

# MATERNAL AND CHILD HEALTH BRIEF #3:

INFANT MORTALITY, LOW BIRTH WEIGHT AND PRETERM BIRTH  
OCTOBER 2012

## INFANT MORTALITY, LOW-BIRTH WEIGHT AND PREMATURITY DEFINED

### *Infant Mortality*

An infant death is defined as death before one year of age. Infant deaths are typically examined as rates, or in any given year, the total number of infants who die before one year of age divided by all live born infants in that year. The infant mortality rate is an indicator of the health status of a country, state, or community.<sup>i</sup>

### *Low Birth Weight*

Low birth weight babies weigh less than 2500 grams (5 pounds, 8 ounces) at birth. Low birth weight may be subdivided into very low birth weight (less than 1500 grams) and extremely low birth weight (less than 1000 grams). At the population level, the proportion of babies with a low birth weight is an indicator of public health problems including long-term maternal malnutrition, ill health, hard work and poor health care in pregnancy. On an individual basis, low birth weight is an important predictor of newborn health and survival.<sup>ii</sup>

*(continued on page 2)*

## OVERVIEW

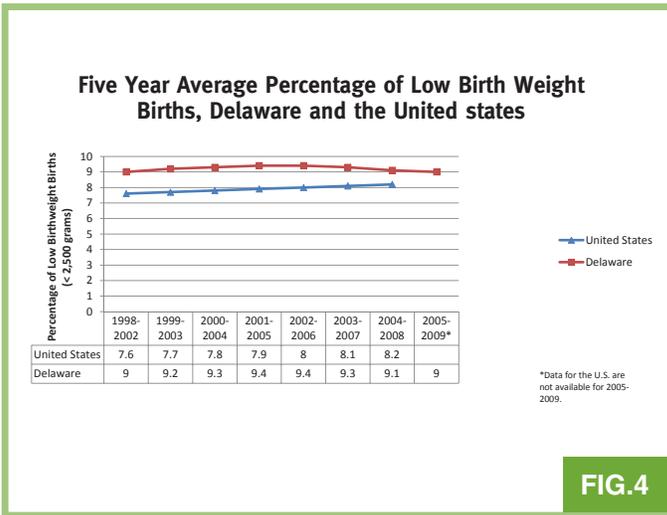


This Maternal and Child Health (MCH) Brief summarizes the latest data regarding three key indicators of birth outcomes - the rates of infant mortality, low birth weight and preterm birth. The brief also identifies several strategies in terms of promotion and prevention that are thought to be effective in raising awareness and educating women and families about the issues and risk factors related to these three suboptimal birth outcomes. Finally, the brief discusses the public health role from the perspective of Maternal and Child Health programs in promoting health across the lifespan and preventing infant mortality, low birth weight and preterm birth.



## LOW BIRTH WEIGHT TRENDS

In the five year period 1998-2002, 9% of births in Delaware consisted of infants with low birth weight (2,500 grams or less). Since this period the percentage of low birth weights has risen to a high of 9.4% and returned to a rate of 9% in the five year period 2005-2009. Nationally, the percentage of low birth weight births has ticked upward from 7.6% in the period of 1998-2002 to 8.2% in the period of 2004-2008 (Figure 4).<sup>iv</sup>



Among the state’s three counties, the highest percentages of low birth weight births over the last decade have been in New Castle County where the percentage has varied between 9.5% and 9.9%. For the latest five year period available (2005-2009), the percentage of low birth weight births in New Castle County was

## INFANT MORTALITY, LOW-BIRTH WEIGHT, AND PREMATURITY (CONTINUED)

### Preterm Birth

Preterm birth is defined as birth occurring at less than 37 completed weeks gestation.

The American College of Obstetricians and Gynecologists subdivides preterm birth into extremely preterm (< 28 weeks), early preterm (28-31 weeks), moderately preterm (32-33 weeks), and late preterm (34-36 weeks).

