12.2
% Births With Prenatal Care Beginning First Trimester ^{5,6}	65.2	68.7	75.6	79.9	61.7	63.1	73.3	55.6	56.0
% Births with First Trimester Prenatal Care									
Black	54.1	49.8	50.0	63.4	50.3	56.9	55.7	55.0	54.2
White	81.9	82.3	81.2	81.6	83.1	81.2	84.2	75.0	72.4
Hispanic ²	64.3	65.3	69.6	74.6	62.2	68.8	59.3	54.8	54.8
% Births With Late or No Prenatal Care ^{5,6}	8.2	8.3	6.6	3.8	10.2	9.8	6.1	8.8	9.1
Infant Deaths (under 1 yr.) Rate (per 1,000 live births) ⁷	74 7.9	7 5.9	1 1.6	1 1.2	5 3.4	13 11.7	11 8.6	11 9.5	25 14.9

Notes: ¹ Rates and ward estimates were derived from the District of Columbia Census 2010 Demographic and Housing Profiles by Ward, U.S. Census Bureau, Census 2010 and the 2012 DC Population Estimates prepared by the DC Office of Planning State Data Center.

² Hispanics include persons of all Hispanic origin of any race.

³ Rates by ward for women aged 15-19 years were calculated using sex- and age-specific ward-level data from the District of Columbia Census 2010 Demographic and Housing Profiles by Ward, U.S. Census Bureau, Census 2010 and the 2012 DC Population Estimates prepared by the DC Office of Planning State Data Center.

⁴ Low birth weight (under 2,500 grams or 5 lbs. 8 oz.).

⁵ Prenatal care beginning in the first trimester of pregnancy is defined as the date of the first prenatal care visit occurring during the first three months of pregnancy (or during the first 13 weeks after the first day of the last menstrual period). Late prenatal care is defined as the date of the first prenatal care visit occurring during the third trimester (or the last three months of pregnancy).

⁶ Births for which unknown "prenatal care began" were subtracted from the total number of births before percentages were computed.

⁷ Due to the small number of infant deaths, infant mortality rates are highly variable and should be interpreted cautiously.

Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.

**Table 10: Births, Infant Deaths and Infant Mortality Rates by Ward
District of Columbia Residents, 2011 and 2012**

Ward	Births		Infant Deaths		Infant Mortality Rate ¹		Percent Change ²
	2011	2012	2011	2012	2011	2012	
1	1,174	1,196	4	7	3.4	5.9	72.1
2	601	643	4	1	6.7	1.6	-76.8
3	842	820	0	1	0.0	1.2	--
4	1,423	1,479	12	5	8.4	3.4	-59.8
5	1,089	1,113	14	13	12.9	11.7	-9.5
6	1,245	1,276	7	11	5.6	8.6	53.9
7	1,218	1,156	8	11	6.6	9.5	44.2
8	1,667	1,675	20	25	12.0	14.9	24.4
Unknown	30	12	0	0	0.0	0.0	--
Total	9,289	9,370	69	74	7.4	7.9	6.7

¹Infant deaths per 1,000 live births.

²Changes in value over time (e.g., rates) [(New - Old) / Old = Decimal x 100 = Percent change].

Notes: Due to the small number of infant deaths, the above infant mortality rates are highly variable and should be interpreted cautiously.

Ward distribution based on 2012 ward boundaries.

Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.

**Table 11: Statistical Overview by Ward
District of Columbia Residents, 2011**

Ward	Births	Infant Deaths	IMR*	LBW	Teen Births	LBW to Teens
1	1,174	4	3.4	106	64	11
2	601	4	6.7	49	7	1
3	842	0	0.0	62	0	0
4	1,423	12	8.4	109	94	9
5	1,089	14	12.9	119	129	12
6	1,245	7	5.6	124	81	11
7	1,218	8	6.6	179	224	31
8	1,667	20	12.0	223	302	40
Unknown	30	0	-	2	7	0
Total	9,289	69	7.4	973	908	115

*Infant deaths per 1,000 live births.

Notes: Due to the small number of infant deaths, the above infant mortality rates are highly variable and should be interpreted cautiously.

Ward distribution based on 2002 ward boundaries.

Teen birth in this table is defined as mother's younger than 20 years of age.

Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.

Ward	Births	Infant Deaths	IMR*	LBW	Teen Births	LBW to Teens
1	1,196	7	5.9	101	60	3
2	643	1	1.6	47	14	3
3	820	1	1.2	60	3	0
4	1,479	5	3.4	117	77	9
5	1,113	13	11.7	102	113	13
6	1,276	11	8.6	101	67	7
7	1,156	11	9.5	173	196	20
8	1,675	25	14.9	204	266	25
Unknown	12	0	0.0	1	0	0
Total	9,370	74	7.9	906	796	80

*Infant deaths per 1,000 live births.

Notes: Due to the small number of infant deaths, the above infant mortality rates are highly variable and should be interpreted cautiously.

Ward distribution based on 2012 ward boundaries.

Teen birth in this table is defined as mother's younger than 20 years of age.

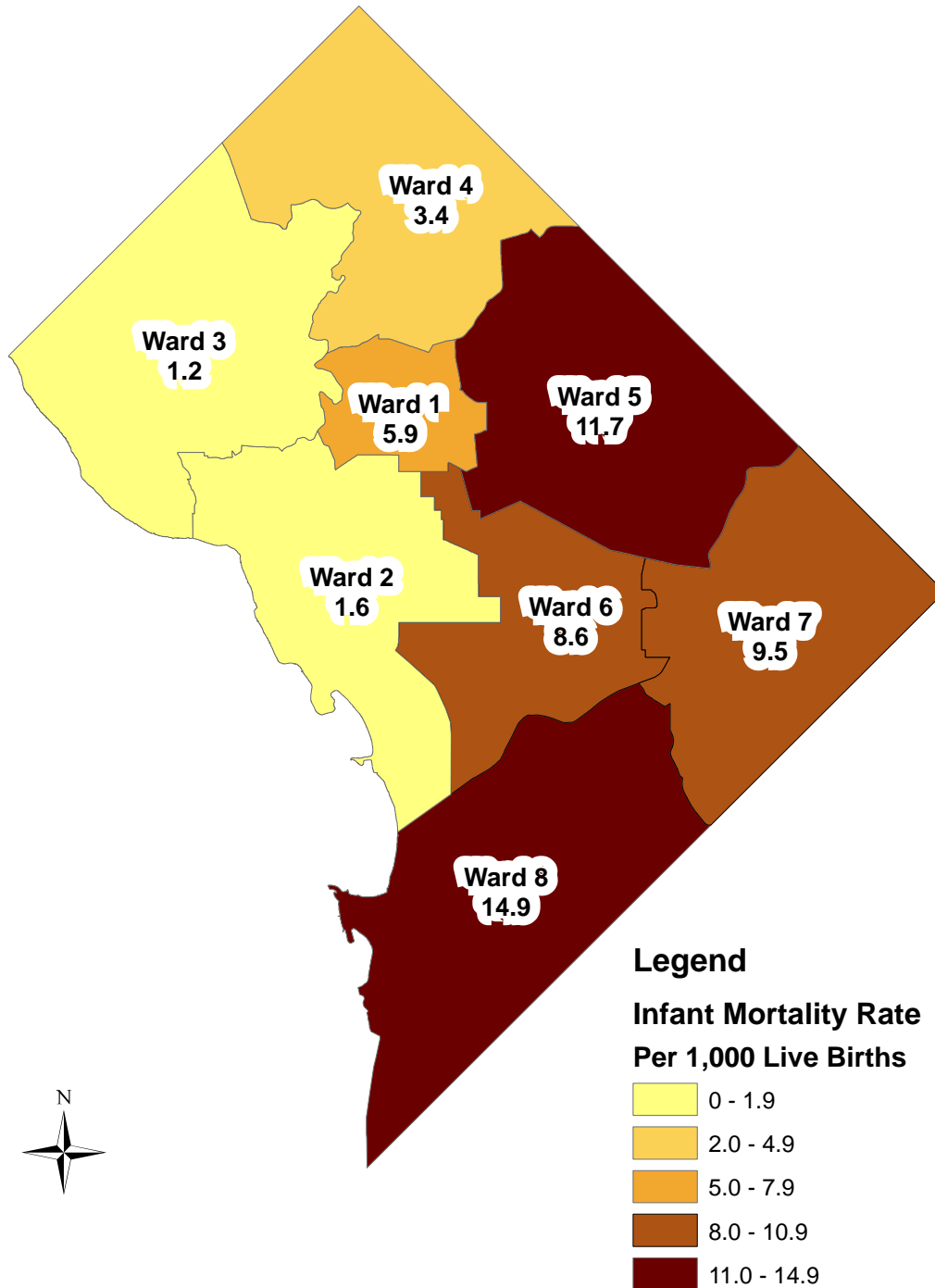
Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.

Ward	2008	2009	2010	2011	2012
1	6.1	8.1	4.1	3.4	5.9
2	2.9	5.8	2.9	6.7	1.6
3	5.1	2.6	5.0	0	1.2
4	10.2	10.4	11.3	8.4	3.4
5	12.9	11.8	10.3	12.9	11.7
6	8.0	1.9	9.8	5.6	8.6
7	17.2	12.9	6.6	6.6	9.5
8	17.7	18.4	10.4	12	14.9
Total	10.9	9.9	8.0	7.4	7.9

Note: Due to the small number of infant deaths, the above infant mortality rates are highly variable and should be interpreted cautiously.

