2013 INFANT MORTALITY RATE

FOR THE

DISTRICT OF COLUMBIA

Prepared by

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Government of the District of Columbia
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May 7, 2015
FINAL

ACKNOWLEDGMENTS

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Executive Summary

For every 1,000 live births to District of Columbia residents in 2013, approximately seven infants died before reaching their first birthday. In 2013, there were 63 infant deaths in the District, resulting in a historic low infant mortality rate (IMR) of 6.8 per 1,000 live births, a 31.3 percent decline since 2009. There were 26 fewer infant deaths in 2013 compared to 2009; however, there were 256 more live births in 2013 compared to 2009. Table 1 and Figure 1 present a ten-year summary of these statistics.

Table 1: Ten-Year Infant Mortality Trends			
District of Columbia Residents, 2004-2013			
Year	**Births**	**Infant Deaths**	**Infant Mortality Rate***
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
2013	9,264	63	6.8

* Per 1,000 live births
Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.

The District's IMR, long among the highest in the nation, has declined to a record low of 6.8 per 1,000 live births in 2013 and paves the way to achieving its Healthy People 2020 goal of no more than 6 infant deaths per 1,000 births. IMR in the District has dropped for 5 years in a row since 2007 (except for a slight uptick in 2012) and reflects the important progress the District has made in reducing infant mortality. Although disparities persist in maternal risk factors and access to care, this overall reduction in IMRs in the District may be explained by large declines in infant deaths to black mothers. Among blacks, the 2013 IMR was 9.9 per 1,000 live births, a 46 percent drop since 2005 when the rate was 18.4, the highest rate in a decade. Figure 3 illustrates the racial disparity in IMRs in the District from 2004 to 2013.

Infant mortality rates in the District fluctuated from 2004 to 2007, however, a stable downward trend was observed from 2007 through 2013. 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, 2004-2013

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
DC Rate	11.8	13.6	11.3	13.1	10.9	9.9	8.0	7.4	7.9	6.8
US Rate	6.8	6.9	6.7	6.8	6.6	6.4	6.1	6.1	6.0	6.0

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

Figure 2. Infant Mortality Rate Disparity Between Black and White Mothers, District of Columbia, 2004-2013
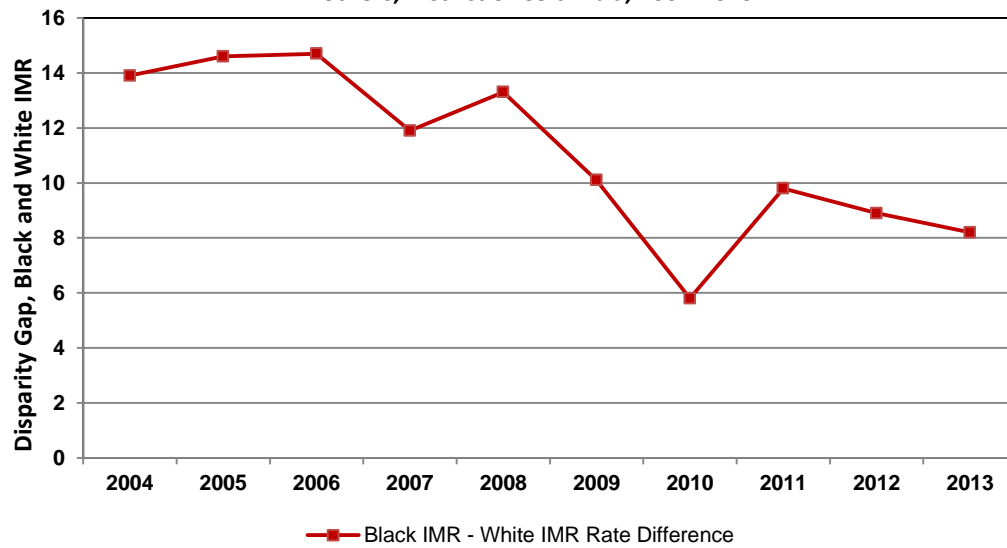
Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.

Figure 3: Infant Mortality Rates for the District of Columbia, 2013 and the United States, Preliminary 2013

	White	Black	Hispanic*	Asian/PI	Total
DC	1.7	9.9	6.4	**	6.8
US	5.1	11.2	4.7	**	6.0

*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/nvsr64/nvsr64_02.pdf
Note: National infant mortality data by race/ethnicity preliminary for 2013.

2012 to 2013 Comparison Highlights

- The number of infant deaths decreased from 74 in 2012 to 63 in 2013, a decrease of 14.9 percent.

- The overall infant mortality rate (IMR) for the District decreased by 13.9 percent from a rate of 7.9 per 1,000 live births in 2012 to 6.8 per 1,000 live births in 2013.

- From 2012 to 2013, infant mortality rates decreased in Wards 1, 2, 6, and 8 but increased in Wards 4, 5, and 7 (Table 10). There was no change in IMR in Ward 3.

- Death to infants younger than 28 days decreased from a rate of 6.5 per 1,000 live births in 2012 to 4.9 per 1,000 live births in 2013, a decrease of 25 percent. (61 neonatal deaths in 2012 and 45 in 2013.)

- The post-neonatal death rate (deaths occurring from 28 days to under 1 year of age) increased by 40 percent, from 1.4 per 1,000 live births in 2012 to 1.9 in 2013. (13 post-neonatal deaths in 2012 and 18 in 2013.)

- The infant death rate to non-Hispanic black mothers decreased from 12.4 per 1,000 live births in 2012 to 9.6 per 1,000 live births in 2013 (Table 2), a decrease of 22.6 percent.

- The infant death rate to non-Hispanic white mothers was 2.5 per 1,000 live births in 2012 and 1.8 for 2013, a decrease of 28 percent (Table 2).

- The infant death rate to Hispanic mothers increased by 25.5 percent from 5.1 per 1,000 live births in 2012 (Table 2) to 6.4 per 1,000 live births in 2013.

- The number of infant deaths that resulted from multiple births decreased by 35.7 percent from 14 in 2012 to 9 in 2013.

- There were 5 maternal deaths in 2013, compared to 3 in 2012 (see Technical Notes for definition).

- The proportion of births to teen mothers (15-19 years of age) decreased by 18.4 percent from 2012 to 2013. (637 births to teen mothers in 2013).

- In 2013, almost half of all infant deaths (47.6 percent) in the District were to mothers who were obese or overweight. The IMR for infants born to obese non-Hispanic black mothers (11.8 per 1,000) was almost double the overall IMR for the District (6.8 per 1,000).

- In 2013, infants born to women on Medicaid and private insurance accounted for 36.6 and 41.6 percent, respectively, 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 38.1 percent vs. 14.3 percent, respectively.

Statistical Overview

In 2013, there were 9,264 live births and 63 infant deaths to District of Columbia residents (Table 1). This resulted in an IMR of 6.8 deaths for every 1,000 live births. In 2012, there were 9,370 live births and 74 infant deaths. The IMR for 2012 was 7.9 deaths per 1,000 live births. There was a 13.9 percent decrease in the IMR from 2012 to 2013. There were 11 less infant deaths in 2013 than in 2012. Ward 5 had the highest IMR at 11.9 deaths per 1,000 live births (Table 10).

Of the 63 infant deaths that occurred in 2013, 45 (or 71.4 percent) occurred during the neonatal period (under 28 days of life). The neonatal death rate decreased by 25.4 percent from 6.5 per 1,000 live births in 2012 to 4.9 per 1,000 live births in 2013. 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, 2012 & 2013						
Race/Ethnicity	Live Births		Infant Deaths		Infant Mortality Rate[1]	
	2012	2013	2012	2013	2012	2013
Total	9,370	9,264	74	63	7.9	6.8
Black	4,816	4,840	59	48	12.3	9.9
White	2,974	2,997	10	5	3.4	1.7
Asian/Other	1,225	1,347	3	7	2.4	5.2
Total	9,370	9,264	74	63	7.9	6.8
Non-Hispanic Black	4,757	4,767	59	46	12.4	9.6
Non-Hispanic White	2,755	2,742	7	5	2.5	1.8
Hispanic[2]	1,370	1,243	7	8	5.1	6.4

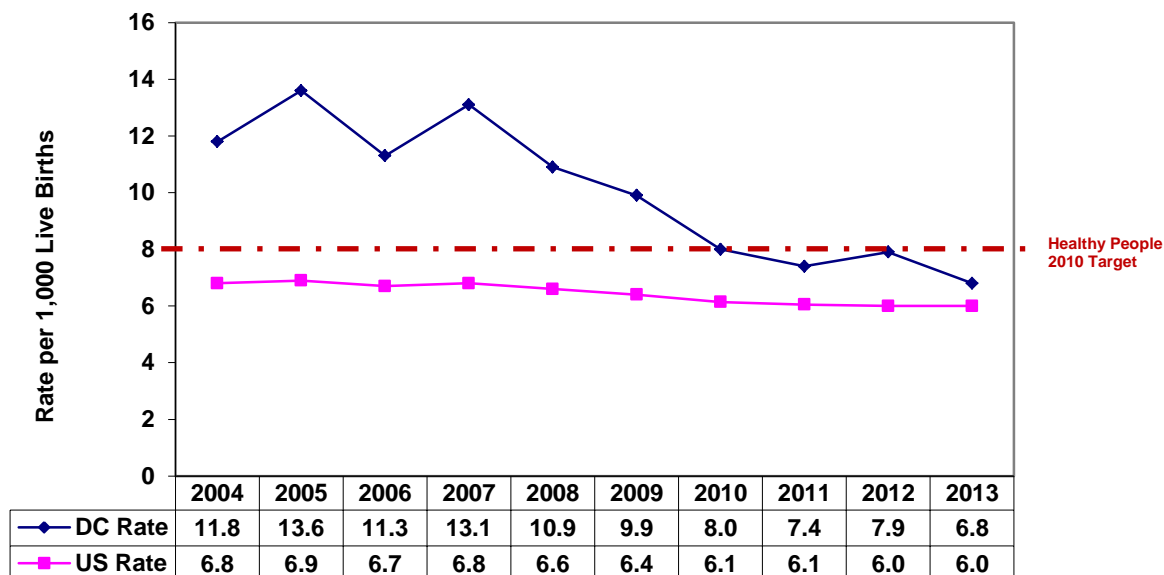Notes: [1] Per 1,000 live births
[2] Hispanics include persons of all Hispanic origin of any race.
Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.

Figure 4. Infant Mortality Rates by Race of Mother, District of Columbia, 2004-2013
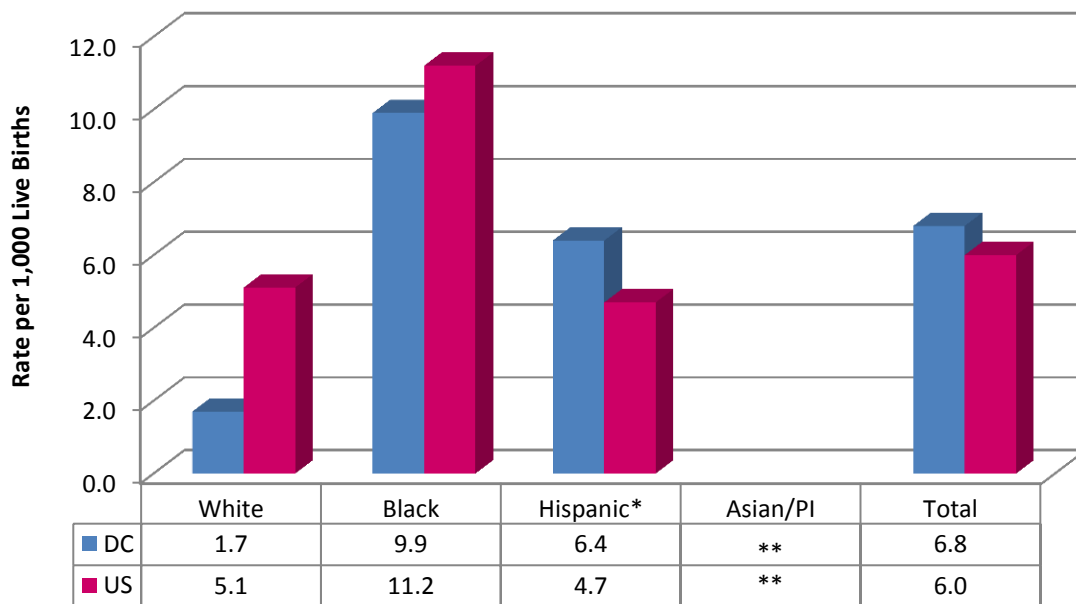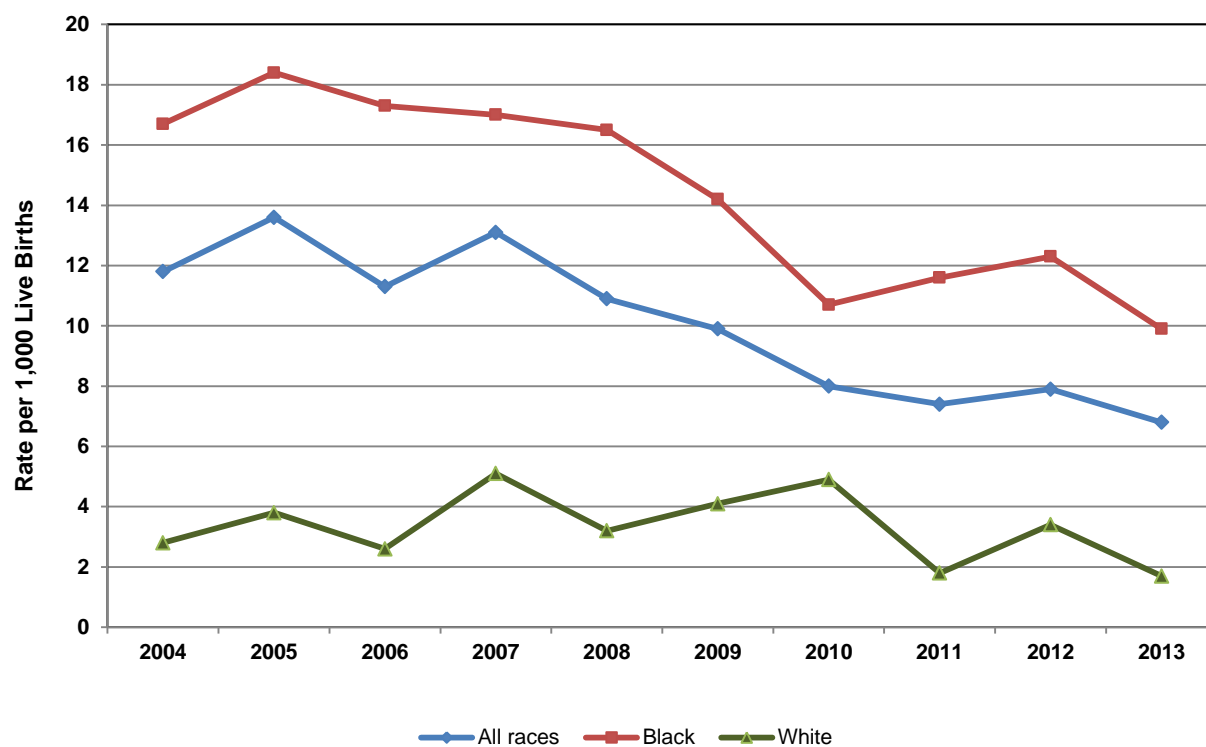

Sources: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.
Note: Data for Hispanic and Asian/Pacific Islander were excluded due to rate variability and small numbers.