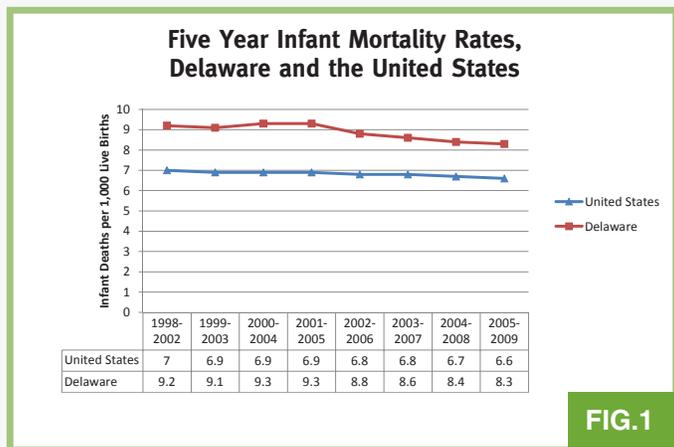
Preterm birth is also an important predictor of newborn health and survival.<sup>iii</sup>

## INFANT MORTALITY TRENDS

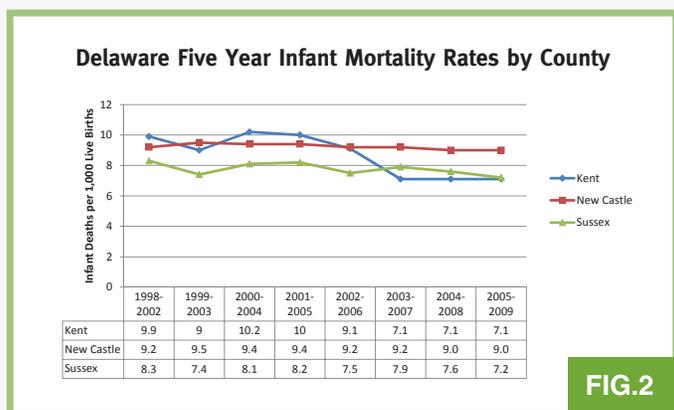
Although Delaware’s infant mortality rate is above the national average, the gap has been narrowing over the last decade. For the five year period 2001-2005, Delaware’s infant mortality rate was 9.3 deaths per 1,000 live births compared to a national average rate of 6.9 deaths per 1,000 live births. For the five year period 2005-2009, Delaware’s infant mortality rate was 8.3 deaths per 1,000 live births compared to 6.6 deaths per 1,000 live births nationally. The overall decrease in the rate in Delaware (10.7%) was over twice the decrease in the national rate (4.3%) over this period (Figure 1).<sup>iv</sup>

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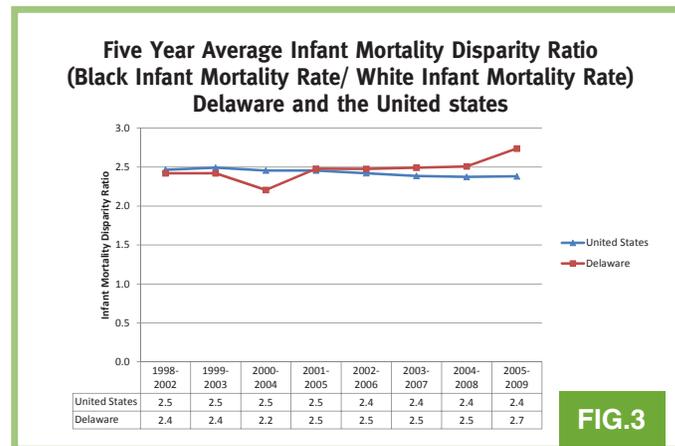
## INFANT MORTALITY TRENDS (CONTINUED)



In terms of geographic differences, Kent County, once the county with the highest infant mortality rate (10.2 deaths per 1,000 live births) in the five year period 2000-2004, has improved to a rate of 7.1 deaths per 1,000 live births in the five year period 2005-2009. It should be noted that in terms of overall burden of infant mortality rate, the City of Wilmington appears to be a driving factor in New Castle County's rates (as well as statewide). For the five year period 2005-2009, the infant mortality rate in the City of Wilmington was 13.8 deaths per 1,000 live births compared to 8.0 infant deaths per 1,000 live births in the balance of New Castle County (Figure 2).<sup>iv</sup>