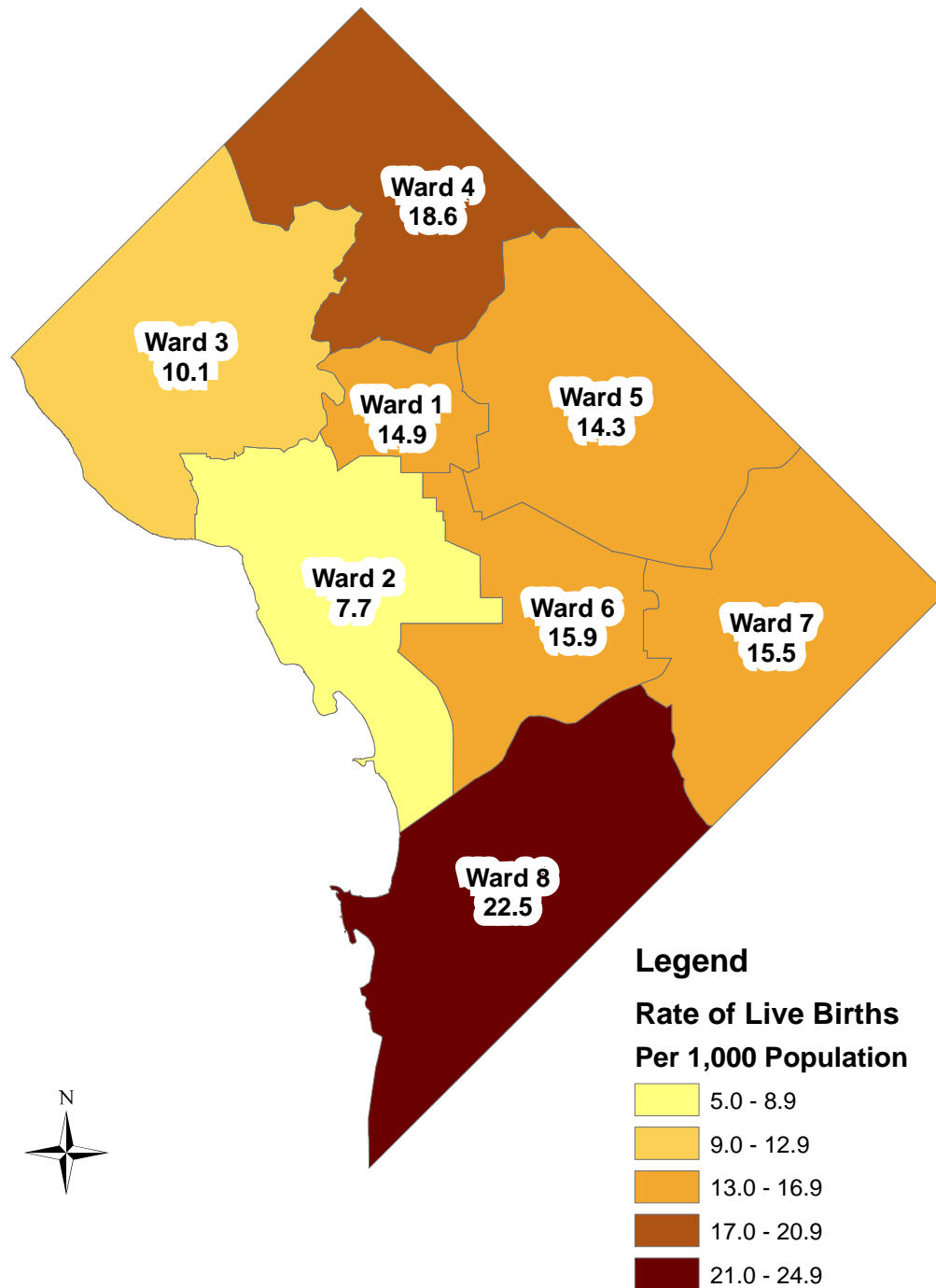
Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.

Map 1. Rates of Infant Mortality by Ward, District of Columbia, 2012



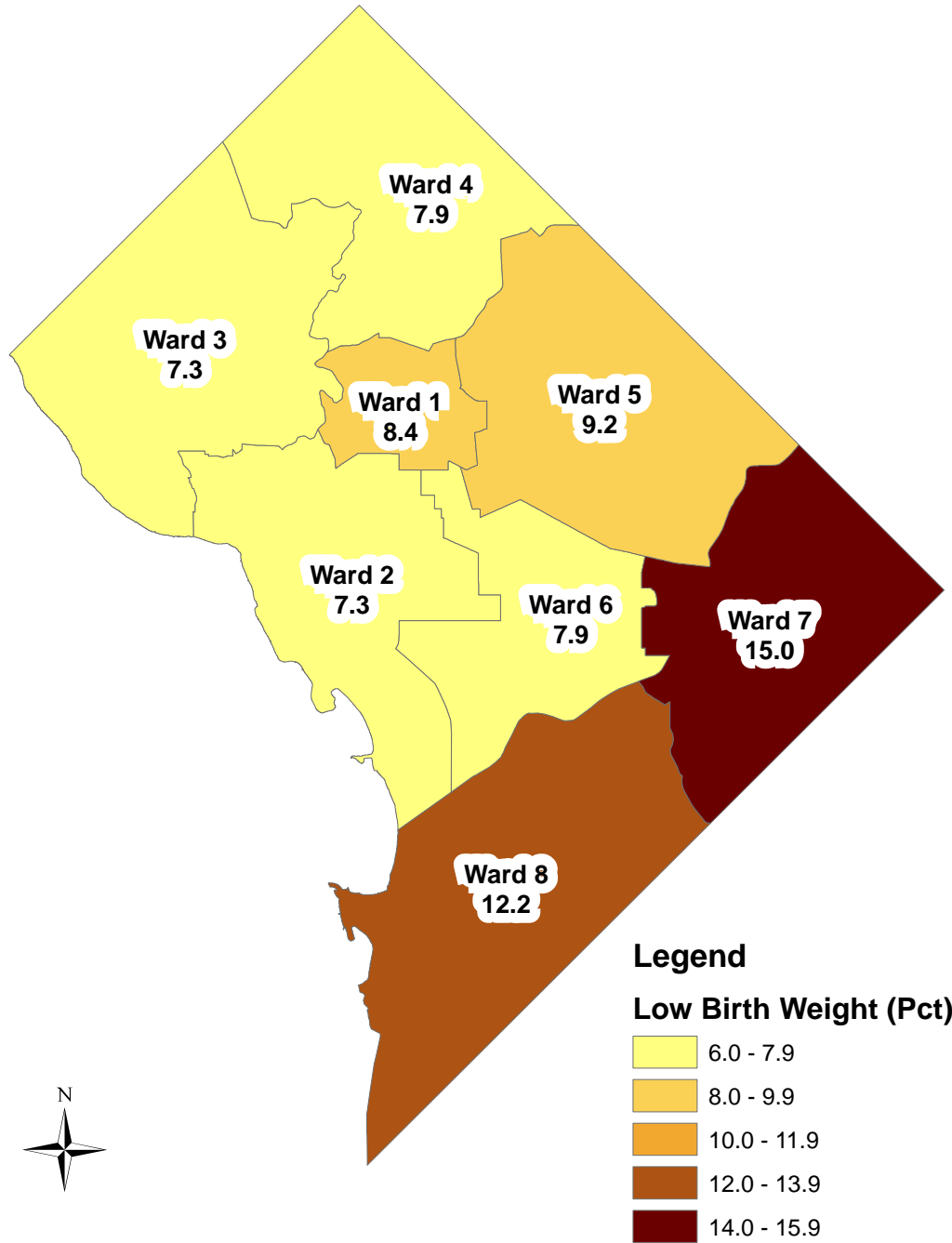
Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.
Notes: Ward distribution based on 2002 ward boundaries.

Map 2. Rates of Live Birth to DC Residents by Ward, District of Columbia, 2012



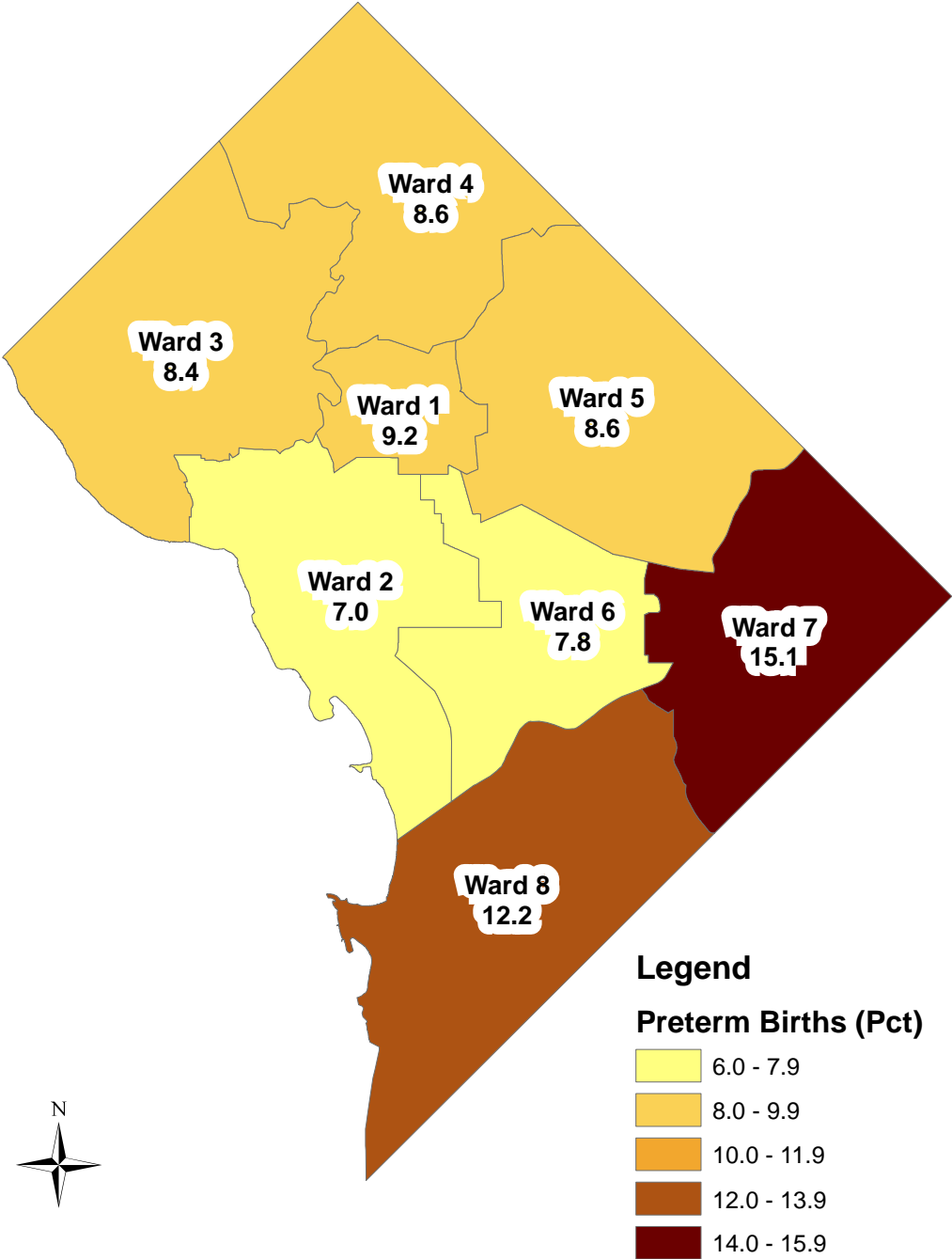
Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.
Notes: Ward distribution based on 2012 ward boundaries.