May 7, 2015

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 2013, the percentage of low birth weight infants (those weighing under 2,500 grams or 5.5 pounds) in the District remained unchanged at 9.7 percent from 2012 to 2013 (Tables 3 and 4). About one in seventeen low birth weight infants died before their first birthday (Tables 3 and 5).

Very Low Birth Weight

A 52.3 percent increase was seen among very low birth weight (under 1,500 grams) newborns between 2012 and 2013; **very low birth weight** births increased from 1.8 percent to 2.7 percent, while **moderately low birth weight** (1,500–2,499 grams) births decreased from 7.9 percent to 7.0 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 2013, about one in six (16.6 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 increased for non-Hispanic black infants from 2012 to 2013 (from 2.6 percent to 3.6 percent); very low birth weight births also increased for non-Hispanic white infants (from 0.8 percent to 1.2 percent) and Hispanic infants (from 1.4 percent to 2.2 percent).

Low Birth Weight and Race and Hispanic Origin of Mother

The percentage of low birth weight babies born to all black mothers slightly increased from 12.1 percent in 2012 to 12.4 percent in 2013 (Table 3). Conversely, a 6.4 percent decrease was seen in low birth weight babies born to all white mothers, from 6.5 percent in 2012 to 6.1 percent in 2013. Among Asian and Pacific Islander mothers, the percentage of low birth weight babies decreased from 8.3 percent in 2012 to 7.1 percent in 2013. 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 decreased by 9.7 percent among babies born to Hispanic mothers (8.5 percent in 2012 to 7.6 percent in 2013). Non-Hispanic white low birth weight births decreased from 6.3 percent in 2012 to 6.0 percent in 2013. Non-Hispanic black low birth weight births increased from 12.1 percent in 2012 to 12.5 percent in 2013.

Table 3: Percent Distribution of Low Birth Weight[1] Babies by Race and Hispanic Origin of Mother District of Columbia Residents, 2012 and 2013			
Race/Hispanic Origin	**2012**	**2013**	**Percent Change**
Total Births for All Races	9,370	9,264	-1.1
- Number Low Birth Weight	906	895	
- Percentage LBW among all Births	9.7%	9.7%	-0.1
Total Births to Black* Mothers	4,816	4,840	0.5
- Number Low Birth Weight	583	599	
- Percentage LBW among Births to Black Mothers	12.1%	12.4%	2.2
Total Births to White* Mothers	2,974	2,997	0.8
- Number Low Birth Weight	194	183	
- Percentage LBW among Births to White Mothers	6.5%	6.1%	-6.4
Total Births to Asian and Pacific Islander Mothers	411	439	6.8
- Number Low Birth Weight	34	31	
- Percentage LBW among Births to Asian and Pacific Islander Mothers	8.3%	7.1%	-14.6
Total Births to Hispanic/Latina Mothers	1,370	1,243	-9.3
- Number of Low Birth Weight	116	95	
- Percentage LBW among Births to Hispanic Mothers	8.5%	7.6%	-9.7

*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 5. Births by Birth Weight, Race and Hispanic Origin of Mother, 2013
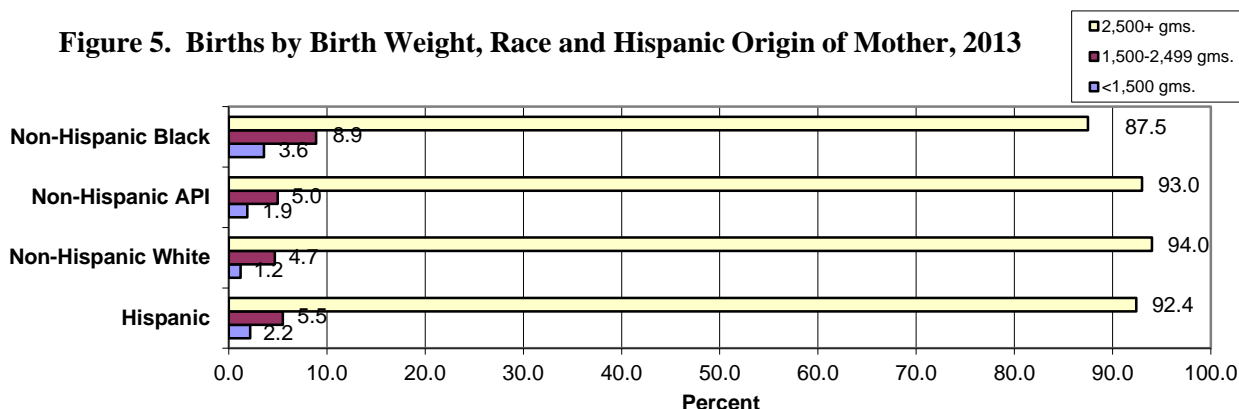
Note: API refers to Asian and Pacific Islanders.
Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.

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 increased from 10.1 percent in 2012 to 12.9 percent in 2013 to (Table 4). The percentage of low birth weight babies born to all mothers 20 years of age and older decreased from 9.6 percent in 2012 to 9.4 percent in 2013.

Table 4: Percent Distribution of Low Birth Weight[1] Babies by Age of Mother District of Columbia Residents, 2012 and 2013			
	2012	**2013**	**Percent Change**
Total Births for All Ages	9,370	9,264	-1.1
- Number of Low Birth Weight	906	895	
- Percentage of Low Birth Weight	9.7%	9.7%	-0.1
Total Births to Mothers Under 20 Years of Age	796	657	-17.5
- Number of Low Birth Weight	80	85	
- Percentage of Low Birth Weight among mothers < 20 years old	10.1%	12.9%	28.7
Total Births to Mothers 20 Years of Age and Older	8,574	8,603	0.3
- Number of Low Birth Weight	826	810	
- Percentage of Low Birth Weight among mothers ≥20 years old	9.6%	9.4%	-2.3
Total Births to Mothers Whose Age is Unknown[2]	0	4	-
- 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 895 low birth weight births, 53 infants (5.9 percent) died in 2013. A total of 29 infants (46 percent of all 63 infant deaths) died to mothers 20-29 years of age in 2013. Twenty-six of these 29 infants (89.7 percent) were low birth weight. Thirty-six percent of all infant deaths (n=23) occurred to mothers aged 30-39 years; eight 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 63 infant deaths, 53 (84.1 percent) were low birth weight infants (40 died during the neonatal period and 13 in the post-neonatal period). Three out of five (60 percent) infant deaths to white mothers were born weighing under 2,500 grams. Forty-one of the 48 (85.4 percent) infant deaths to black mothers were low birth weight babies. All eight (100 percent) infant deaths to mothers of Hispanic origin were also low birth weight (data not shown).

Of the 53 low birth weight infants, 41 (77.4 percent) were very low birth weight and 12 were moderately low birth weight (22.6 percent).

Table 5: Percent Distribution of Low Birth Weight Infant Deaths by Age of Mother and Time of Death District of Columbia Residents, 2013						
Age of Mother	Infant Deaths	Percent Deaths*	LBW Deaths	%LBW Deaths**	Time of Infant Death		
					Total LBW	Neonatal	Post-neonatal
Total	63	100.0	53	84.1	53	40	13
< 20 years	5	7.9	4	80.0	4	4	0
20-24 years	11	17.5	9	81.8	9	9	0
25-29 years	18	28.6	17	94.4	17	13	4
30-34 years	14	22.2	13	92.9	13	7	6
35-39 years	9	14.3	6	66.7	6	4	2
$\geq$ 40 years	4	6.3	3	75.0	3	2	1
Unknown age	2	3.2	1	0	1	1	0

*Percentage based on all infant deaths (N=63).
**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 2012-2013. Premature births in the District increased from 9.9 percent in 2012 to 10.6 percent in 2013. Preterm births have increased across all racial groups in 2013, with the highest climb of 11.6 percent among Asian/Pacific Islander mothers. In contrast, an 8 percent drop in preterm births was seen among Hispanic/Latina mothers who delivered from 2012 to 2013.

About 61 percent of all preterm births occurred between 34-36 weeks gestation. Fifty-one of the 63 (81 percent) infants who died in 2013 were preterm. Of these preterm infant deaths, 40 (78.4 percent) weighed under 1,500 grams (Figure 5). Almost 60 percent of preterm infants died to mothers ages 25-34.

Table 6. Percent Distribution of Premature Babies by Race and Hispanic Origin of Mother District of Columbia Residents, 2012 and 2013			
Race/Hispanic Origin	**2012**	**2013**	**Percent Change**
Total Births for All Races	9,370	9,264	
-Number of Premature Babies	926	979	
-Percent Premature Babies	9.9%	10.6%	6.9
Total Births to Black* Mothers	4,816	4,840	
-Number of Premature Babies to Black Mothers	574	619	
-Percent Premature Babies to Black Mothers	11.9%	12.8%	7.3
Total Births to White* Mothers	2,974	2,997	
-Number of Premature Babies to White Mothers	213	225	
-Percent Premature Babies to White Mothers	7.2%	7.5%	4.8
Total Births to Asian and Pacific Islander (API) Mothers	411	439	
-Number of Premature Babies to API Mothers	26	31	
-Percent Premature Babies to API Mothers	6.3%	7.1%	11.6
Total Births to Hispanic Mothers	1,370	1,243	
-Number of Premature Babies to Hispanic Mothers	133	111	
-Percent Premature Babies to Hispanic Mothers	9.7%	8.9%	-8.0

* 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 6. Preterm Infant Deaths by Birth Weight, 2013
(n=51)
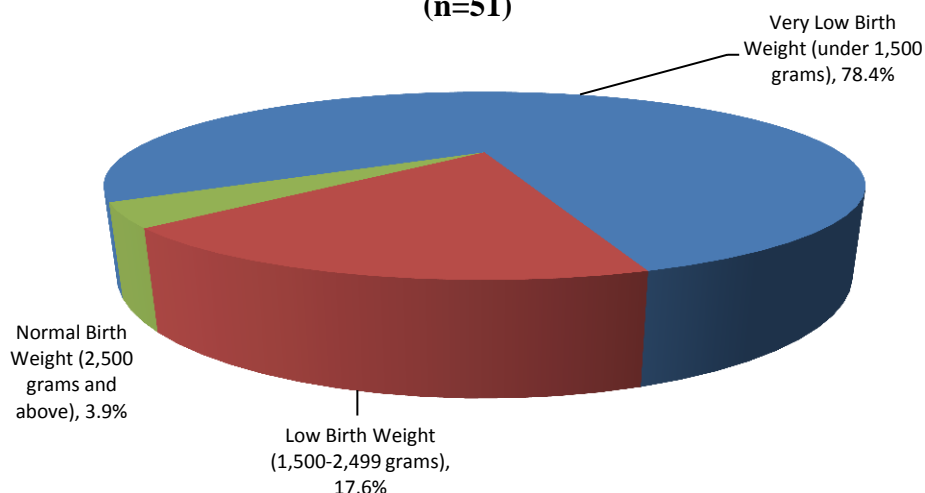
Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.

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 mothers[4].Women who receive late (third trimester of pregnancy[5]) 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 the time prenatal care began was unknown were subtracted from the total number of births before percentages were computed. Based on this computation, 65.6 percent of District resident mothers who gave birth in 2013 began prenatal care in the first trimester of pregnancy (Table 9). More than 82 percent of white mothers who gave birth in 2013 had timely entry into prenatal care compared to 64 percent of Hispanic mothers and 54 percent of black mothers (Table 9).

About 8 percent of mothers began care late or had no prenatal care at all. About 70 percent of these were black women (data not shown).