Map 3. Percentage of Low Birth Weight Live Births by Ward, District of Columbia, 2012



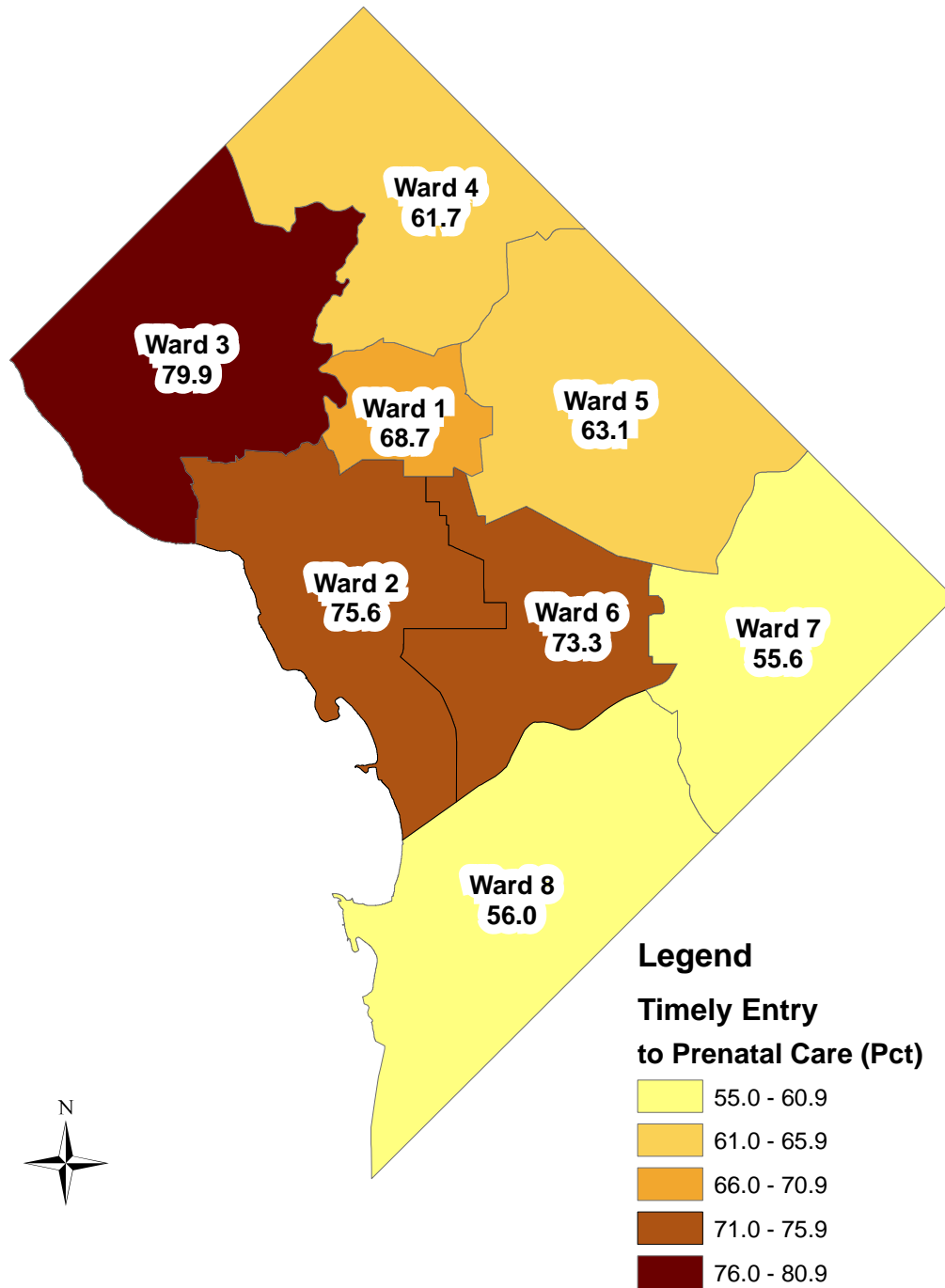
Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.
Notes: Ward distribution based on 2012 ward boundaries.

Map 4. Percentage of Preterm Births by Ward, District of Columbia, 2012



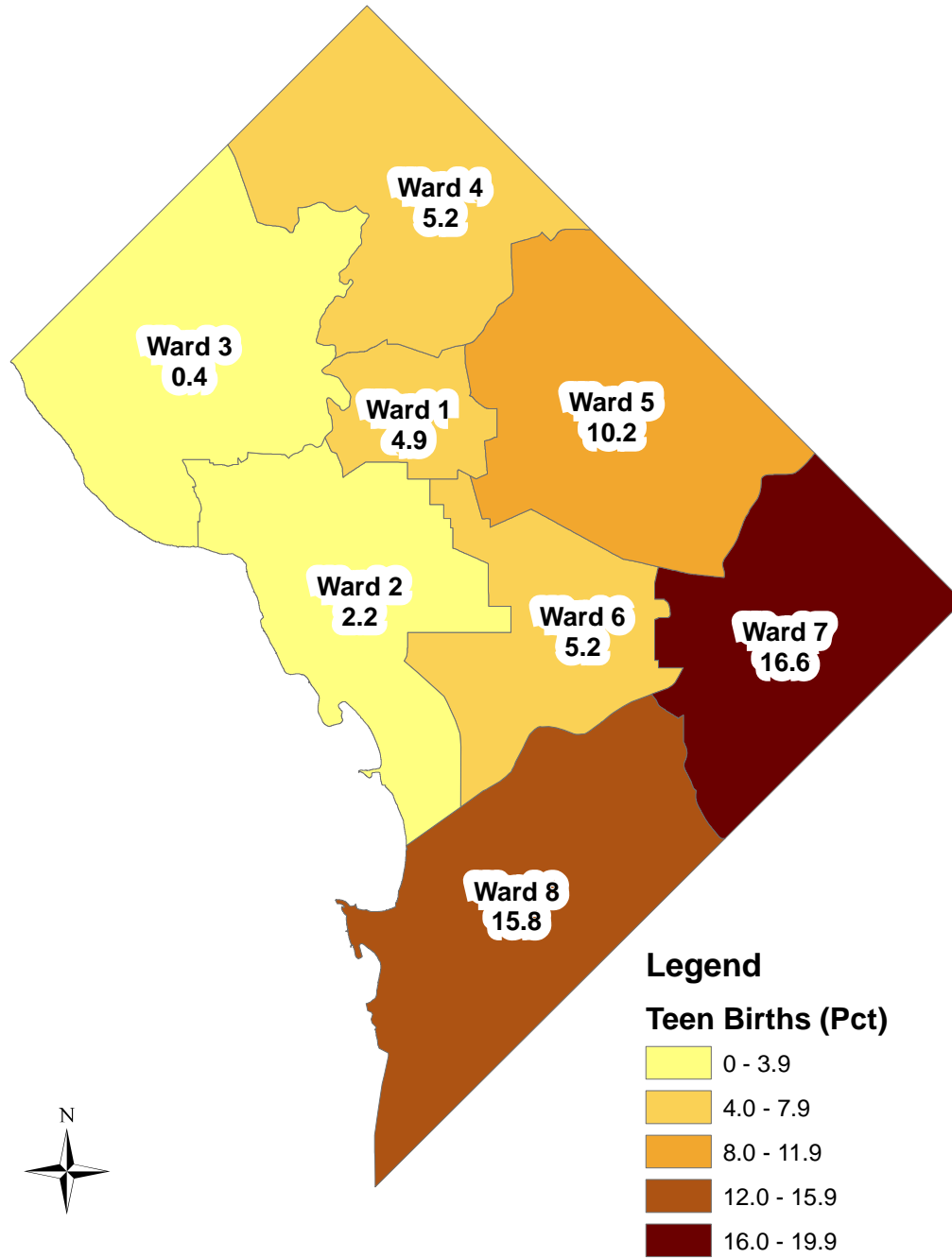
Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.
Notes: Ward distribution based on 2012 ward boundaries.

Map 5. Percentage of Births with Prenatal Care Beginning First Trimester by Ward, District of Columbia, 2012



Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.
Notes: Ward distribution based on 2012 ward boundaries.

Map 6. Teen Births by Ward, District of Columbia, 2012



Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.
Notes: Ward distribution based on 2012 ward boundaries.

Causes of Death

The leading cause of infant mortality, **Disorders related to short gestation and low birth weight, not elsewhere classified** accounted for 21.6 percent of all infant deaths in 2012 (Table 14). **Congenital malformations, deformations and chromosomal abnormalities** were the second leading cause of death, which accounted for 20.3 percent of all infant deaths. **Newborn affected by maternal complications of pregnancy** was the third leading cause of death, which accounted for 14.9 percent of all infant mortality. **Newborn affected by complications of placenta, cord, and membranes** was the fourth leading cause of death, which accounted for 10.8 percent of infant deaths in 2012. **Sudden infant death syndrome (SIDS)** was the fifth leading cause of death, which accounted for 9.5 percent of all infant mortality. **These five leading causes of infant death in 2012 accounted for 77.0 percent of all infant deaths in the District of Columbia.** These five leading causes of death in 2012 were the same as those in 2011, but they changed ranks compared with 2011. Infant deaths due to congenital malformations rose from 10 to 15; deaths due to SIDS increased from 2 to 7. Infant deaths related to short gestation and low birth weight increased from 14 to 16, while maternal complications of pregnancy decreased from 14 to 11, and complications of placenta, cord, and membranes fell from 11 to 8 between 2011 and 2012.

Rank ¹	Cause of Death (Based on Tenth Revision, International Classification of Diseases, 2008 Edition, 2009)	Number	Percent*	Rate**
...	All causes	74	100.0	789.8
1	Disorders related to short gestation and low birth weight, not elsewhere classified (P07)	16	21.6	170.8
	... Extremely low birth or extreme immaturity (P07.0, P07.2)	14	18.9	149.4
	... Other low birth weight or preterm (P07.1, P07.3)	2	2.7	21.3
2	Congenital malformations, deformations and chromosomal abnormalities (Q00-Q99)	15	20.3	160.1
	... Anencephaly and similar malformations (Q00)	1	1.4	10.7
	... Other congenital malformations of nervous system (Q01-Q02, Q04, Q06-Q07)	2	2.7	21.3
	... Spina bifida (Q05)	1	1.4	10.7
	... Congenital malformations of heart (Q20-Q24)	5	6.8	53.4
	... Congenital malformations of genitourinary system (Q50-Q64)	2	2.7	21.3
	... Congenital malformations and deformations of musculoskeletal system, limbs and integument (Q65-Q85)	1	1.4	10.7
	... Other congenital malformations and deformations (Q10-Q18, Q86-Q89)	1	1.4	10.7
	... Edward's syndrome ((Q91.0-Q91.3)	1	1.4	10.7
	... Other congenital malformations and chromosomal abnormalities, not elsewhere classified (Q92-Q99)	1	1.4	10.7
3	Newborn affected by maternal complications of pregnancy (P01)	11	14.9	117.4
	... Newborn affected by incompetent cervix (P01.0)	4	5.4	42.7
	... Newborn affected by premature rupture of membranes (P01.1)	6	8.1	64.0
	... Newborn affected by multiple pregnancy (P01.5)	1	1.4	10.7
4	Newborn affected by complications of placenta, cord, and membranes (P02)	8	10.8	85.4
	... Newborn affected by complications involving placenta (P02.0-P02.3)	2	2.7	21.3
	... Newborn affected by complications involving cord (P02.4-P02.6)	1	1.4	10.7

**Table 14: Leading Causes of Infant Death
District of Columbia Residents, 2012**

Rank ¹	Cause of Death (Based on Tenth Revision, International Classification of Diseases, 2008 Edition, 2009)	Number	Percent*	Rate**
...	... Newborn affected by chorioamnionitis (P02.7)	5	6.8	53.4
5	Sudden infant death syndrome (SIDS) (R95)	7	9.5	74.7
...	All other causes	17	23.0	181.4

*Percent based on total number of infant deaths.

**Rate per 100,000 live births.

... Category not applicable.

¹ Rank based on number of infant deaths.

Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.

In 2011, the leading cause of infant death nationally was **Congenital malformations, deformations and chromosomal abnormalities**. **Disorders related to short gestation and low birth weight, not elsewhere classified (low birth weight)** was the second leading cause for the U.S. (Table 15), but ranked first for the District of Columbia.

**Table 15. Infant Deaths and Infant Mortality Rates for the 10 Leading Causes of Infant Death:
United States, Preliminary, 2011**

Rank ¹	Cause of death (based on the <i>International Classification of Diseases, Tenth Revision, 2008 Edition, 2009</i>)	Number	Rate ²
...	All causes	23,907	604.7
1	Congenital malformations, deformations and chromosomal abnormalities (Q00–Q99)	4,984	126.1
2	Disorders related to short gestation and low birth weight, not elsewhere classified (P07)	4,116	104.1
3	Sudden infant death syndrome (R95)	1,711	43.3
4	Newborn affected by maternal complications of pregnancy (P01)	1,578	39.9
5	Accidents (unintentional injuries) (V01–X59)	1,089	27.5
6	Newborn affected by complications of placenta, cord and membranes (P02)	992	25.1
7	Bacterial sepsis of newborn (P36)	526	13.3
8	Respiratory distress of newborn (P22)	514	13.0
9	Diseases of the circulatory system (I00-I99)	496	12.5
10	Neonatal hemorrhage ((P50-P52,P54)	444	11.2
...	All other causes (residual)	7,457	188.6

... Category not applicable.

¹ Rank based on number of infant deaths.

² Rates are per 100,000 live births.

Notes: 1. Data are based on a continuous file of records received from the states. Figures are based on weighted data rounded to the nearest individual, so categories may not add to totals or subtotals.

2. For certain causes of death such as unintentional injuries, sudden infant death syndrome, and congenital malformations, deformations and chromosomal abnormalities, preliminary and final data may differ significantly because of the truncated nature of the preliminary file. Data are subject to sampling and/or random variation.

Source: National Vital Statistics Reports, Vol. 61, No. 6, October 10, 2012. Deaths: Preliminary data for 2011. Available from:

http://www.cdc.gov/nchs/data/nvsr/nvsr61/nvsr61_06.pdf

Note: National infant mortality data unavailable for 2012.

Neonatal Mortality

The leading cause of neonatal death in 2012 was **Disorders related to short gestation and low birth weight, not elsewhere classified** which accounted for 26.2 percent of all neonatal deaths. **Congenital malformations, deformations and chromosomal abnormalities** was the second ranked leading cause of neonatal death, climbing from fourth position in 2011 and accounting for 19.7 percent of neonatal deaths in 2012. **Newborn affected by maternal complications of pregnancy**, was the third leading cause of neonatal death, which accounted for 18.0 percent of all neonatal deaths. **Newborn affected by complications of placenta, cord, and membranes** (13.1 percent) was the fourth leading cause of neonatal deaths (Table 16).

Rank ¹	Cause of Death (Based on Tenth Revision, International Classification of Diseases, 2008 Edition, 2009)	Number	Percent*	Rate**
...	All causes	61	100.0	651.0
1	Disorders related to short gestation and low birth weight, not elsewhere classified (P07)	16	26.2	170.8
2	Congenital malformations, deformations and chromosomal abnormalities (Q00-Q99)	12	19.7	128.1
3	Newborn affected by maternal complications of pregnancy (P01)	11	18.0	117.4
4	Newborn affected by complications of placenta, cord, and membranes (P02)	8	13.1	85.4
...	All other causes or total	14	23.0	149.4

*Percent based on total number of neonatal deaths.

**Rate per 100,000 live births.

... Category not applicable.

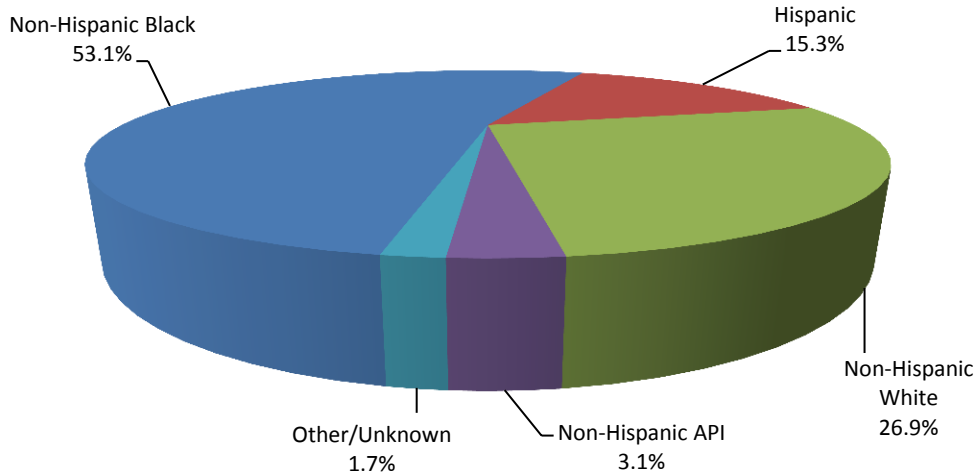
¹ Rank based on number of infant deaths.

Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.

Five-Year Birth and Infant Death Trend

Figure 11 shows the total number of births, 53,897 for the five-year period of 2008 to 2012. About 53.1 percent were to non-Hispanic black mothers, 26.9 percent were to non-Hispanic white mothers and 15.3 percent were to Hispanic mothers.

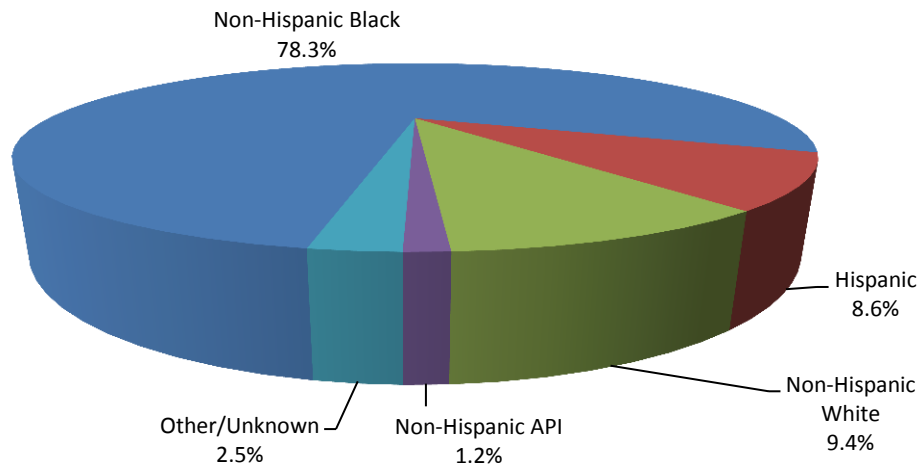
Figure 11. Births by Race and Hispanic Origin of Mother, 2008-2012 (n=53,897)



Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.

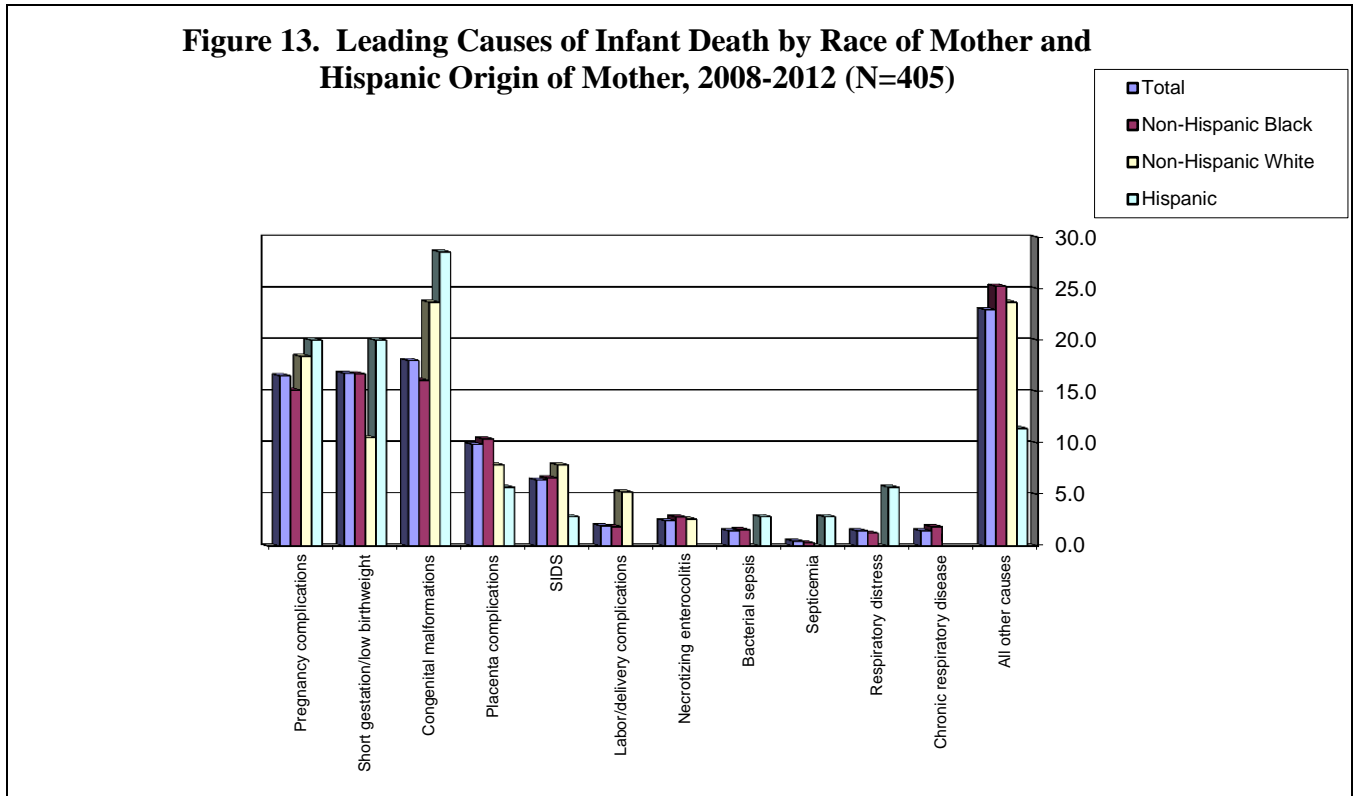
Of the total number of births (N=53,897), 405 infants died from 2008 to 2012. Figure 12 shows the average percentage of infant deaths by race/ethnicity from 2008 to 2012. On average between 2008 to 2012, infants to non-Hispanic black mothers disproportionately died (78.3 percent) compared to their total number of births (53.1 percent).