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 obesity[8]. 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 2011 to 2013, 53.5 percent of District of Columbia women who gave birth to a live infant had healthy weight prior to pregnancy, 43.7 percent were either overweight or obese before their pregnancy, and 4.6 percent were underweight. Non-Hispanic black and Hispanic mothers in DC were more likely to be overweight or obese (55.9 percent and 52.4 percent, respectively) than non-Hispanic white mothers (19.5 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 7. Disparities in Pre-pregnancy Weight Status by Race/Ethnicity, District of Columbia, 2011-2013
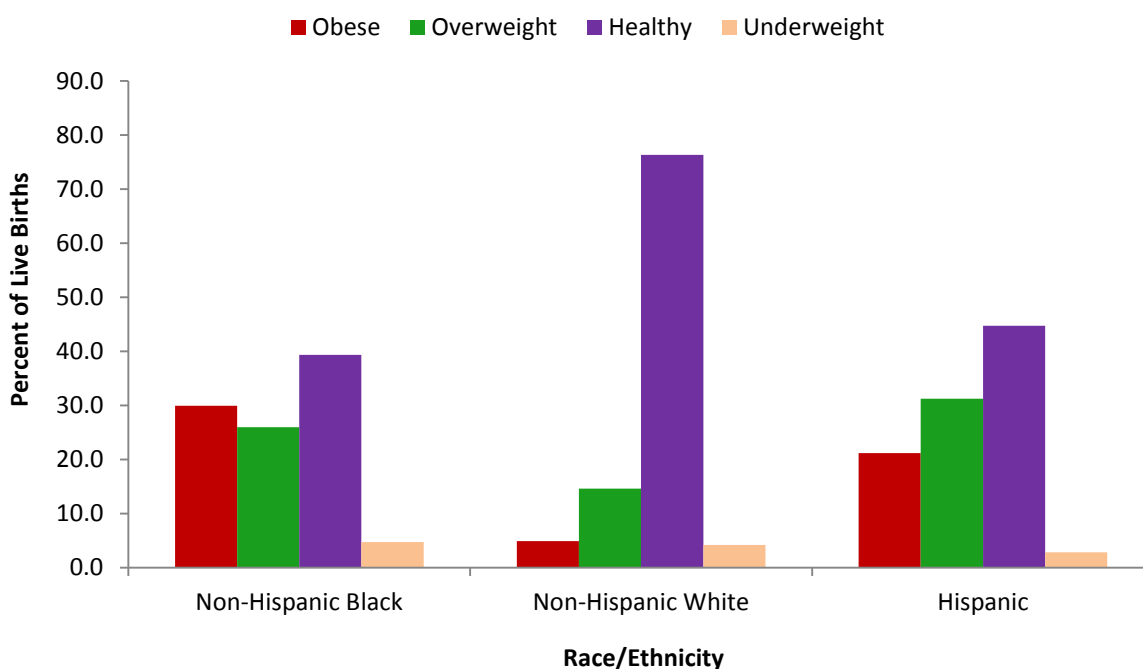
Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.

Figure 8. Infant Mortality by Pre-pregnancy Weight Status and Race/Ethnicity, District of Columbia, 2011-2013
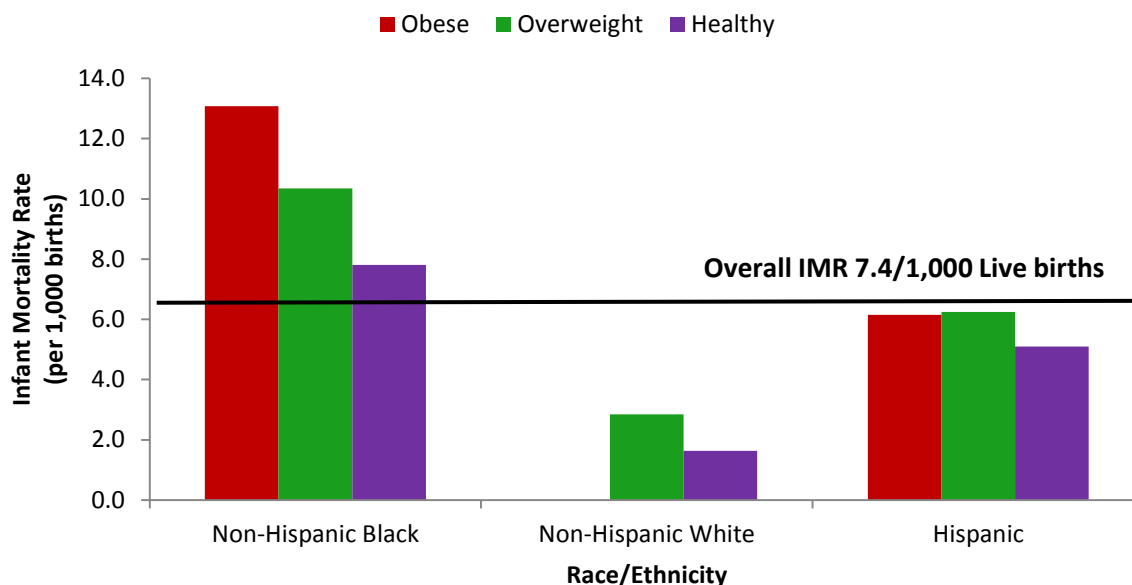
Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.

Figure 9. Infant Mortality by Pre-pregnancy Weight Status and Race/Ethnicity, District of Columbia, 2013
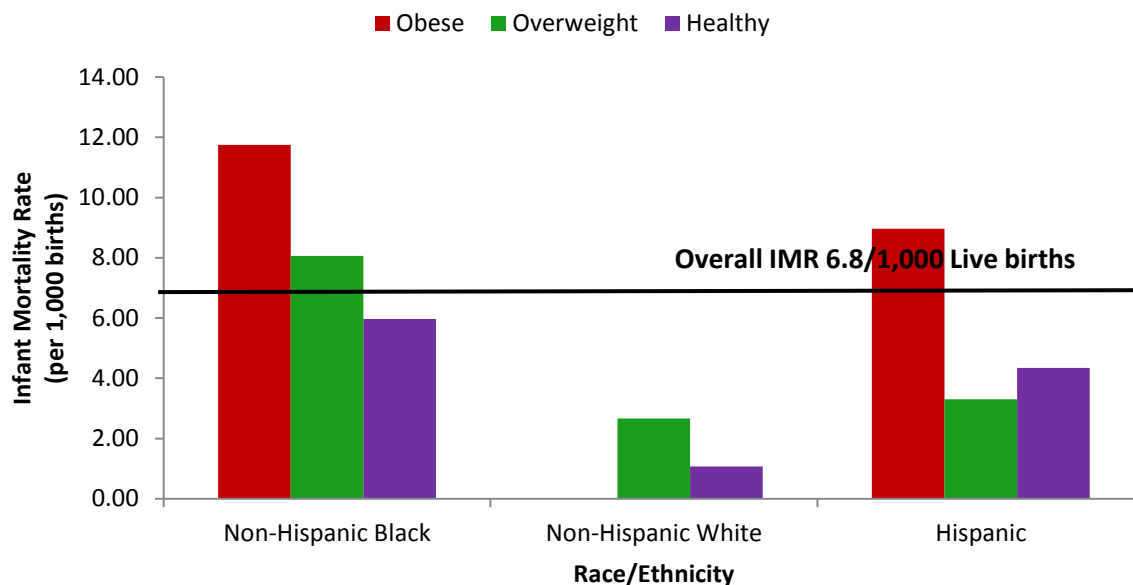
Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.

Overall, the highest IMR observed for 2011 to 2013 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 13.1 per 1,000 births. Hispanic mothers who were obese had a lower IMR of 6.2 per 1,000 births. There were no infant deaths to obese non-Hispanic white mothers during the 3-year period. Among infants born to overweight mothers, non-Hispanic blacks and Hispanics had the highest rates, 10.3 and 6.3, respectively.

In 2013, 40 percent of 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 11.8 per 1,000 live births (Figure 8) —almost double the overall infant mortality rate for the District in 2013 (6.8 per 1,000 live births), and higher than the overall IMR for non-Hispanic black mothers (9.6 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 2013.

Marital Status

The proportion of births to unmarried women decreased in 2013 to 50.6 percent compared with 51.1 percent in 2012. Of the 4,690 (51.1 percent) births to unmarried women in 2013, 14 percent were to teens below 20 years old. Almost 90 percent of births to women aged 20-24 years and 62 percent of births to women aged 25-29 years were to unmarried women (data not shown).

In 2013, 76.2 percent of infant deaths were to unmarried women, compared to 74.3 percent in 2012, an increase of 2.6 percent. Between 2009 and 2013, more than three-quarters of infant deaths were to unmarried women (Table 7). Table 9 shows the distribution of unmarried women by race and Hispanic origin of mother.

Table 7: Number and Percentage of Births and Infant Deaths by Marital Status District of Columbia Residents, 2009-2013										
		Births to Unmarried Women		Births to Married Women			Infant Deaths to Unmarried Women		Infant Deaths to Married Women	
Year	Total Number of Births	Number of births	Percent	Number of Births	Percent	Total Infant Deaths	Number of Infant Deaths	Percent	Number of Infant Deaths	Percent
2013	9,264	4,690	50.6	4,523	48.8	63	48	76.2	12	19.0
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

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 insurance[12]. According to 2004 Pregnancy Risk Assessment Monitoring System (PRAMS) data from 26 states[13], 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 2013 births and infant deaths in the District by insurance type and maternal race/ethnicity.

City-wide, 36.6 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, 38.1 percent vs. 14.3 percent, respectively (Figure 9). Figure 10 shows that non-Hispanic black mothers were the highest Medicaid beneficiaries at 58.9 percent. Almost half of infants who died to non-Hispanic black mothers used Medicaid insurance as the principal source of payment at the time of delivery.

**Figure 10. Births and Infant Deaths by Mother's Insurance Type at Time of Delivery, District of Columbia, 2013**
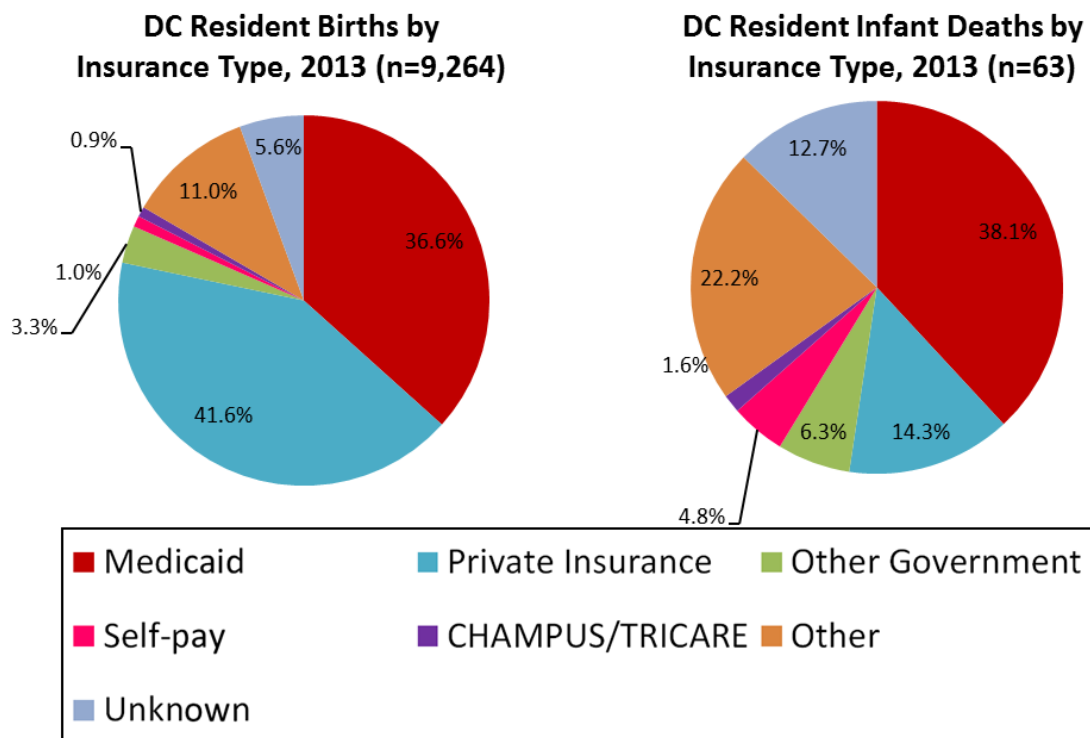
Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.

Figure 11. Births and Infant Deaths by Mother's Race/Ethnicity and Insurance Type at Time of Delivery, District of Columbia, 2013
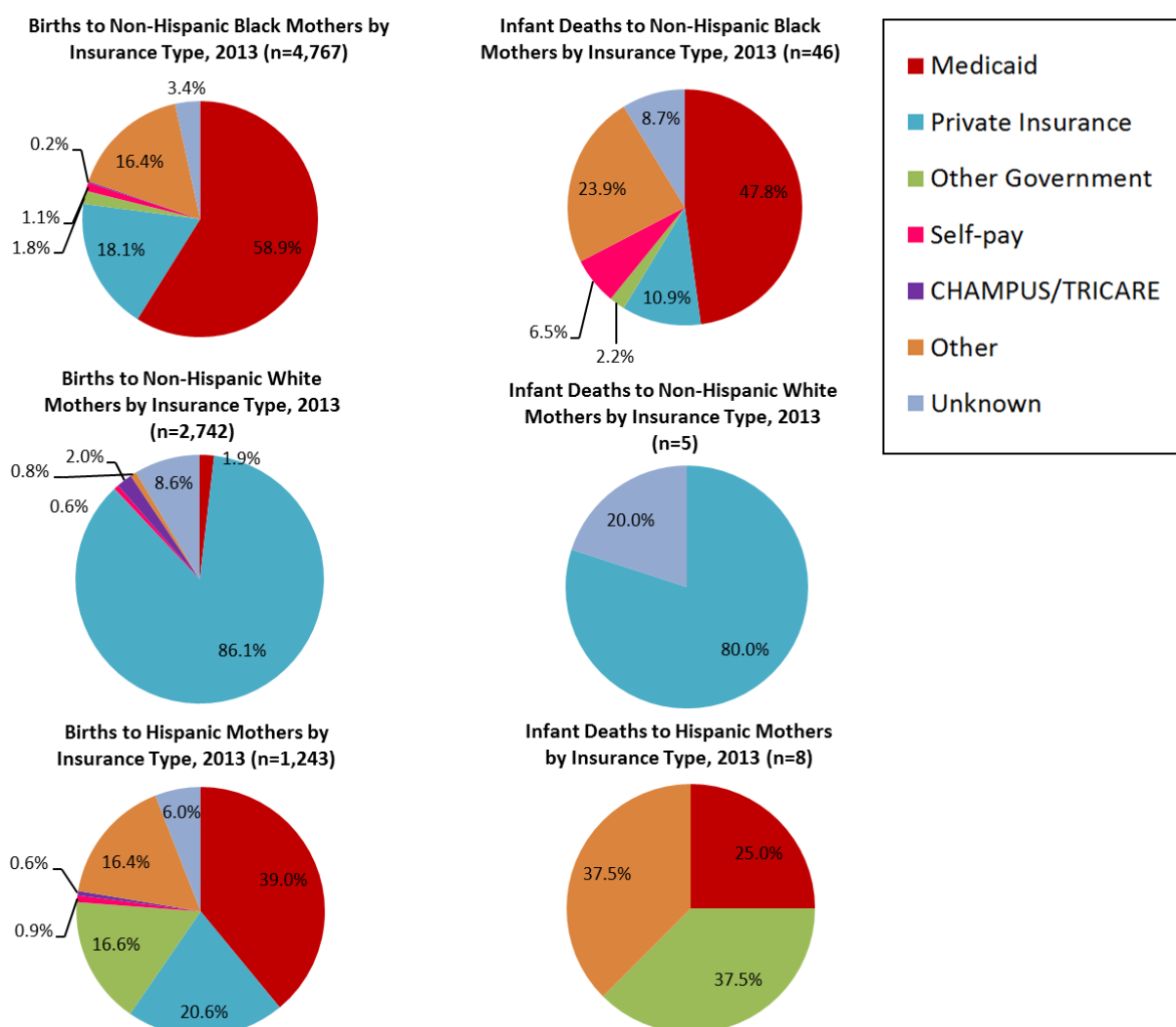
Births to Non-Hispanic Black Mothers by Insurance Type, 2013 (n=4,767)