Figure 12. Infant Deaths by Race and Hispanic Origin of Mother, 2008-2012 (n=405)



Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.

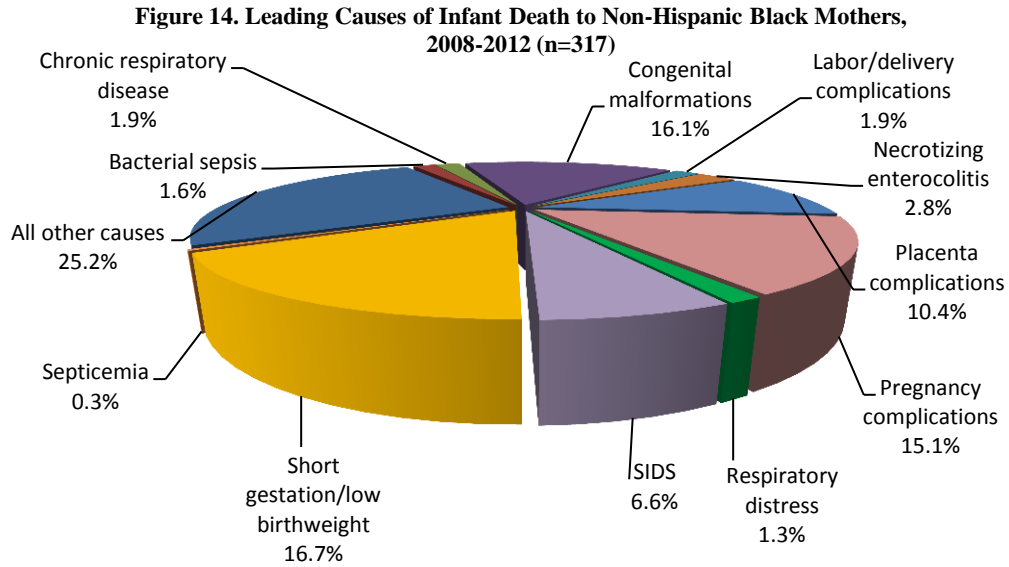
Figure 13 shows the leading causes of infant death over this five-year period (2008-2012). The leading cause of infant mortality was **Congenital malformations, deformations and chromosomal abnormalities**, which accounted for 18 percent, followed by **Short gestation and low birth weight** (16.8 percent). The third leading cause was **Newborn affected by maternal complications of pregnancy** (16.5 percent).



Note: Data by Asian/Pacific Islander were excluded due to small numbers.

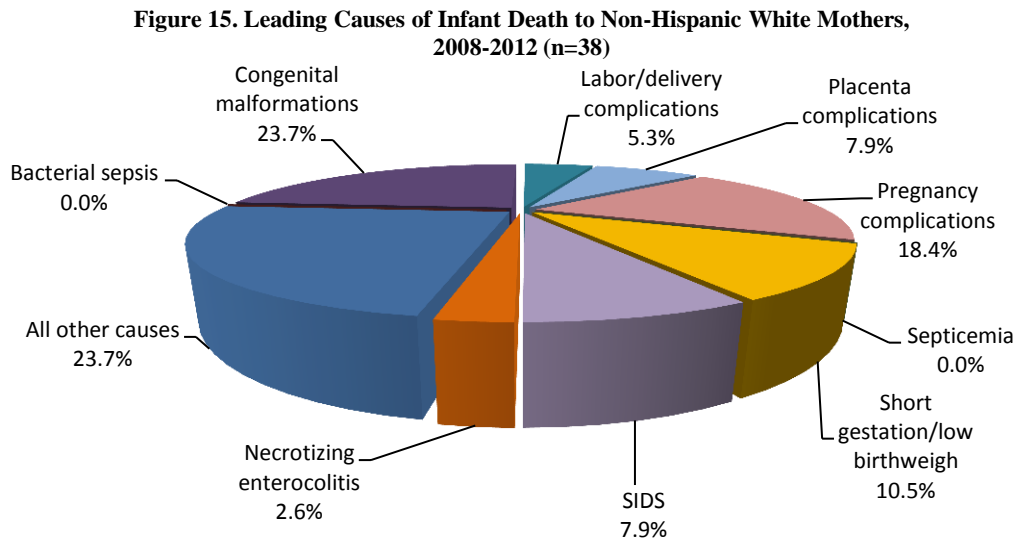
Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.

Among non-Hispanic black mothers, **Disorders related to short gestation and low birth weight, not elsewhere classified** was the leading cause of death (16.7 percent), followed by **Congenital malformations, deformations and chromosomal abnormalities** (16.1 percent). **Newborn affected by maternal complications of pregnancy** was the third leading cause of infant death (15.1 percent) on the average, from 2008-2012 (Figure 14).



Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.

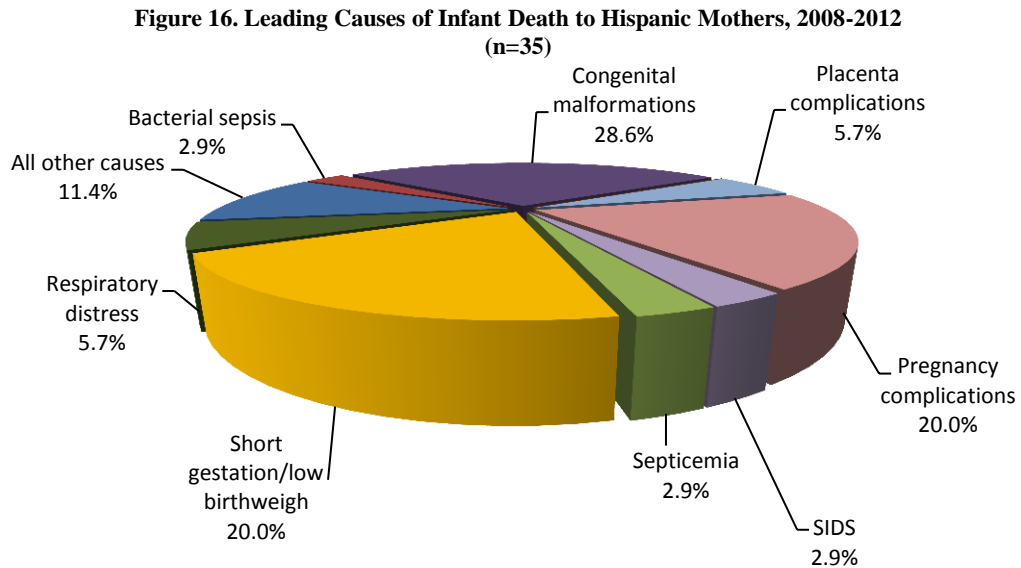
For infant deaths to non-Hispanic white mothers between 2008 to 2012, **Congenital malformations, deformations and chromosomal abnormalities** was the leading cause of infant death (23.7 percent) and **Newborn affected by maternal complications of pregnancy** was the second leading cause (18.4 percent). **Disorders related to short gestation and low birth weight, not elsewhere classified** was the third leading cause of infant death (10.5 percent) (Figure 15).



Note: Percentage does not add to 100 due to rounding.

Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.

Figure 16 shows that the leading cause of infant death to Hispanic mothers from 2008 to 2012 was **Congenital malformations, deformations and chromosomal abnormalities** (28.6 percent). **Disorders related to short gestation and low birth weight, not elsewhere classified** (20.0 percent) was the second leading cause, tied with **Newborn affected by maternal complications of pregnancy** (20.0 percent).



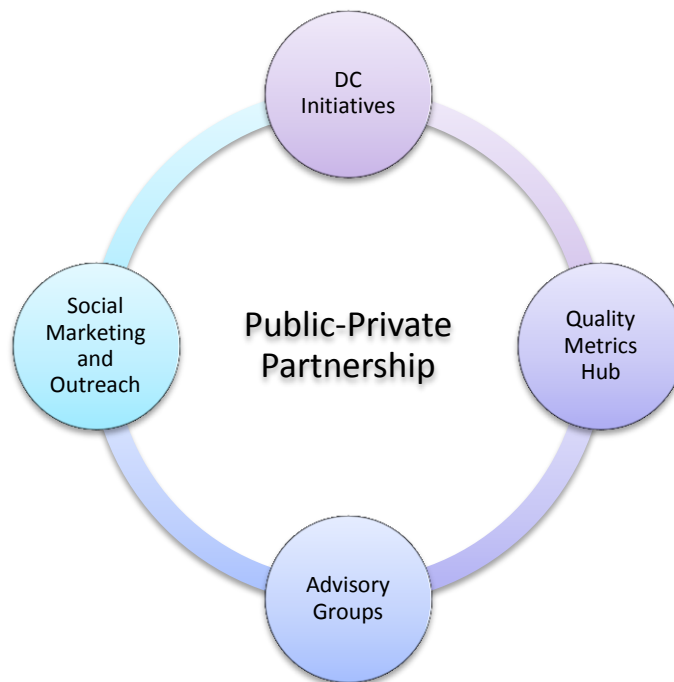
Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.

DOH Maternal and Child Health Program Activities

In 2012, the District of Columbia Department of Health (DOH) Community Health Administration (CHA) continued its effort to improve birth outcomes. Through the DC Healthy Start Program, case managers enrolled over 1,000 pregnant and postpartum women and provided over 4,380 home visits in Ward 5, Ward 6, Ward 7, and Ward 8. Home visits are provided by a Nurse Case Manager and a Family Support Worker team. Recognizing the important role of the father/partner, DC Healthy Start enrolled over 100 fathers into case management. Enrollment into DC Healthy Start provides physical assessments for mom and baby; screening for depression, substance abuse, domestic violence and developmental delays in the child; assistance with identified needs; and health education and parenting skills to name a few. The District's Safe Crib Program provided safe sleep environment education to over 630 residents and provided over 1,230 pack-n-plays to target Sudden Infant Death Syndrome attributed to co-sleeping and roll-overs.

Current Reproductive Health Outcomes Oriented Programs

In 2014, DOH submitted a new funding opportunity to continue its work to decrease the District's perinatal disparities. This new application will support the implementation of a Citywide Action Plan to improve the overall system of care and respond in a targeted manner to the population clusters within the District most impacted by adverse perinatal outcomes. Through this opportunity DOH will implement a public-private partnership to ensure equity in the availability and provision of clinical care across the maternal and child health system and implement strategies to identify and mitigate the social determinants of health that drive health care inequity. The framework for the project has been developed based on integrating District systems components to better ensure sustainability of the efforts.



DOH has engaged in substantial data analysis to identify the key drivers of IMR in the District and based on the current data, the following key activities were identified:

1. Increase the percentage of pregnant women receiving prenatal care in the first trimester to 78% by 2020.
2. Increase the percentage of pregnant women receiving early and adequate prenatal care to 78% by 2020.
3. Increase the abstinence from smoking among pregnant women to 98% by 2020.
4. Eliminate infant mortality due to Sudden Infant Death Syndrome (SIDS) by 2020.
5. Develop a Birthing Facility Report Card to identify opportunities to improve the maternal and infant services at birthing facilities.

For women who are pregnant, DOH and its partners will focus on the services they receive during the course of their pregnancies and the services they receive in the eighth week after their deliveries. For women who have been or hope to become pregnant, DOH will focus on the services that these women receive before a planned conception and with the two year period between the woman's last delivery and the next time she conceives a child. In all cases, DOH will embrace a variety of evidence-based practices for care across each period of engagement and support each health care provider's long term ongoing improvement efforts. Through this partnership, DOH will engage parents, families, health care providers, and communities to: 1) improve women's health, 2) promote quality services, 3) strengthen family resilience, 4) achieve collective impact, and 5) increase accountability through quality improvement, performance monitoring, and evaluation.

Harnessing GIS Technology for Evidence-Based Decision Making in Infant Mortality

Geostatistics is a class of statistics used to analyze and predict values associated with spatial or spatiotemporal (i.e., relating to space and time) phenomena¹⁴. Many geostatistical tools were originally developed as a practical means to describe spatial patterns and interpolate data. Those tools and methods have since evolved to not only predict values, but also measures of uncertainty for those values. The measurement of uncertainty is critical to informed decision making, as it provides information on the possible outcomes for each location rather than just one interpolated value. Geostatistics is widely used in many areas of science and engineering, such as the mining industry, environmental sciences, meteorology, and most recently, in the area of public health¹⁴.

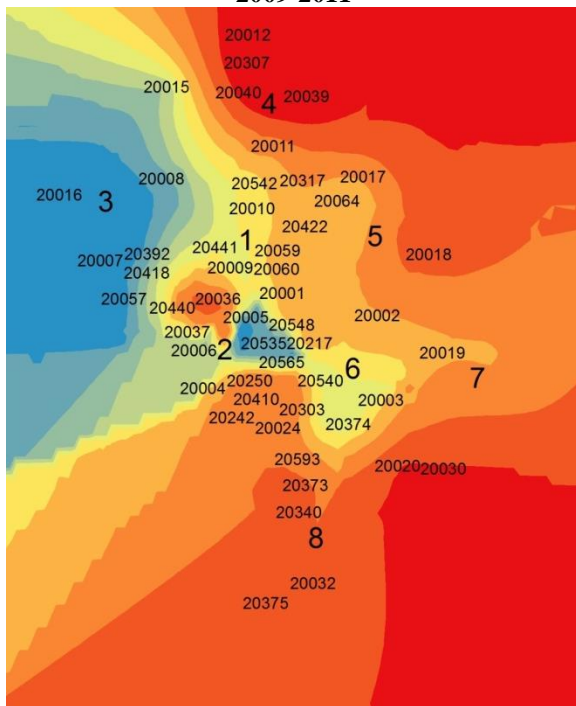
Present-day geostatistical applications provide a comprehensive set of tools to explore data variability, understand spatial relationships, look for unusual data values, and create optimal statistical models to produce reliable maps of predictions, prediction errors, and probabilities for improved decision making¹⁵. In this report, a Bayesian approach to *kriging* was used to predict infant mortality based on 2009-2011 data. The basic idea of *kriging* is to predict the value of a function at a given point by computing a weighted average of the known values of the function in the neighborhood of the point. The method is mathematically closely related to regression analysis. Essentially, *kriging* is a statistical interpolation method that is optimal in the sense that it makes best use of what can be inferred about the spatial structure¹⁶. Bayesian statistical methods start with existing 'prior' beliefs, and update these using data to give 'posterior' beliefs, which may be used as the basis for inferential decisions¹⁷. The goal of this study is to predict infant deaths along with the level of the model uncertainty that can aid in an evidence-based approach to determining the optimal value that infant mortality could be reduced by.

Maps 7 and 8 were generated using ArcGIS[®] Geostatistical Analyst¹⁸, a geographic information systems (GIS) software application licensed thru ESRI.

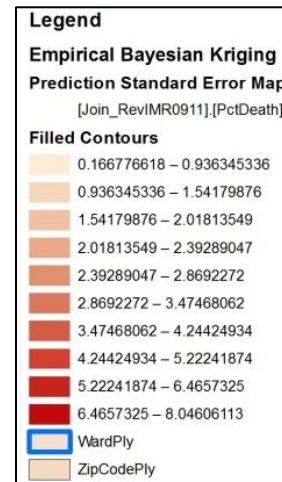
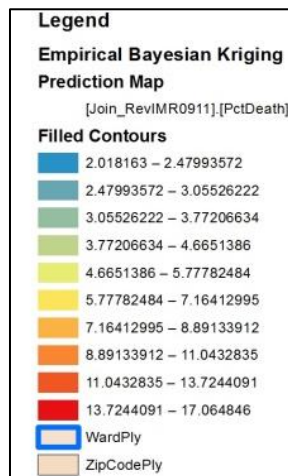
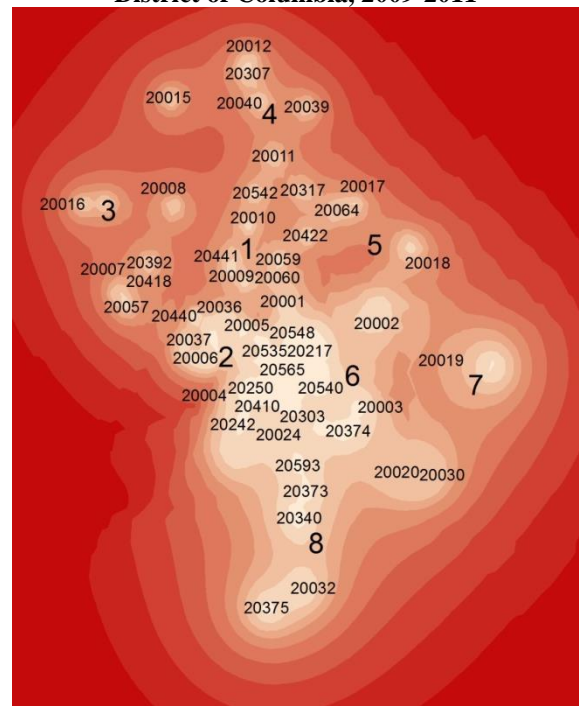
- Map 7 presents a spatial comparison of infant mortality rate predictions based on infant mortality data for 2009-2011.
- Zip codes in shades of red and dark orange were predicted to have the highest infant mortality rates (11 or more infant deaths per 1,000 births) in 2012.
- Similarly, zip codes depicted in shades of blue were predicted to have the lowest infant mortality rates (less than 3 infant deaths per 1,000 births) in 2012.
- Generally, the spatial distribution patterns of infant mortality in 2012 and these predicted values displayed were consistent, thereby providing a high degree of confidence in the predictive map.
- In 2012, zip codes 20032, 20018, 20002, and 20024 had IMRs greater than 11 per 1,000 births, while the corresponding zip codes in Wards 2 and 3 in blue shading had IMRs of less than 3 per 1,000 births.

- In order to determine the validity and level of uncertainty associated with the infant mortality predictive map using geostatistics, a spatial comparison of standard errors was performed and depicted here in Map 8.
- Map 8 (referred to as the prediction standard error map) shows infant mortality zip codes located in shades of red were predicted to have error rates of 3.5 or higher, while areas with lighter shades had error rates of less than 2.0.
- The standard error map quantifies and validates the level of errors in the prediction map, and confirms that low errors were associated with the prediction map.

Map 7. Prediction Map Based on Infant Mortality by Zip Code and Ward, District of Columbia, 2009-2011



Map 8. Prediction Standard Error Map Based on Infant Mortality by Zip Code and Ward, District of Columbia, 2009-2011



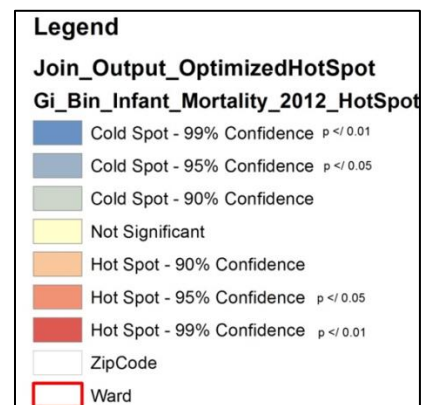
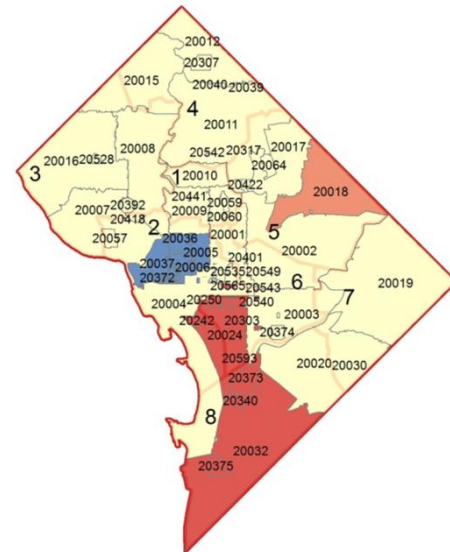
Locating IMR Clusters: Hot Spot Analysis in GIS

Tools in spatial statistics quantify or identify characteristics of data with a geographic component. To describe spatial pattern and distribution, we determine if these features and characteristics are random, clustered, or evenly dispersed across a study area. Spatial statistics can also help pinpoint causes of specific geographic patterns by overlaying maps and analyzing correlations. For example, a visual inspection of infant mortality data displayed on a map may reveal clustering in a certain neighborhood or zip code. However, in order to utilize GIS data more effectively in making programmatic decisions for these high-risk areas, spatial statistics enable users to provide information and conclusions with a higher level of confidence. GIS tools have the ability to assess every spatial feature on a particular map within the context of neighboring features in order to determine whether it represents a spatial outlier, if it is part of a statistically significant spatial cluster, or if the clustered pattern could be the result of random chance¹⁹.