Infant Deaths to Non-Hispanic Black Mothers by Insurance Type, 2013 (n=46)

Legend:
- Medicaid
- Private Insurance
- Other Government
- Self-pay
- CHAMPUS/TRICARE
- Other
- Unknown

Births to Non-Hispanic White Mothers by Insurance Type, 2013 (n=2,742)

Infant Deaths to Non-Hispanic White Mothers by Insurance Type, 2013 (n=5)

Births to Hispanic Mothers by Insurance Type, 2013 (n=1,243)

Infant Deaths to Hispanic Mothers by Insurance Type, 2013 (n=8)

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 the lowest from 2009 to 2013 (Table 8).

Table 8: Infant Mortality Rate Comparisons for Baltimore, the District of Columbia, Richmond and Detroit Cities, 2009-2013					
[Rates are Infant deaths per 1,000 live births]					
City	2009	2010	2011	2012	2013
Baltimore City, Maryland[1]	13.5	11	10.5	9.7	10.3
Detroit City, Michigan[2]	14.8	13.3	12.6	15.0	13.3
District of Columbia[3]	9.9	8.0	7.4	7.9	6.8
Richmond, Virginia[4]	12.2	12.8	8.7	10.5	10.6

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 2013, there was a decrease in the number of infants born in Wards 1, 4, 6, and 8 (Table 10). Further, the infant mortality breakdown by ward for 2013 shows a decline in the IMR for four wards (1, 2, 6, and 8). The IMR increased in Wards 4, 5, and 7 while in Ward 3, the IMR remained unchanged. Among the wards with increased IMRs in 2013, Ward 5 had the highest rate (almost double the city-wide rate), with a 1.8 percentage increase (from a rate of 11.7 per 1,000 live births in 2012 to 11.9 per 1,000 live births in 2013. Ward 2 had zero infant deaths while Ward 3 had only 1 infant death in 2013. 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. Although the IMR in Ward 6 fell by more than half (54 percent), Ward 8 had the largest meaningful decrease from 25 infant deaths in 2012 to 18 in 2013, a 27 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 2009 and 2013 are presented in Table 13. The geographic distribution of 2013 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, 2013									
Indicators	DC	Ward 1	Ward 2	Ward 3	Ward 4	Ward 5	Ward 6	Ward 7	Ward 8
2013 Estimated Population[1]	649,111	82,198	86,209	83,228	81,740	80,160	82,630	76,665	76,281
Live Births Rate/1,000 pop[1]	9,264 14.3	1,061 12.9	667 7.7	824 9.9	1,372 16.8	1,178 14.7	1,259 15.2	1,235 16.1	1,646 21.6
Live Births Black White Hispanic[2]	4,840 2,997 1,243	283 412 340	71 467 91	34 671 62	587 364 437	774 230 164	429 701 55	1,154 36 49	1,496 111 39
Births to Unmarried Women (Percent)	4,690 50.6	449 42.3	93 13.9	44 5.3	620 45.2	686 58.2	396 31.5	1,050 85.0	1,335 81.1
% Births to Unmarried Women Black White Hispanic[2]	78.4 6.6 59.4	67.5 10.4 65.3	45.1 4.7 45.1	35.3 4.0 12.9	55.2 7.1 64.5	72.2 12.2 62.8	79.0 3.9 43.6	87.6 36.1 75.5	87.9 9.0 38.5
Births to Mothers age <20 yrs. (Percent)	657 7.1	53 5.0	9 1.3	3 0.4	74 5.4	84 7.1	48 3.8	153 12.4	230 14.0
Births to Mothers 15-19 yrs. (Percent) Birth Rate/1,000 Women 15-19 yrs.[3]	637 6.9 33.4	52 4.9 22.0	9 1.3 2.7	2 0.2 0.9	72 5.2 41.4	81 6.9 31.0	46 3.7 43.3	149 12.1 55.7	223 13.5 74.2
Low Birth Weight Live Births[4] (Percent)	895 9.7	82 7.7	56 8.4	42 5.1	123 9.0	119 10.1	104 8.3	173 14.0	195 11.8
% Low Birth Weight Births[4] Black (Percent) White (Percent) Hispanic[2] (Percent)	599 (12.4) 183 (6.1) 95 (7.6)	36 (12.7) 21 (5.1) 22 (6.5)	7 (9.9) 36 (7.7) 11 (12.1)	4 (11.8) 28 (4.2) 1 (1.6)	69 (11.8) 25 (6.9) 31 (7.1)	84 (10.9) 18 (7.8) 16 (9.8)	51 (11.9) 45 (6.4) 4 (7.3)	166 (14.4) 4 (11.1) 3 (6.1)	182 (12.2) 6 (5.4) 6 (15.4)
Low Birth Weight[4] to Mothers <20 yrs. (Percent)	85 12.9	7 13.2	1 11.1	0 0	9 12.2	9 10.7	5 10.4	24 15.7	30 13.0
% Preterm Births (<37 weeks gestation)	10.6	8.7	6.7	7.8	9.4	10.0	10.5	16.2	11.9
% Births With Prenatal Care Beginning First Trimester[5,6]	65.6	66.6	78.3	82.2	65.8	61.0	73.6	53.4	56.6
% Births with First Trimester Prenatal Care Black White Hispanic[2]	53.8 82.4 64.3	45.3 82.8 60.6	51.6 83.0 81.0	62.5 84.0 73.2	55.2 81.4 64.5	56.1 80.7 56.6	54.8 83.3 69.4	52.3 73.5 69.8	54.5 75.2 63.9
% Births With Late or No Prenatal Care[5,6]	8.3	9.5	6.0	3.8	9.7	9.4	6.3	9.7	9.4
Infant Deaths (under 1 yr.) Rate (per 1,000 live births) [7]	63 6.8	6 5.7	0 0	1 1.2	7 5.1	14 11.9	5 4.0	12 9.7	18 10.9

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 2013 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 2013 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, 2012 and 2013

Ward	Births 2012	Births 2013	Infant Deaths 2012	Infant Deaths 2013	Infant Mortality Rate[1] 2012	Infant Mortality Rate[1] 2013	Percent Change[2]
1	1,196	1,061	7	6	5.9	5.7	-3.4
2	643	667	1	0	1.6	0.0	-100.0
3	820	824	1	1	1.2	1.2	-0.5
4	1,479	1,372	5	7	3.4	5.1	50.9
5	1,113	1,178	13	14	11.7	11.9	1.8
6	1,276	1,259	11	5	8.6	4.0	-53.9
7	1,156	1,235	11	12	9.5	9.7	2.1
8	1,675	1,646	25	18	14.9	10.9	-26.7
Unknown	12	22	0	0	0.0	0.0	-
Total	9,370	9,264	74	63	7.9	6.8	-13.9

[1]Infant deaths per 1,000 live births.
[2]Changes 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, 2012

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.

Table 12: Statistical Overview by Ward District of Columbia Residents, 2013						
Ward	**Births**	**Infant Deaths**	**IMR***	**LBW**	**Teen Births**	**LBW to Teens**
1	1,061	6	5.7	82	53	7
2	667	0	0.0	56	9	1
3	824	1	1.2	42	3	0
4	1,372	7	5.1	123	74	9
5	1,178	14	11.9	119	84	9
6	1,259	5	4.0	104	48	5
7	1,235	12	9.7	173	153	24
8	1,646	18	10.9	195	230	30
Unknown	22	0	0.0	1	3	0
Total	9,264	63	6.8	895	657	85

*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.

Table 13: Five-Year Infant Mortality Trend by Ward, District of Columbia Residents, 2009-2013 [Rates are Infant deaths per 1,000 live births]					
Ward	**2009**	**2010**	**2011**	**2012**	**2013**
1	8.1	4.1	3.4	5.9	5.7
2	5.8	2.9	6.7	1.6	0.0
3	2.6	5.0	0	1.2	1.2
4	10.4	11.3	8.4	3.4	5.1
5	11.8	10.3	12.9	11.7	11.9
6	1.9	9.8	5.6	8.6	4.0
7	12.9	6.6	6.6	9.5	9.7
8	18.4	10.4	12	14.9	10.9
Total	9.9	8.0	7.4	7.9	6.8

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, 2013

Ward 4
5.1

Ward 3
1.2

Ward 1
5.7

Ward 5
11.9

Ward 2
0.0

Ward 6
4.0

Ward 7
9.7

Ward 8
10.9

N

Legend

Infant Mortality Rate

Per 1,000 Live Births

0 - 1.9
2.0 - 4.9
5.0 - 7.9
8.0 - 10.9
11.0 - 14.9

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 2. Rates of Live Birth to DC Residents by Ward, District of Columbia, 2013
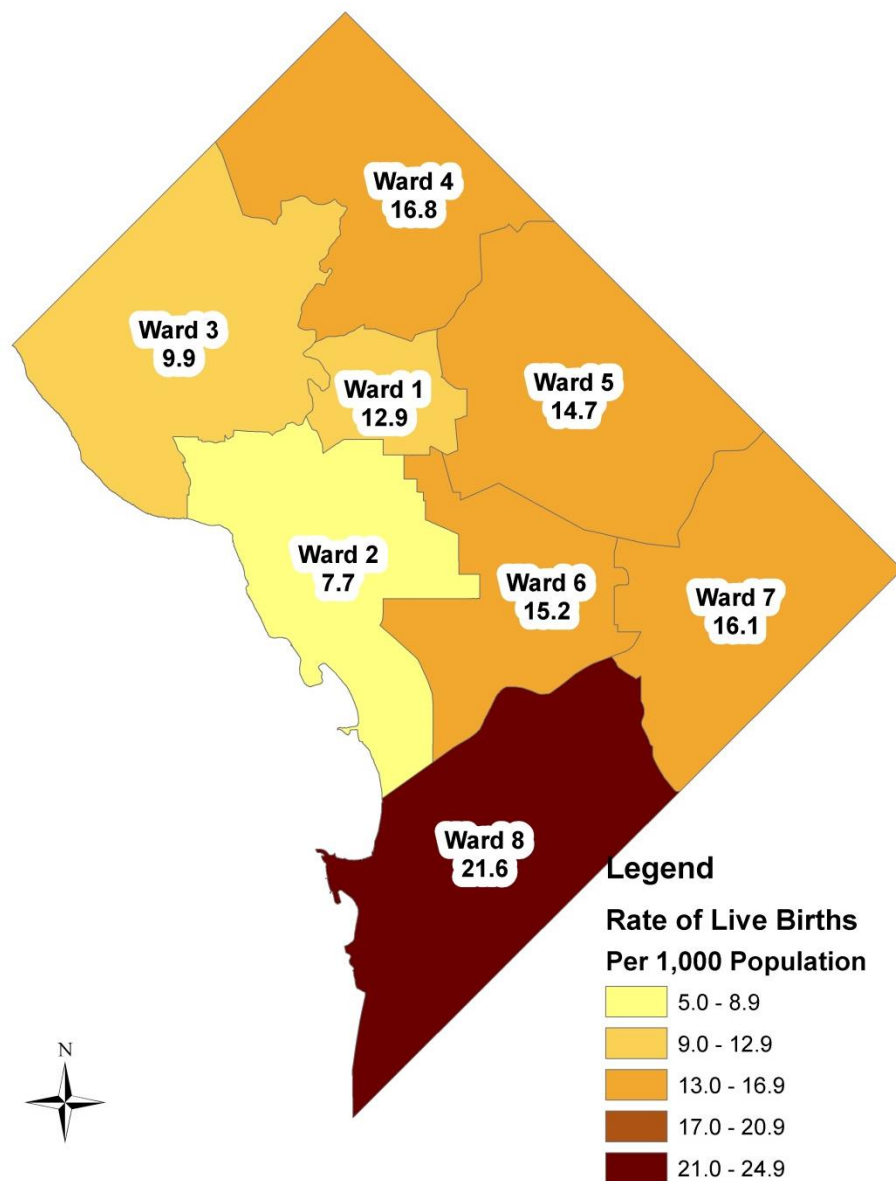
Ward 4
16.8

Ward 3
9.9

Ward 1
12.9

Ward 5
14.7

Ward 2
7.7

Ward 6
15.2

Ward 7
16.1

Ward 8
21.6

Legend
Rate of Live Births
Per 1,000 Population

5.0 - 8.9
9.0 - 12.9
13.0 - 16.9
17.0 - 20.9
21.0 - 24.9

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, 2013

Ward 4
9.0

Ward 3
5.1

Ward 1
7.7

Ward 5
10.1

Ward 2
8.4

Ward 6
8.3

Ward 7
14.0

Ward 8
11.8

N

Legend

Low Birth Weight (Pct)

- 5.0 - 7.9
- 8.0 - 9.9
- 10.0 - 11.9
- 12.0 - 13.9
- 14.0 - 15.9

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, 2013

Ward 4
9.4

Ward 3
7.8

Ward 1
8.7

Ward 5
10.0

Ward 2
6.7

Ward 6
10.5

Ward 7
16.2

Ward 8
11.9

N

Legend

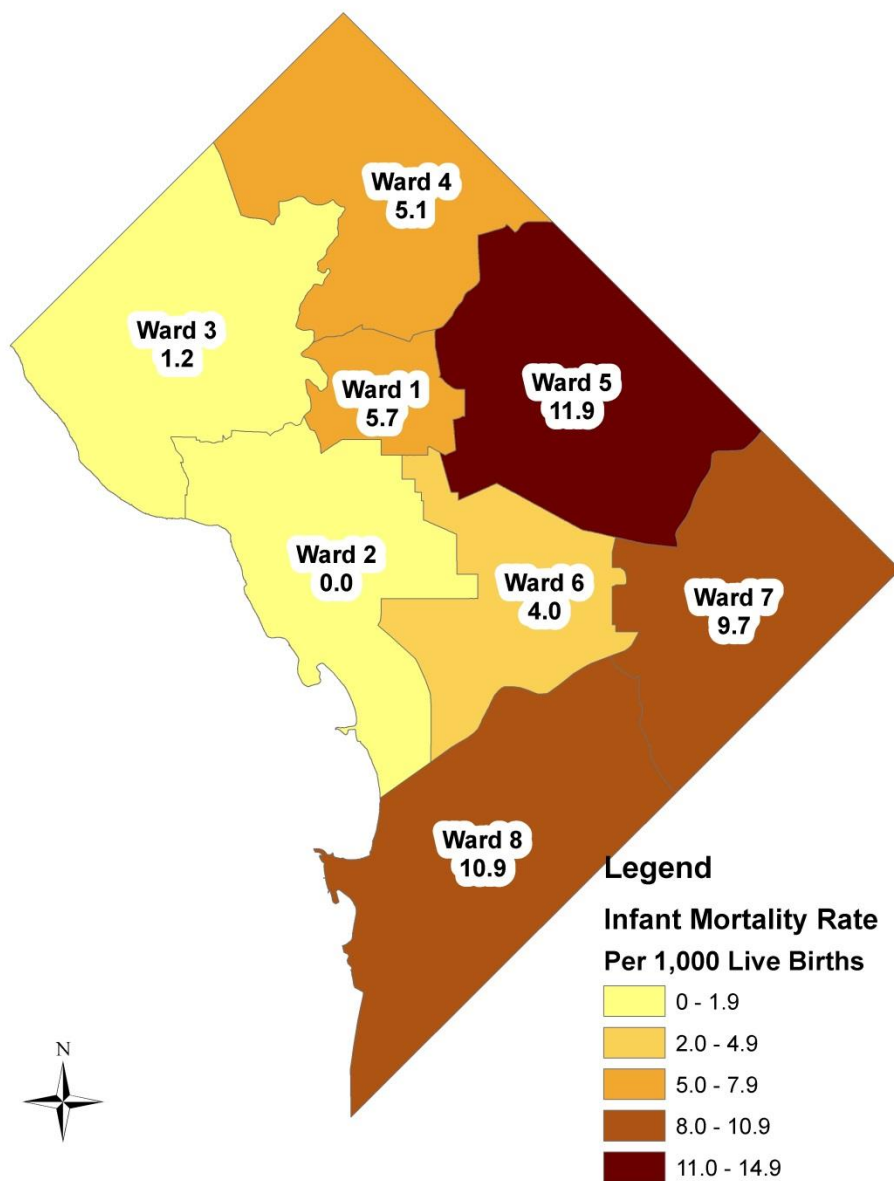**Preterm Births (Pct)**

6.0 - 8.9

9.0 - 11.9

12.0 - 14.9

15.0 - 17.9

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, 2013

Ward 4
65.8

Ward 3
82.2

Ward 1
66.6

Ward 5
61.0

Ward 2
78.3

Ward 6
73.6

Ward 7
53.4

Ward 8
56.6

Legend

Timely Entry

to Prenatal Care (Pct)

50.1 - 65.0

65.1 - 70.0

70.1 - 75.0

75.1 - 80.0

80.1 - 85.0

N

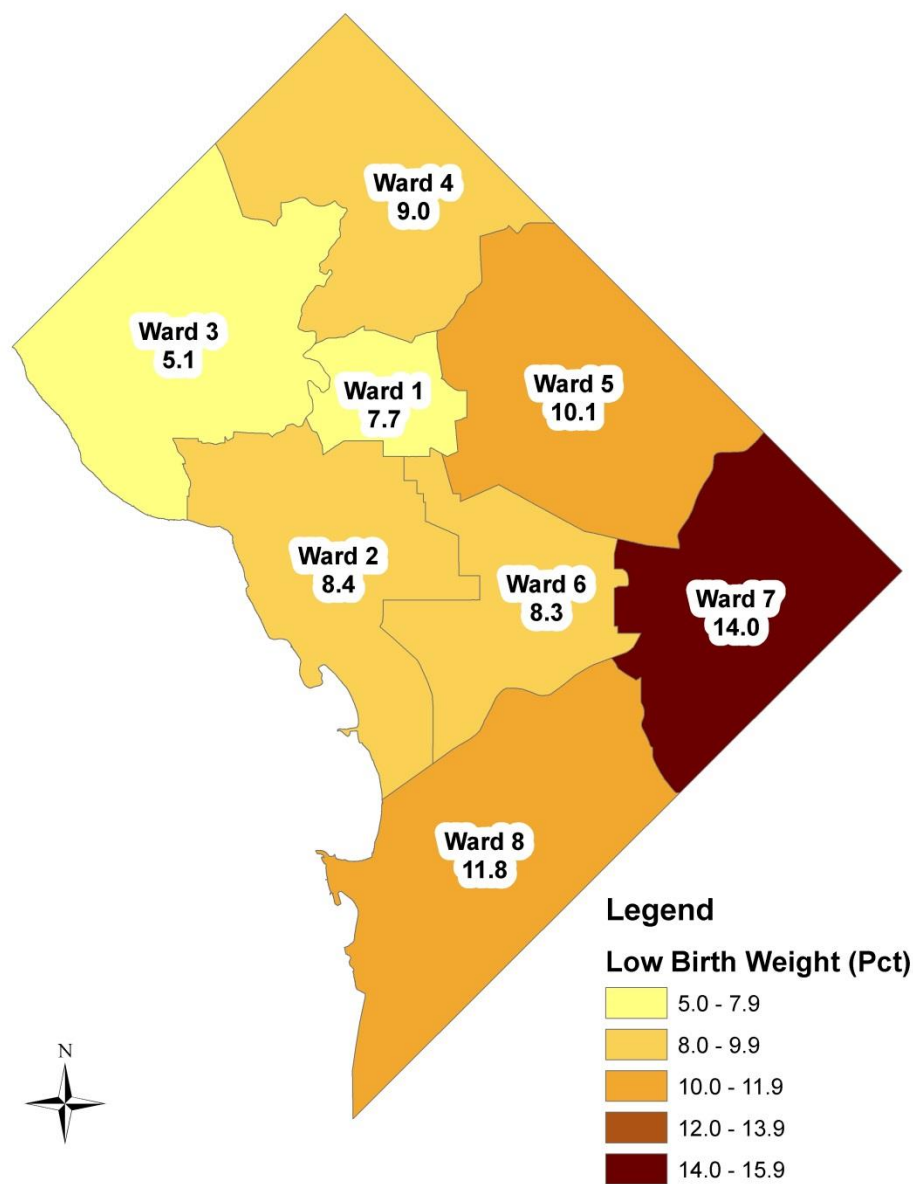Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.
Notes: Ward distribution based on 2012 ward boundaries.

Map 6. Teen Births by Ward, District of Columbia, 2013

Ward 4
5.4

Ward 3
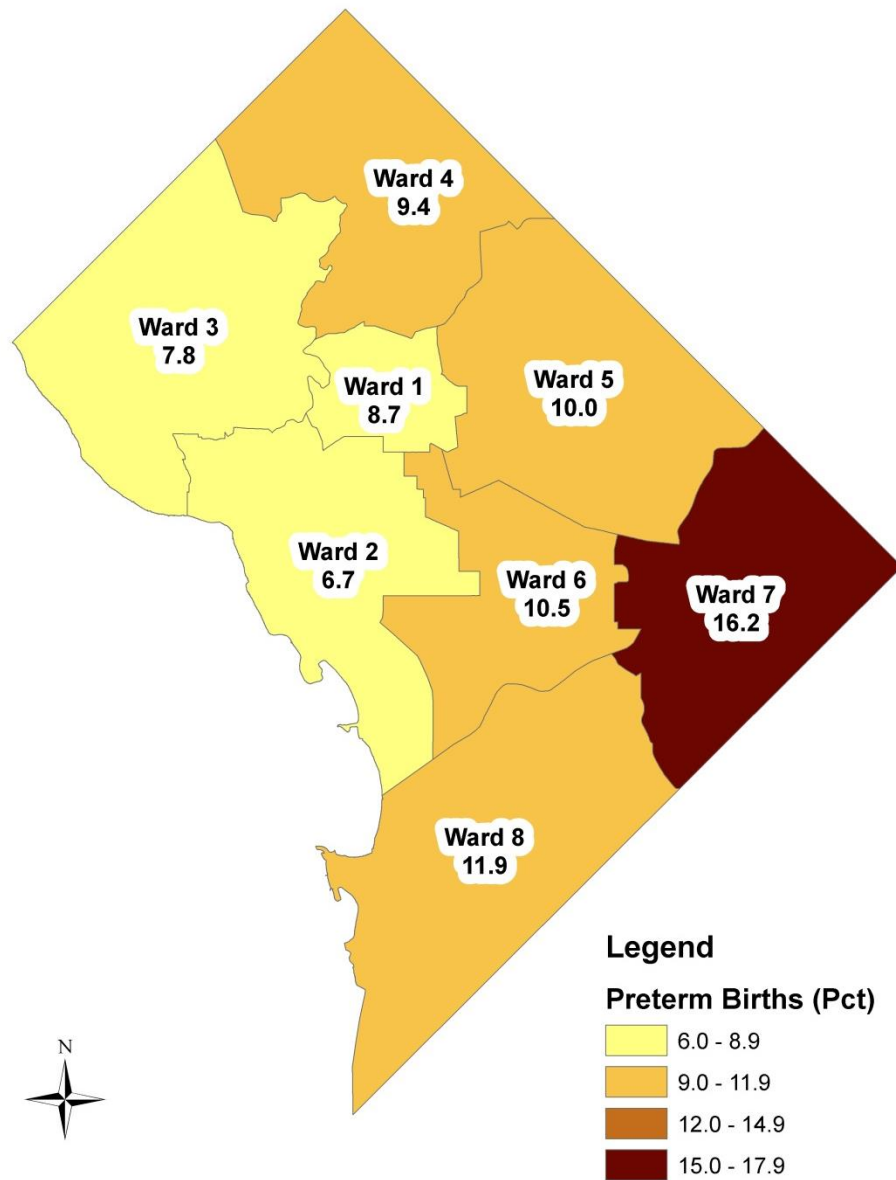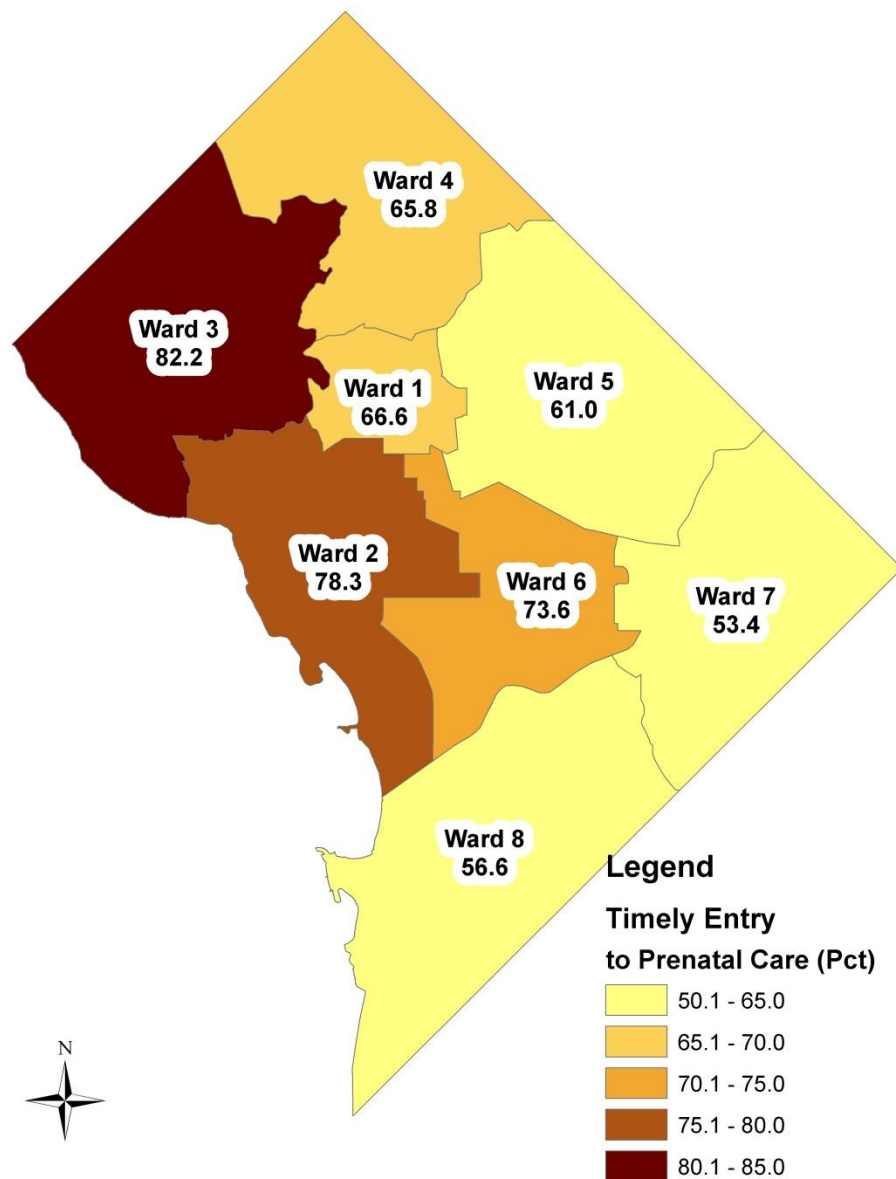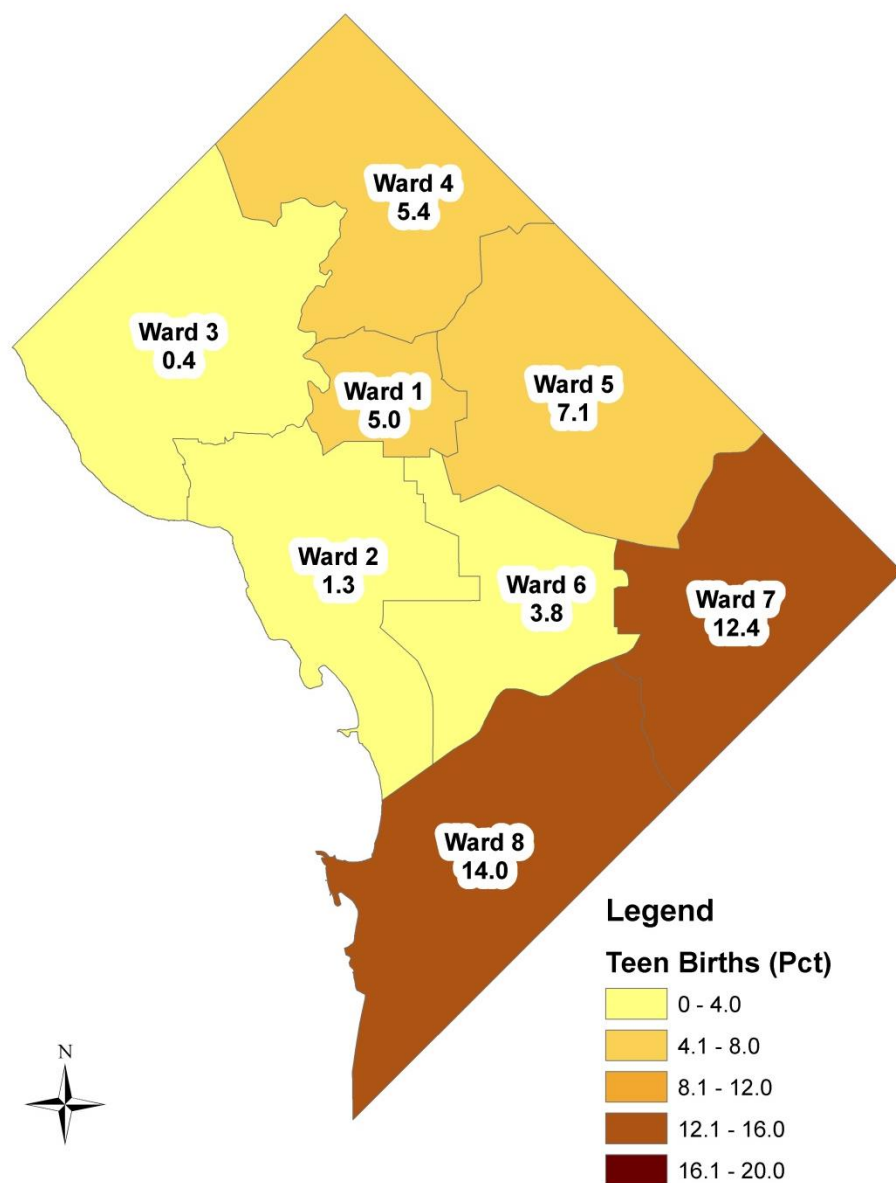0.4