The Hot Spot Analysis Getis Ord G_i^* tool within Arc GIS[®] can be used to delineate clusters of features with values significantly higher or lower than the overall study area or average value²⁰. A standardized Z score is calculated for each feature; a high Z score results when a feature has a high value and is surrounded by other features with high values (Hot Spot), while a low Z score is generated for features with low values surrounded by other features with low values (Cold Spot). Map 9 shows the results of a Hot Spot Analysis conducted for 2012 infant mortality rates by zip code.

Map 9 was generated using ArcGIS[®] software by ESRI.

Map 9. Optimized Hot Spot Analysis of Infant Mortality by Zip Code and Ward, District of Columbia, 2012



- Zip codes in red or orange are those that were statistically significant hot spots for infant mortality in 2012.
- Identification of these high-risk areas for infant mortality will help maternal and child health programs to locate suitable areas to provide prenatal, post-partum, and infant care.
- In contrast, zip codes shown in blue were statistically significant cold spots for infant mortality in 2012. In other words, areas in blue are considered low-risk for infant mortality during this time period.
- Understanding spatial patterns of infant mortality using available tools in GIS would assist DOH in the allocation of resources and more effectively focus its outreach programs and services offered to pregnant women and their infants.

***Use of Market Research Data for
Community Health Assessment:
A Novel Approach in the District of
Columbia***

Market research data is generally defined as information collected on consumer preferences and characteristics commonly utilized by business groups, retailers, media providers, and advertisers to enhance marketing strategies. Sources of market research data include a combination of self-reported survey data, sales data, automobile registration, product warranty cards, financial services, and other public records²¹. Because market research data is fundamentally intended to capture the tendencies of a particular population, it may also contain a geospatial component such as point location data, zip code and census information. This data not only provides a comprehensive understanding of the marketplace but is also an invaluable resource in determining geographic areas predominated by the target population.

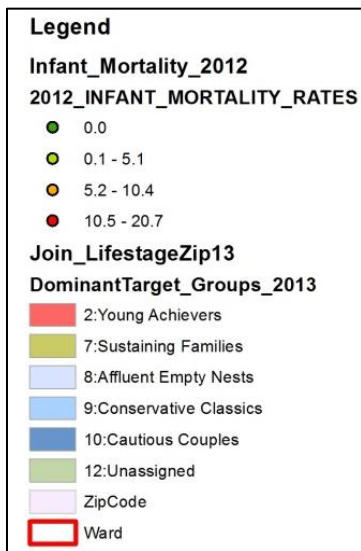
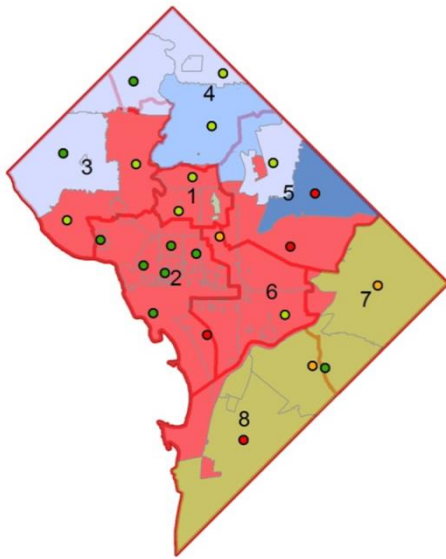
Under a cooperative agreement with the Directors for Health Promotion and Education (DHPE), the District of Columbia Department of Health (DC DOH) has been granted access to ***Nielsen PrimeLocation and ConsumerPoint***, a Nielsen-Claritas market research database and software application useful in developing new approaches to achieving health equity in the District. DC DOH is conducting multidisciplinary studies based on the unique collaboration between market research and public health. This new approach will leverage an extensive compilation of consumer behavioral research in designing public health interventions to maximize program impact. For example, geographically summarized demographic data, lifestyle preferences, spending habits, and healthcare utilization data gleaned from market research will enable DC DOH to make data-driven decisions targeting areas with high infant mortality rates in the District. This knowledge will enable DC DOH to develop the appropriate health messages to targeted populations.

***Market Research Data Correlations with
Infant Mortality***

Market research data can be used to show the interplay of social, economic, and environmental dynamics that drive health indicators of a community, in this case, infant mortality in the District of Columbia. Preliminary findings show that high infant mortality is co-located with households composed of working class families, mostly with children, have low income, and are ethnically mixed. Households that share certain sociological traits, behavioral patterns, geographic location, and other common characteristics (such as age, income, race, household structure, and education) are classified into Lifestage Groups defined by Nielsen. For detailed descriptions of the Lifestage Groups depicted in Map 10, please refer to Appendix 1.

The Lifestage Group - Sustaining Families, dominates high infant mortality census tracts (green polygons in Map 10) and coincides with areas characterized by lower income and families with children. Sustaining Families is the least affluent of the Family Lifestage Groups (annual income below \$30,000), and have a high percentage of African American, Asian, and Hispanic families. Most adults hold blue-collar and service jobs, earning wages that relegate their families to small, older apartments and modest lifestyles. These households shop at discount chains and convenience stores, and tune into BET channel and read Ebony magazine. This information on consumption and lifestyle patterns typically used in the advertising industry can be incorporated in the planning and development of DC DOH intervention campaigns and health messages to educate the public. In addition, programs targeting teen pregnancy, perinatal disparities, and infant mortality should factor in the distribution of social lifestyle groups in the District.

Map 10. Infant Mortality and Lifestage Groups by Zip Code and Ward, District of Columbia, 2012



- Sustaining Families were predominant in Ward 8 which had the highest IMR and number of infant deaths in 2012. This Lifestage Group was also found in zip codes in Ward 7, which had the third highest IMR in 2012.
- Ward 5 had the second highest IMR and number of infant deaths in 2012. Lifestage groups in Ward 5 were a combination of Young Achievers, Cautious Couples, Affluent Empty Nests, and Conservative Classics.
- Wards 2 and 3, on the other hand, had 1 infant death in each ward in 2012. Lifestage groups in these wards were a combination of Young Achievers, Affluent Empty Nests, and Conservative Classics.
- Predominance of these groups may explain low infant mortality rates in wards with high income, high educational attainment, and households with no children.

Note: Lifestage Groups are based on a Nielsen classification of households that share certain sociological traits, behavioral patterns, and other common characteristics (such as age, income, race, household structure, education).

Appendix: Description of Lifestage Groups (Adapted from Nielsen 2013 PRIZM, DHPE)

Lifestage Group	Selected Description	Ethnicity	Ward
Young Achievers	Median HH Income: \$91,104, Family Mix - Order from expedia.com - Go water skiing - Read The Economist - Watch Independent Film Channel - Audi A3	White, Asian, Hispanic, Mix	1, 2, 3, 4, 5, 6, 7, 8
Sustaining Families	Median HH Income: \$25,761, Mostly w/ Kids - In-home cosmetics purchase - Domestic travel by bus - Read Ebony - Watch BET - Nissan Pathfinder	White, Black, Hispanic, Mix	1, 6, 7, 8,
Affluent Families	Median HH Income: \$121,186, HH w/o Kids - Shop at Saks Fifth Ave. - Belong to a country club - Read Conde Nast Traveler - Watch Golf Channel - Mercedes SL Class	White, Asian, Mix	1, 2, 3, 4, 5, 6, 7
Conservative Classics	Median HH Income: \$59,750, Mostly w/o Kids - Shop at Costco - Buy classical music - Read Harper's Bazaar - Watch BBC America - Lexus LX	White, Black, Asian, Hispanic	2, 3, 4, 5, 7
Cautious Couples	Median HH Income: \$43,049, Mostly w/o Kids - Shop at Macy's - Domestic travel by railroad - Read The New Yorker - Watch The View - Chrysler PT Cruiser	White, Black, Asian, Hispanic	3, 5, 6, 7
Sustaining Seniors	Median HH Income: \$26,113, Mostly Retired - Order from drugstore.com - Gamble in Reno, NV - Read Town & Country - Watch NAACP Image Awards - Chrysler 300	White, Black, Asian, Hispanic	5
Midlife Success	Median HH Income: \$109,351, HHO w/out Kids, Mostly Owners - Order from J Crew - Attend NHL games - Watch Saturday Night Live - Land Rover Range Rover	White, Asian, Mix	3
Striving Singles (subgroup)	Median HH Income: \$34,647, Twenty-something singles - Live in apartment complexes, dormitories, or mobile homes - Favor outdoor sports, movies and music, fast food - Inexpensive cars	-	5, 6, 7
Young Accumulators (subgroup)	Median HH Income: \$74,570, Ethnically diverse and college educated - Live in mid-sized homes in suburban or exurban areas - Favor outdoor sports, campers, powerboats, motorcycles	-	1, 4, 5, 6, 7
Mainstream Families (subgroup)	Median HH Income: \$48,719, Large families with at least one child under 18 still at home - Live in modestly priced homes - Own three or more cars - Favor sports, electronic toys, groceries in bulk, televised media	-	1, 6