Ward 1
5.0

Ward 5
7.1

Ward 2
1.3

Ward 6
3.8

Ward 7
12.4

Ward 8
14.0

N

Legend

Teen Births (Pct)

- 0 - 4.0
- 4.1 - 8.0
- 8.1 - 12.0
- 12.1 - 16.0
- 16.1 - 20.0

Causes of Death

The leading cause of infant mortality, **Newborn affected by maternal complications of pregnancy** accounted for 20.6 percent of all infant deaths in 2013 (Table 14). This was the first time in 5 years since maternal complications of pregnancy had surpassed all other causes of infant death. **Disorders related to short gestation and low birth weight, not elsewhere classified** slid from first to second leading cause of death in 2013, accounting for 19 percent of all infant deaths. Although there was no increase in the number of deaths attributed to it from 2012 to 2013, **Newborn affected by complications of placenta, cord, and membranes** rose from fourth to third leading cause of death and accounted for 12.7 percent of all infant mortality. **Congenital malformations, deformations and chromosomal abnormalities** dropped from second to fourth leading cause of death, and accounted for 11.1 percent of infant deaths in 2013. **Sudden infant death syndrome (SIDS)** remained the fifth leading cause of death for 3 consecutive years and accounted for 9.5 percent of all infant mortality in 2013. **These five leading causes of infant death in 2013 accounted for 73.0 percent of all infant deaths in the District of Columbia.** These five leading causes of death in 2013 were the same as those in 2012, with changes in ranking in comparison with 2012. Infant deaths due to congenital malformations fell from 15 to 7; deaths related to short gestation and low birth weight decreased from 16 to 12. Maternal complications of pregnancy increased from 11 to 13; SIDS went down from 7 to 6 deaths; and complications of placenta, cord, and membranes remained unchanged at 8 deaths between 2012 and 2013.

Rank[1]	Cause of Death (Based on Tenth Revision, International Classification of Diseases, 2008 Edition, 2009)	Number	Percent*	Rate**
Table 14: Leading Causes of Infant Death **District of Columbia Residents, 2013**			
…	All causes	63	100.0	680.1
1	**Newborn affected by maternal complications of pregnancy (P01)**	13	20.6	140.3
	… Newborn affected by incompetent cervix (P01.0)	4	6.3	43.2
	… Newborn affected by premature rupture of membranes (P01.1)	5	7.9	54.0
	… Newborn affected by multiple pregnancy (P01.5)	2	3.2	21.6
	… Newborn affected by other maternal complications of pregnancy (P01.2-P01.4, P01.6-P01.9)	2	3.2	21.6
2	**Disorders related to short gestation and low birth weight, not elsewhere classified (P07)**	12	19.0	129.5
	… Extremely low birth or extreme immaturity (P07.0, P07.2)	12	19.0	129.5
3	**Newborn affected by complications of placenta, cord, and membranes (P02)**	8	12.7	86.4
	… Newborn affected by complications involving placenta (P02.0– P02.3)	2	3.2	21.6
	… Newborn affected by chorioamnionitis (P02.7)	6	9.5	64.8
4	**Congenital malformations, deformations and chromosomal abnormalities (Q00-Q99)**	7	11.1	75.6
	… Other congenital malformations of circulatory system (Q25– Q28)	2	3.2	21.6
	… Congenital malformations of respiratory system (Q30–Q34)	1	1.6	10.8
	… Congenital malformations and deformations of musculoskeletal system, limbs and integument (Q65–Q85)	2	3.2	21.6
	… Other congenital malformations and deformations (Q10–Q18, Q86–Q89)	1	1.6	10.8
	… Edward's syndrome (Q91.0–Q91.3)	1	1.6	10.8

Rank[1]	Cause of Death (Based on Tenth Revision, International Classification of Diseases, 2008 Edition, 2009)	Number	Percent*	Rate**
5	**Sudden infant death syndrome (SIDS) (R95)**	6	9.5	64.8
…	All other causes	17	27.0	183.5

Table 14: Leading Causes of Infant Death District of Columbia Residents, 2013

*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 2013, 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), followed by **Newborn affected by maternal complications of pregnancy.**

Table 15. Infant Deaths and Infant Mortality Rates for the 10 Leading Causes of Infant Death: United States, 2013

Rank[1]	Cause of death (based on the *International Classification of Diseases, Tenth Revision, 2008 Edition*, 2009)	Number	Rate[2]
…	All causes	23,440	596.1
1	Congenital malformations, deformations and chromosomal abnormalities (Q00–Q99)	4,758	121.0
2	Disorders related to short gestation and low birth weight, not elsewhere classified (P07)	4,202	106.9
3	Newborn affected by maternal complications of pregnancy (P01)	1,595	40.6
4	Sudden infant death syndrome (R95)	1,563	39.7
5	Accidents (unintentional injuries) (V01–X59)	1,156	29.4
6	Newborn affected by complications of placenta, cord and membranes (P02)	953	24.2
7	Bacterial sepsis of newborn (P36)	578	14.7
8	Respiratory distress of newborn (P22)	522	13.3
9	Diseases of the circulatory system (I00-I99)	458	11.6
10	Neonatal hemorrhage ((P50-P52,P54)	389	9.9
…	All other causes (residual)	7,266	184.8

…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: CDC/NCHS, National Vital Statistics System, Mortality 2013. Available from:
http://www.cdc.gov/nchs/data/dvs/LCWK7_2013.pdf

Neonatal Mortality

The leading cause of neonatal death in 2013 was **Newborn affected by maternal complications of pregnancy,** accounting for 28.9 percent of all neonatal deaths and climbing from second position in 2012. **Disorders related to short gestation and low birth weight, not elsewhere classified** was the second leading cause of neonatal death and accounted for 26.7 percent of all neonatal deaths in 2013. **Newborn affected by complications of placenta, cord, and membranes** (13.3 percent) resulted in half the number of neonatal deaths as short gestation/low birth weight and was the third leading cause of neonatal deaths in 2013 (Table 16).

Rank[1]	Cause of Death (Based on Tenth Revision, International Classification of Diseases, 2008 Edition, 2009)	Number	Percent*	Rate**
Table 16: Leading Causes of Neonatal Infant Death (N=45) **District of Columbia Residents, 2013**			
…	All causes	45	100.0	485.8
1	**Newborn affected by maternal complications of pregnancy (P01)**	13	28.9	140.3
2	**Disorders related to short gestation and low birth weight, not elsewhere classified (P07)**	12	26.7	129.5
3	**Newborn affected by complications of placenta, cord, and membranes (P02)**	6	13.3	64.8
…	All other causes or total	10	22.2	107.9

*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, 46,087 for the five-year period of 2009 to 2013. About 51.7 percent were to non-Hispanic black mothers, 28 percent were to non-Hispanic white mothers and 14.8 percent were to Hispanic mothers.

Figure 12. Births by Race and Hispanic Origin of Mother, 2009-2013 (n=46,087)

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

Of the total number of births (N=46,087), 368 infants died from 2009 to 2013. Figure 12 shows the average percentage of infant deaths by race/ethnicity from 2009 to 2013. On average between 2009 to 2013, infants to non-Hispanic black mothers disproportionately died (76.1 percent) compared to their total number of births (51.7 percent).

Figure 13. Infant Deaths by Race and Hispanic Origin of Mother, 2009-2013 (n=368)

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 (2009-2013). The leading cause of infant mortality was **Congenital malformations, deformations and chromosomal abnormalities**, which accounted for 17.7 percent, followed by **Short gestation and low birth weight** (17.4 percent). The third leading cause was **Newborn affected by maternal complications of pregnancy** (16.3 percent).

Figure 14. Leading Causes of Infant Death by Race of Mother and Hispanic Origin of Mother, 2009-2013 (N=368)

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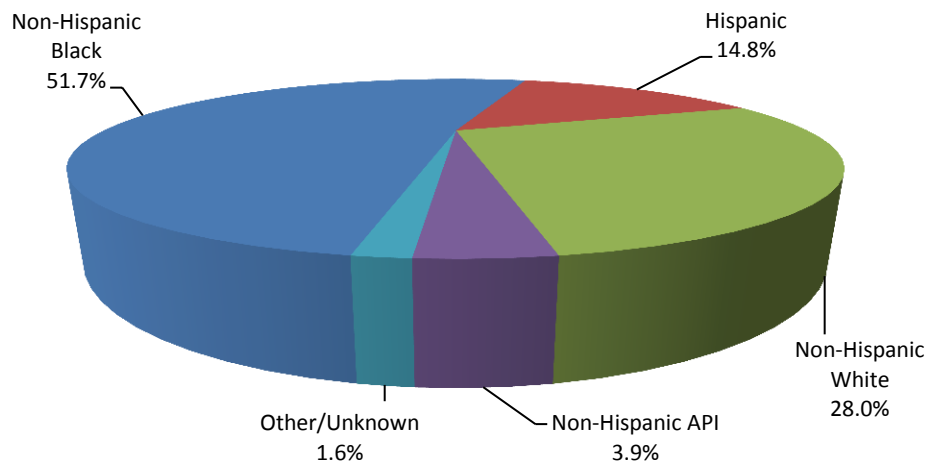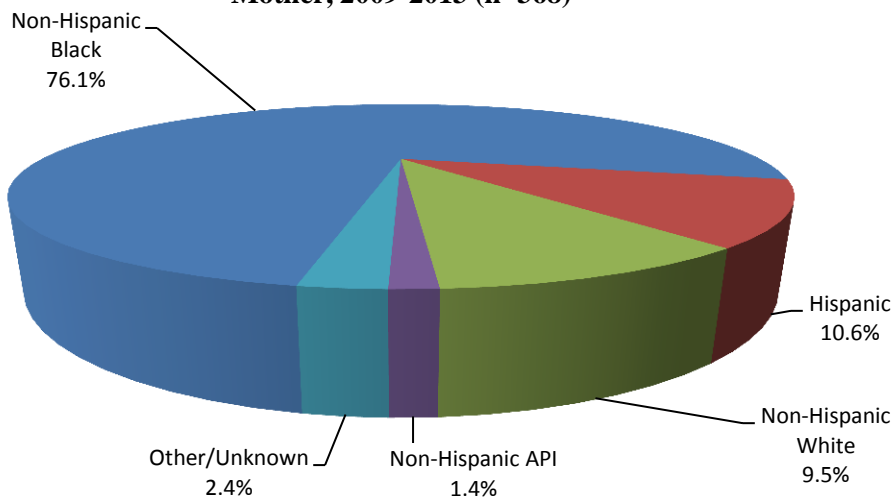Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.

Among non-Hispanic black mothers, **Disorders related to short gestation and low birth weight, not elsewhere classified** was the leading cause of death (17.5 percent), followed by **Congenital malformations, deformations and chromosomal abnormalities** (16.4 percent). **Newborn affected by maternal complications of pregnancy** was the third leading cause of infant death (15 percent) on the average, from 2009-2013 (Figure 14).

Figure 15. Leading Causes of Infant Death to Non-Hispanic Black Mothers, 2009-2013 (n=280)
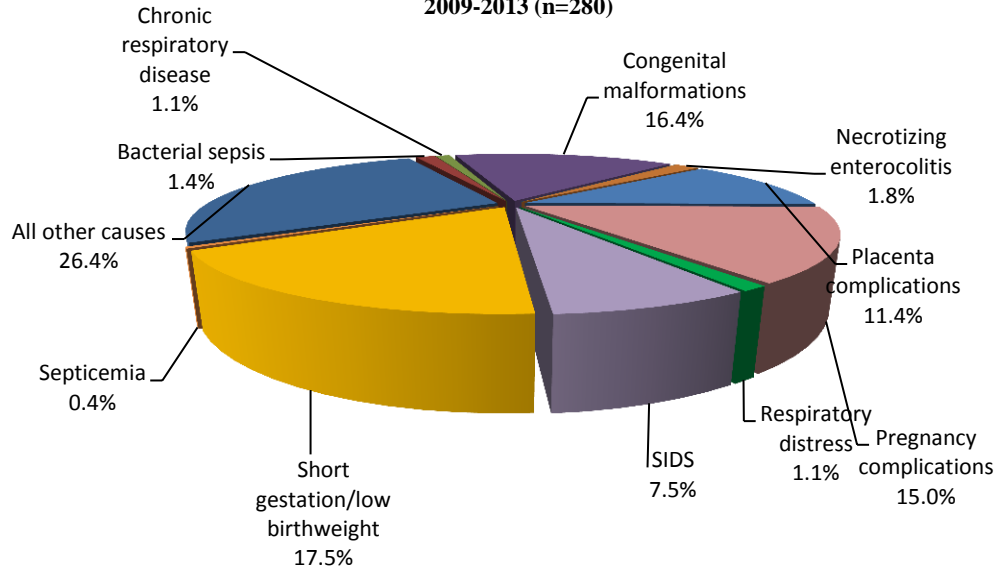
- Chronic respiratory disease 1.1%
- Congenital malformations 16.4%
- Necrotizing enterocolitis 1.8%
- Bacterial sepsis 1.4%
- Placenta complications 11.4%
- All other causes 26.4%
- Septicemia 0.4%
- Respiratory distress 1.1%
- Pregnancy complications 15.0%
- Short gestation/low birthweight 17.5%
- SIDS 7.5%

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

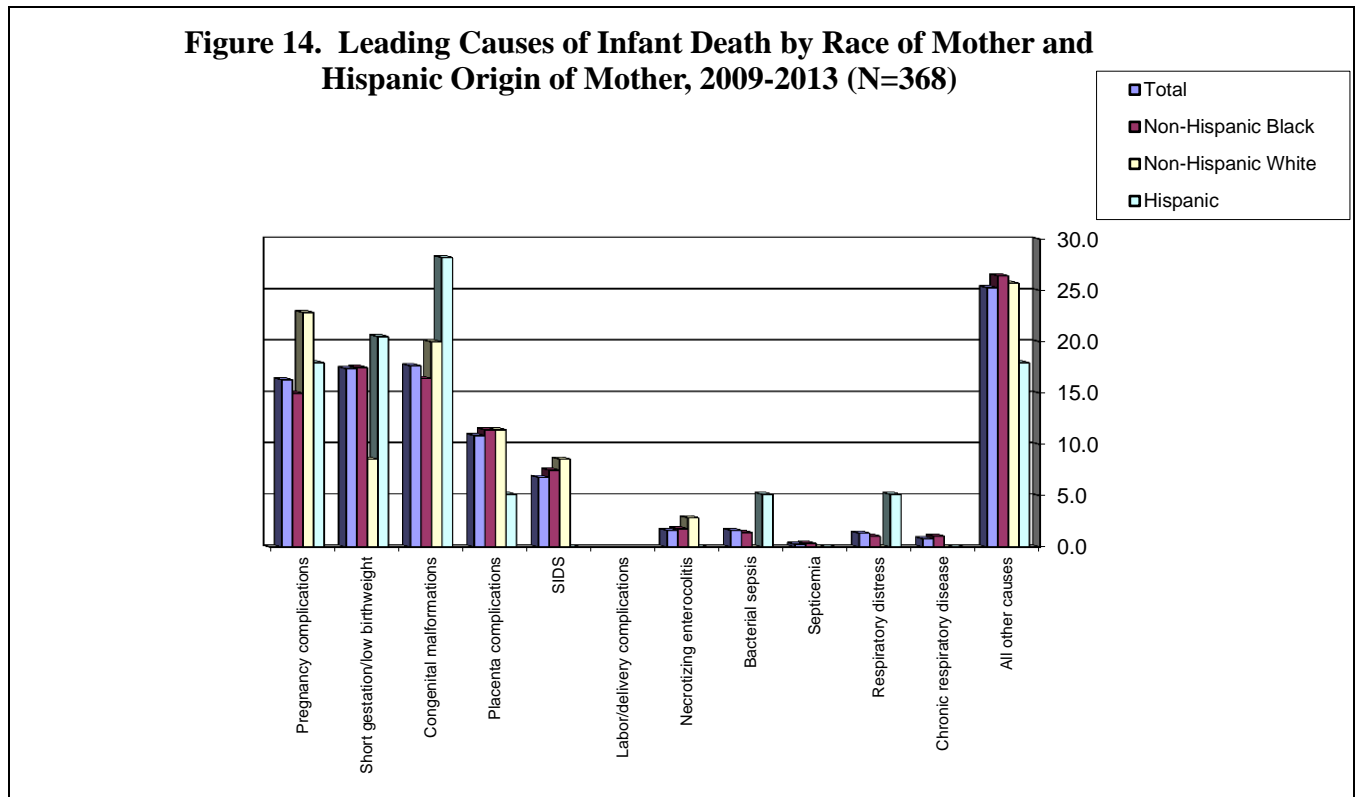For infant deaths to non-Hispanic white mothers between 2009 to 2013, **Newborn affected by maternal complications of pregnancy** was the leading cause of infant death (22.9 percent) and **Congenital malformations, deformations and chromosomal abnormalities** was the second leading cause (20 percent). **Newborn affected by complications of placenta, cord, and membranes** was the third leading cause of infant death (11.4 percent) (Figure 15).

Figure 16. Leading Causes of Infant Death to Non-Hispanic White Mothers, 2009-2013 (n=35)

- Congenital malformations 20.0%
- Placenta complications 11.4%
- Pregnancy complications 22.9%
- All other causes 25.7%
- Short gestation/low birthweigh 8.6%
- Necrotizing enterocolitis 2.9%
- SIDS 8.6%

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 2009 to 2013 was **Congenital malformations, deformations and chromosomal abnormalities** (28.2 percent). **Disorders related to short gestation and low birth weight, not elsewhere classified** (20.5 percent) was the second leading cause, followed by **Newborn affected by maternal complications of pregnancy** (17.9 percent).
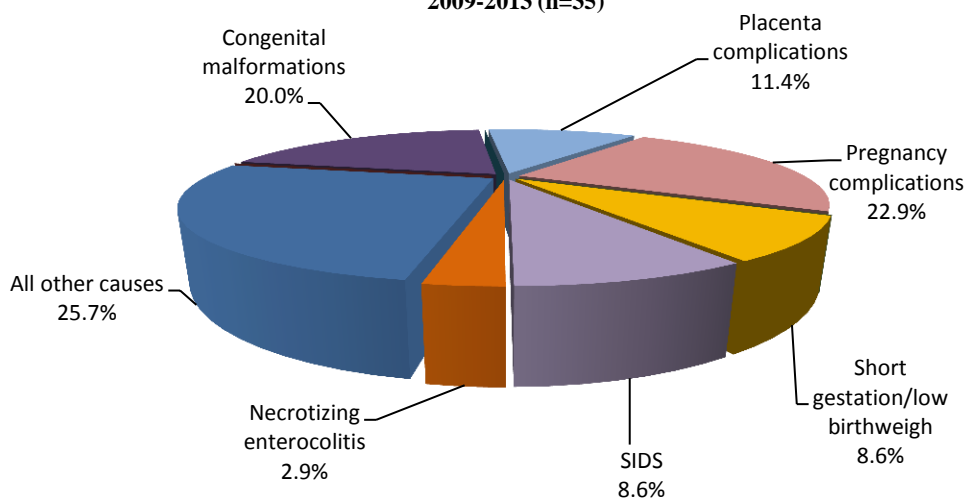
Figure 17. Leading Causes of Infant Death to Hispanic Mothers, 2009-2013
(n=39)
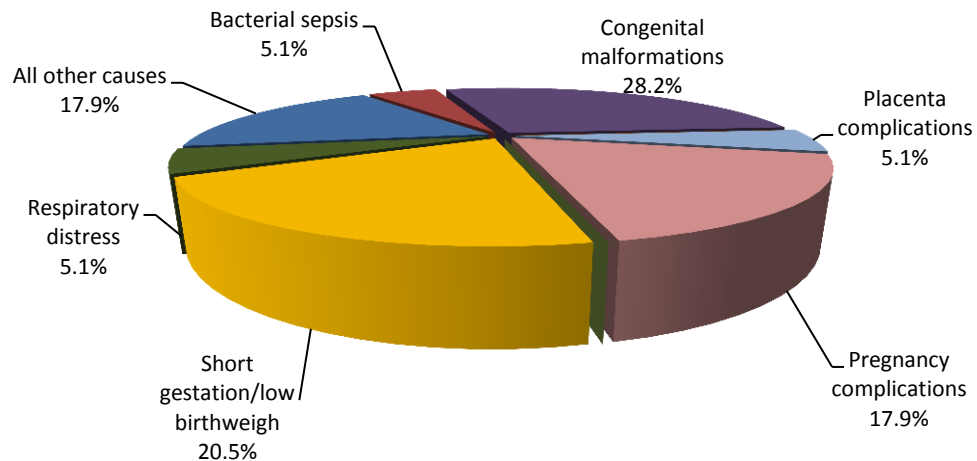
Source: Data Management and Analysis Division, Center for Policy, Planning and Evaluation, DC Department of Health.

DOH Maternal and Child Health Program Activities

In 2013, the District of Columbia Department of Health (DOH) Community Health Administration (CHA) continued its efforts to improve maternal, child and family health outcomes through a variety of programmatic activities (see Table *). The DC Healthy Start Project continued providing outreach and client recruitment, case management and health education to pregnant and parenting women in Ward 5, Ward 6, Ward 7, and Ward 8. The Healthy Start program also provides case management services to fathers of children up to age 2 years. Healthy Start clients have exhibited improved perinatal and birth outcomes when compared with the District's population, except for the indicator of early entry into prenatal care

Indicators	DC Healthy Start Participants	DC Total Population
Live Births	456	9,264
Percent **Low Birth Weight** Single **Births**	10.5%	9.7%
Percent **Very Low Birth Weight** Single **Births**	0%	2.7%
Percent **Births with First Trimester Prenatal Care**	20.4%	65.6%
Infant Deaths (under 1 year)	0	63

The DC Maternal, Infant and Early Childhood Home Visit (MIECHV) Program also began implementation in 2013. Using evidenced based home visiting models, MIECHV programs are designed to promote maternal, infant and early childhood health. Programs provide services to high–risk families with children in the District's Wards 5, 7 and 8. During 2013, the MIECHV program served 249 families/children.

DOH Maternal and Child Health Programs	
Program	Description
DC Healthy Start	Physical and psychosocial assessments and linkages, health promotion and educations through home visitation model for prenatal and postpartum women and their families.
Safe Crib Program	Safe sleep education and free cribs for DC residents to reduce sleep related infant deaths.
MIECVH	Evidence based home visiting services for at-risk pregnant women and parents with young children up to kindergarten entry
Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)	Health assessments, nutrition education and counseling, breastfeeding promotion and peer counselor support along with a monthly, nutritionally prescribed tailored food package.
Supplemental Nutrition Assistance Program: Nutrition Education and Obesity Prevention (SNAP-ed)	Nutrition and fitness education along with obesity prevention activities aimed at helping SNAP eligible residents make healthy food choices and choose active living.