References

1. Mathews TJ, MacDorman MF. Infant mortality statistics from the 2004 period linked birth/infant death data set. National Vital Statistics Reports; vol 55 no 15. Hyattsville, MD: National Center for Health Statistics. 2008.
2. Hack M, Klein NK, Taylor HG. Long-term developmental outcomes of low birth weight infants. In: The future of children: Low birth weight. 5(1):19–34. Los Altos, California: Center for the Future of Children. The David and Lucile Packard Foundation. 1995.
3. Wilson-Costello D, Friedman H, Minich N, et al. Improved survival rates with increased neurodevelopmental disability for extremely low birth weight infants in the 1990s. Pediatrics 115(4):997–1003. 2005.
4. Centers for Disease Control and Prevention. Entry Into Prenatal Care – United States, 1989-1997. MMWR 49(18):393–8. 2000.
5. Osterman MJK, Martin JA, Mathews TJ, et al. Expanded data from the new birth certificate, 2008. National Vital Statistics Reports; vol 59 no 7. Hyattsville, MD: National Center for Health Statistics. 2012.
6. Institute of Medicine. Preventing low birth weight. Washington, DC: Institute of Medicine, National Academy Press. 1985.
7. Office of Technology Assessment, US Congress. Healthy children: investing in the future. Washington, DC: US Congress, Office of Technology Assessment. 1988.
8. National Institutes of Health. Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults. The Evidence Report. NIH Publication No. 98-4083, September 1998.
http://www.nhlbi.nih.gov/guidelines/obesity/ob_gdlns.pdf
9. Castro LC, Avina RL; “Maternal obesity and pregnancy outcomes”. Curr Opin Obstet Gynecol. 14(6):601-6. 2002.
10. Rasmussen, SA, Chu, SY, Kim, SY, Schmid, CH, Lau, J. Maternal obesity and risk of neural tube defects: a metaanalysis. American Journal of Obstetrics & Gynecology 189(6), 611-9. 2008.
11. Sebire NJ, et al. Maternal obesity and pregnancy outcome: A study of 287,213 pregnancies in London. Int J Obes Relat Metab Disord 25(8):1175-82. 2001.
12. D’Angelo, et al. Health status and health insurance coverage of women with live-born infants: An opportunity for preventive services after pregnancy. Matern Child Health J. 16 Suppl 2:222-30. 2012.
13. Centers for Disease Control and Prevention. Preventing smoking and exposure to secondhand smoke before, during, and after pregnancy. Division of Reproductive Health, National Center for Chronic Disease Prevention and Health Promotion. July 2007.
<http://www.cdc.gov/nccdphp/publications/factsheets/prevention/pdf/smoking.pdf>
14. ESRI. What is geostatistics? ArcGIS Resources, ArcGIS Help 10.1.
<http://resources.arcgis.com/en/help/main/10.1/index.html#//003100000001000000>
15. ESRI. ArcGIS Geostatistical Analyst Overview. <http://www.esri.com/software/arcgis/extensions/geostatistical>
16. O’Sullivan, D. and D. Unwin. Geographic Information Analysis, Second Edition, John Wiley & Sons, Inc., Hoboken, N.J., pp. 1-405. 2010.
17. Spiegelhalter, D. and K. Rice. Bayesian Statistics, Scholarpedia, 4(8):5230. 2009.
18. Johnston, K., J.M. Ver Hoef, K. Krivoruchko and N. Lucas. Using ArcGIS Geostatistical Analyst GIS by ESRI, ESRI, New York Street, Redlands, CA, pp. 1-300. 2001.
19. Andy Mitchell. ESRI Guide to GIS Analysis, Vol. 2. ESRI Press. 2006.
20. Instructor-led training. Advanced Analysis with ArcGIS.
21. The Nielsen Company. Customer Acquisition with Nielsen ConsumerPoint: CPT 101 Training Guide. 2011.

Maps throughout this report were created using ArcGIS® software by Esri. ArcGIS® and ArcMap™ are the intellectual property of Esri and are used herein under license. Copyright © Esri. All rights reserved. For more information about Esri® software, please visit www.esri.com.

Technical Notes

Data Sources and Method

Data shown in this report for 2012 are based on data from the District of Columbia (DC) resident linked birth/infant death data set, which are part of the DC Vital Registration System and DC resident infant deaths and births that occurred in other states through the inter-state exchange agreement. Data for DC were collected and reported using the 2003 revision of the U.S. standard birth certificate and the 2003 revision of the U.S. standard death certificate.

The linked birth/infant death data set is the primary data source for analyzing infant mortality trends and patterns in DC. In the linked birth/infant death data set, information from resident birth certificate is linked to information from resident death certificate for each infant less than 1 year of age. The purpose of the linkage is to use the many additional variables available from the birth certificate to conduct more detailed analyses of infant mortality patterns. The linked birth/infant death data set is particularly useful for computing accurate infant mortality rates by race and ethnicity because the race and ethnicity of the mother from the birth certificate is used in both the numerator and denominator of the infant mortality rate. The race and ethnicity from the birth certificate is generally provided by the mother at the time of delivery, and is considered to be more accurate than race and ethnicity from the death certificate that is provided by an informant, or in the absence of an informant, by observation. Linked birth/infant death data sets are available from the Data Management and Analysis Division (DMAD), Center for Policy, Planning, and Evaluation (CPPE), DC Department of Health.

The report also uses data from the National Center for Health Statistics (NCHS) 2011 preliminary mortality report for the United States, National Vital Statistics Reports, Vol. 61, No. 6, October 10, 2012. Deaths: Preliminary data for 2011. Available from: http://www.cdc.gov/nchs/data/nvsr/nvsr61/nvsr61_06.pdf

Cause-of-death classification

The mortality statistics presented in this report were compiled in accordance with World Health Organization (WHO) regulations, which specify that member nations classify and code causes of death in accordance with the current revision of the International Classification of Diseases (ICD). The ICD provides the basic guidelines used in virtually all countries to code and classify causes of death. Effective with deaths occurring in 1999, the United States began using the Tenth Revision of this classification (ICD-10).

In this report, tabulations of cause-of-death statistics are based solely on the underlying cause of death. The underlying cause is defined by WHO as “the disease or injury which initiated the train of events leading directly to death, or the circumstances of the accident of violence which produced the fatal injury.” The underlying cause is selected from the conditions entered by the physician in the cause-of-death section of the death certificate. When more than one cause or condition is entered by the physician, the underlying cause is determined by the sequence of conditions on the certificate, provisions of the ICD, and associated selection rules and modifications. Generally, more medical information is reported on death certificates than is directly reflected in the underlying cause of death. This is captured in NCHS multiple cause-of-death statistics.

Tabulation lists and cause-of-death ranking

For this report, the tabulation List of 130 Selected Causes of Death is used for deaths for all infant less than 1 year of age. This list is also used to rank leading causes of death.

Race and Hispanic origin

The 2003 revision of the U.S. Standard Certificate of Birth allows the reporting of more than one race (multiple races) and Hispanic origin of mother separately on the birth certificates. This change was implemented to reflect the increasing diversity of the population of the United States and to be consistent with the decennial census. The race and ethnicity items on the revised certificate are compliant with the 1997 “Revision of the Race and Ethnic Standards for Federal Statistics and Administrative Reporting.” These were issued by the Office of Management and Budget (OMB) and have replaced the previous standards that were issued in 1997.

Population bases for computing rates

Populations used for computing 2012 birth and death rates shown in this report represent the population residing in DC, estimated as 632,323 as of July 1, 2012. Birth and death rates shown in this report for 2012 by ward were derived from the District of Columbia Census 2010 Demographic and Housing Profiles by Ward, U.S. Census Bureau, Census 2010 and the 2012 DC Population Estimates prepared by the DC Office of Planning State Data Center.

Computing rates

Rates in this report are on an annual basis per 1,000 live births and per 100,000 population residing in the District of Columbia. The infant mortality rate (IMR) is calculated by dividing the number of infant deaths in a calendar year by the number of live births registered for the same period and are presented as a rate per 1,000 live births. The number of infant deaths and live births reported for an area represent complete counts of such events. However, numbers of births, deaths, and infant mortality rates are subject to random variation. This means that when the number of events is small (less than 100) and the probability of such an event is small, considerable caution must be observed in interpreting the data. When comparing infant mortality rates that are based on less than 100 deaths, statistical testing¹ is conducted to determine the precision, variability, and significance of findings. Similarly, when interpreting percent changes in infant mortality by ward, caution should be exercised because ward-level IMR are highly variable and do not meet standards of reliability or precision.

Availability of mortality data

Infant Mortality data are available in publications, unpublished tables, and electronic products as described on the Department of Health, Center for Policy, Planning, and Evaluation website at the following address: <http://doh.dc.gov/node/164152>. Detailed analyses not provided in this report are available upon request.

Source:

Matthews TJ, MacDorman MF. Infant mortality statistics from the 2009 period linked birth/infant death data set. National Vital Statistics Report; Vol 6 No 5. Hyattsville, MD: National Center for Health Statistics. 2013.

¹ Statistical testing was performed by constructing 95-percent confidence intervals and applying the non-overlap method.

Definition of terms

Birth weight	The weight of the fetus or infant at the time of delivery.
Body Mass Index	Calculated using height and weight, is a fairly reliable indicator of body fat or weight status. A BMI between less than 18.5 is considered underweight, 18.5 to 24.9 is healthy, 25 to 29.9 is considered overweight, and 30 or above indicates obesity.
Entry into prenatal care	Prenatal care is more likely to be effective if women begin receiving care early in pregnancy - in the first trimester. The American College of Obstetrics and Gynecology recommends that all pregnant women receive at least 13 prenatal visits during a full-term pregnancy.
Gestational period	Number of weeks elapsed between the first day of the last menstrual period and date of delivery or date of pregnancy termination. The term gestational period is interchangeable with weeks of gestation, gestational age, and duration of pregnancy. This report uses the physician's estimate of gestational age.
Infant death	Death of an infant before his or her first birthday.
Live birth	Every product of conception that gives a sign of life after birth, regardless of the length of the pregnancy, is considered a live birth. This concept is included in the definition set forth by the World Health Organization in 1950 and revised in 1988 by a working group formed by the American Academy of Pediatrics and the American College of Obstetricians and Gynecologists. A live birth is the complete expulsion or extraction from its mother of a result of conception, irrespective of the duration of pregnancy, which, after such separation, breathes or shows any other evidence of life, such as beating of the heart, pulsation of umbilical cord, or definite movement of voluntary muscles, whether or not the umbilical cord has been cut or the placenta is attached.
Low birth weight	Newborn weighing under 2,500 grams or 5 lbs. 8 oz.
Neonatal death	Death of a child younger than 28 days of age.
Occurrence data	Vital statistics compiled on the basis of where the vital event actually occurred.
Plurality	The number of siblings born as the result of a single pregnancy (e.g., twins, triplets).
Post-neonatal death	Death of a child 28 days of age or older but younger than one year of age.

Premature birth	A live birth weighing 2,500 grams (5-1/2 pounds) or less. If birth weight is not stated, length of gestation (under 37 weeks) is used.
Preterm birth	Birth before 37 completed weeks of gestation.
Residence data	Vital statistics compiled on the basis of the usual place of residence of the mother regardless of where the birth occurred.
Very low birth weight	Newborn weighing under 1,500 grams or 3lbs. 5oz.

Rates and Ratios

The impact of chance variation must be considered in evaluating categories with small frequencies. For example, a small change in the number of births by racial/ethnic groups in a county or ward—as is the case in the District—can disproportionately affect the fertility rate for that county. Rates for cities and counties, therefore, require special consideration. Regional and state rates, with larger frequencies, provide more stable rates.

Birth Rate (Crude) = (Number of live births / Population) X 1,000

Fertility Rate = (Number of live births to women aged 15-44/ Number of women aged 15-44) X 1,000

Infant mortality rate = (Number of infant deaths/Number of live births) X 1,000

Neonatal mortality rate = (Number of neonatal deaths/Number of live births) X 1,000

Post-neonatal mortality rate = (Number of post-neonatal deaths/Number of live births) X 1,000