Teen Pregnancy Prevention Program	Local funding for teen pregnancy prevention to Crittenton Services of Greater Washington for implementation of SNEAKERS and PEARLS. SNEAKERS is designed for teen girls that can be vulnerable as they navigate the challenges of high school. The PEARLS program enables pregnant and parenting teens to develop positive life and parenting skills.
DC Hears	Ensures all infants born in the District of Columbia receive a newborn hearing screening and all abnormal screens receive appropriate follow up care.
Newborn Metabolic Screen	Provides newborn screening services for metabolic and genetic disorders to children born in the District of Columbia.
DC Linkage and Tracking System (DCLTS)	Designed to identify, refer, and linkage of infants with Medicaid, at risk for developmental delays or disabilities into comprehensive services.
Baby Friendly Hospital Initiative	Addresses hospitals and birthing centers that offer an optimal level of care for infant feeding and mother/baby bonding.
School Based Health Centers	Comprehensive medical homes located within high schools. SBHCs reduce barriers to adolescents accessing primary care, mental health, dental and prenatal health care services.

Current Reproductive Health Outcomes Oriented Programs

In response to emerging best practices in addressing perinatal and infant mortality disparities, the DOH is restructuring current programs to align with nationally recognized strategies. Based on recommendations provided by the Secretary's Advisory Committee on Infant Mortality and the Health Resources and Services Administration Maternal Child Health Bureau, DOH's citywide strategy will reflect the core principles identified to decrease perinatal health disparities and improve maternal and child health. These principles include using a life course perspective, addressing social determinants of health, implementing systems level interventions, and building collective impact.[1]

In 2014, DOH was awarded a new five year Healthy Start grant, and has begun work to improve outcomes and reduce racial and ethnic disparities in perinatal health through community-based approaches to service delivery, with patient centered medical homes in higher risk areas providing the foundation. Additionally, DOH will work with multi sector public and private partners to develop a common agenda that will aim to create large-scale, lasting social change. In contrast with prior programming, this new initiative will target a larger population, emphasize achieving optimal health for all reproductive aged women, promote high quality health care and coordination of care, and increase accountability through more rigorous program evaluation and monitoring.

In early 2014, the District of Columbia Department of Health, in partnership with child serving District agencies, local provider groups, and community based organizations began initial

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[1] Secretary's Advisory Committee on Infant Mortality (SACIM). 2013. **Report of the Secretary's Advisory Committee on Infant Mortality (SACIM): Recommendations for Department of Health and Human Services action and framework for a national strategy.** [Rockville, MD]: Secretary's Advisory Committee on Infant Mortality (SACIM), 74 pp.

planning to establish a *Help Me Grow* network. *Help Me Grow (HMG)* is a system that builds collaboration across sectors, including child health care, early care and education, and family support. Through comprehensive physician and community outreach and centralized information and referral centers, families are linked with needed programs and services. Ongoing data collection and analysis helps identify gaps in and barriers to the system. This system will improve access to existing resources and services for children through age eight, supporting optimal infant and young child health and development, including early learning.

DOH will continue other programming that addresses infant mortality from a life course perspective including home visiting (MIECHV), Health Sexuality and Education, Title V funded programs, teen pregnancy prevention efforts focused on life skills and academic success, and chronic disease self-management.

## 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) phenomena[14]. 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 health[14].

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 making[15]. In this report, a Bayesian approach to *kriging* was used to predict infant mortality based on 2009-2012 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 structure[16]. 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 decisions[17]. 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 Analyst[18], 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 2010-2012.
- Areas 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 2013.
- Similarly, areas depicted in shades of blue were predicted to have the lowest infant mortality rates (less than 3 infant deaths per 1,000 births) in 2013.
- Generally, the spatial distribution patterns of infant mortality in 2013 and these predicted values displayed were consistent, thereby providing a high degree of confidence in the predictive map.
- In 2013, zip codes 20032 and 20017 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, 2010-2012
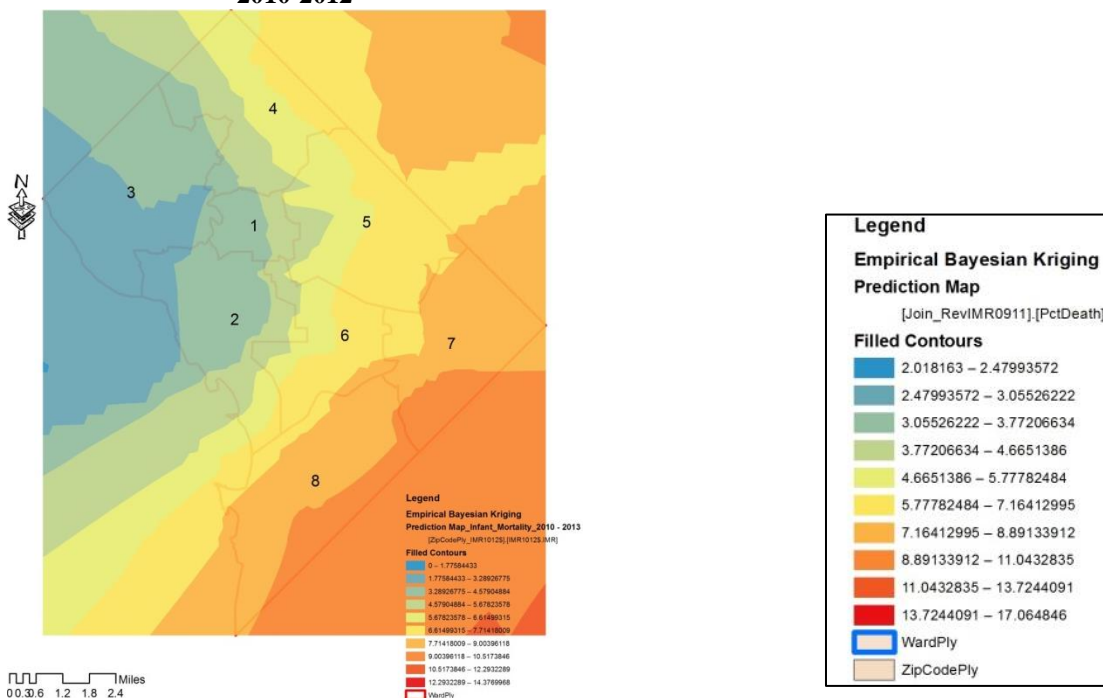
Map 8. Prediction Standard Error Map Based on Infant Mortality by Zip Code and Ward, District of Columbia, 2010-2012
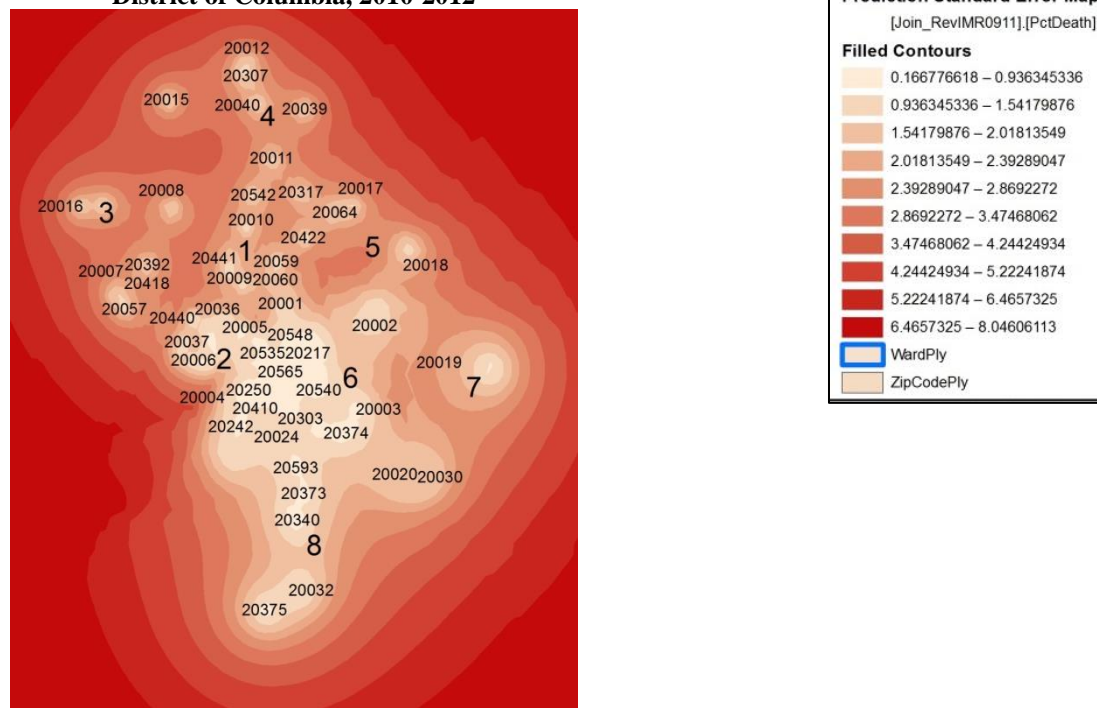
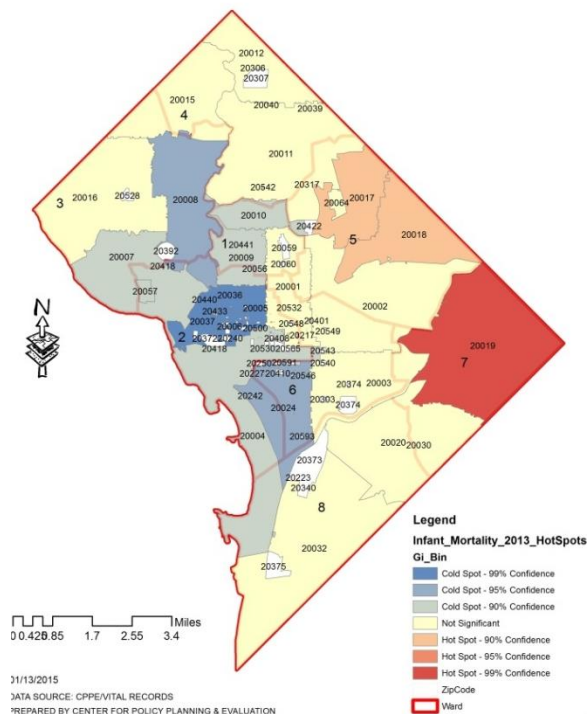## Locating IMR Clusters: Hot Spot Analysis in GIS

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 chance[19].

The Hot Spot Analysis Getis Ord Gi* 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 value[20]. 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 2013 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, 2013

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 records[21]. 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.

- Zip codes in red or orange are those that were statistically significant hot spots for infant mortality in 2013.
- 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 2013. 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.

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 Morality

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, 2013
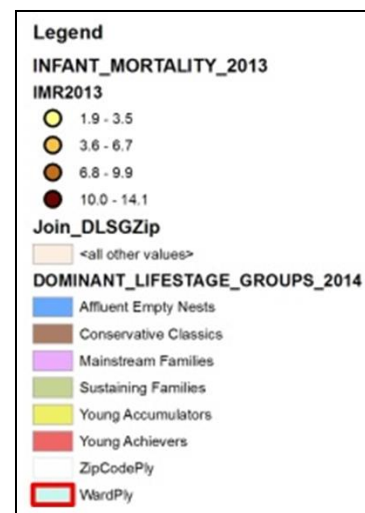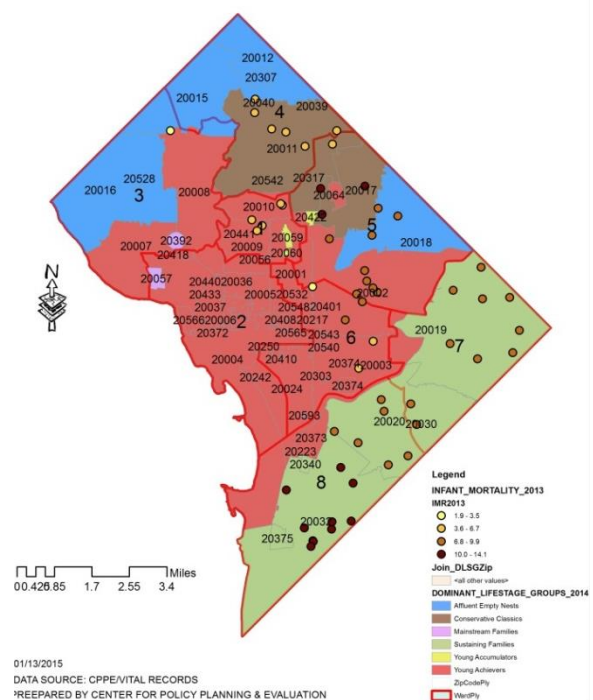
Note: Lifestage Groups are based on a Nielsen classification of households that share certain sociological traits, behavioral patterns, and other common characteristics (such as age, income, race, household structure, education).

- Sustaining Families were predominant in Wards 7 and 8 which had the highest numbers of infant deaths in 2013.
- Ward 5 had the highest IMR in 2013. Lifestage groups in Ward 5 were a combination of Young Achievers, Affluent Empty Nests, and Conservative Classics.
- Wards 2 and 3, on the other hand, had zero and 1 infant death, respectively, in 2013. Young Achievers and Affluent Empty Nests were the prevalent Lifestage groups in these wards.
- Predominance of these groups may explain low infant mortality rates in wards with high income, high educational attainment, and households with no children.

Appendix: Description of Lifestage Groups (Adapted from Nielsen 2014 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

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Technical Notes

Data Sources and Method

Data shown in this report for 2013 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) 2013 mortality report for the United States, National Vital Statistics Reports, Vol. 64, No. 2. Deaths: Final data for 2013. Available from: http://www.cdc.gov/nchs/data/nvsr/nvsr64/nvsr64_02.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 2013 birth and death rates shown in this report represent the population residing in DC, estimated as 649,111 as of July 1, 2013. Birth and death rates shown in this report for 2013 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 2013 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 testing[1] 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.

Maternal death/pregnancy-   Death of a woman from direct or indirect obstetric cause during or
related   within one year of pregnancy, and all deaths from any cause (including injury or trauma) among women who were pregnant or within one year of pregnancy and were identified using a pregnancy "check-box" on the death certificate or by linking the death certificate to a live birth or fetal death.

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