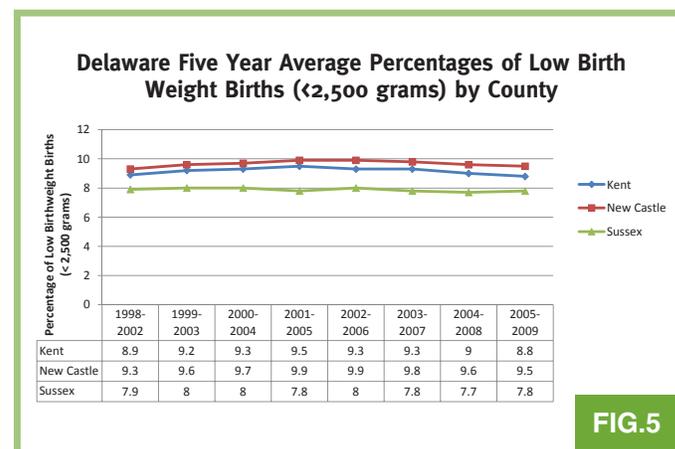


Despite the relative decline in overall infant mortality in the state, the disparity ratio (comparing the rate of deaths of black infants to the rate of deaths to white infants) was higher than the national disparity ratio and ticked upwards in the 2005-2009 five year period (Figure 3).<sup>iv</sup>



## LOW-BIRTH WEIGHT (CONTINUED)

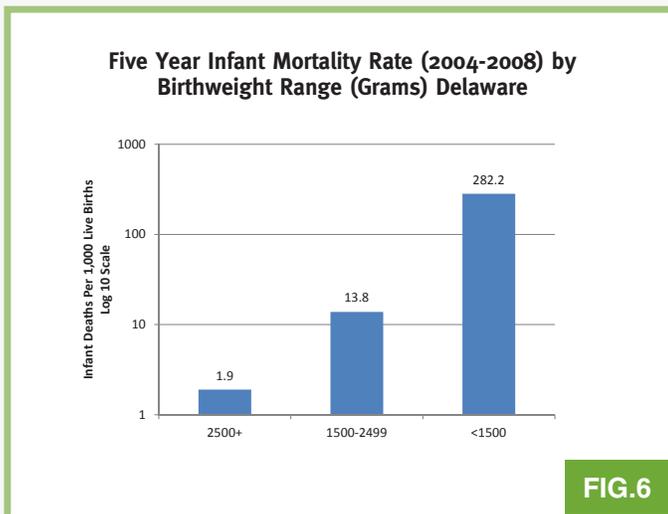
9.5 percent. Conversely, Sussex county has consistently had the lowest percentages of low birth weight births over the same time period with 7.8% of births reported to be low birth weights in the five year period 2005-2009 (Figure 5).<sup>iv</sup>



(continued on page 4)

## LOW BIRTH WEIGHT (CONTINUED)

The association of low birth weight with infant mortality can be better understood by examining the infant mortality rate among assorted birth weight ranges. For infants who are born at a weight of 2,500 grams or more, the infant mortality rate for the five year period 2004-2008 was 1.9 deaths per 1,000 live births. Among infants born at a birth weight of between 1,500 grams and 2,499 grams, the infant mortality rate was 13.8 deaths per 1,000 live births. Among infants born at a birth weight of less than 1,500 grams, the infant mortality rate was 282.2 deaths per 1,000 live births (Figure 6).<sup>iv</sup>



For the last several five year periods reported, the Delaware disparity ratio, comparing black infant low birth weight to white infant low birth weight, has remained relatively stable and comparable to the U.S. average. Note that due to rounding, the slight differences over these time periods are not reflected in the numbers presented (Figure 7).<sup>iv</sup>

Five Year Average Low Birth Weight Disparity Ratio (Black Low Birthweight Percentage / White Low Birthweight Percentage) Delaware and the United States

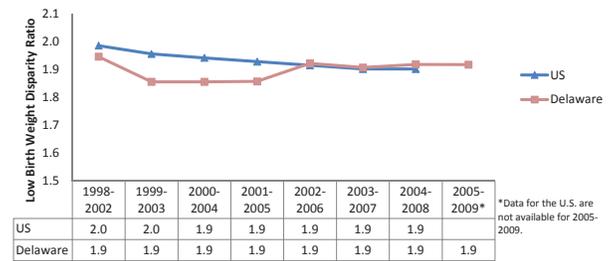


FIG.7

## PRETERM BIRTHS BY RACE / ETHNICITY

Among the race and ethnic categories reported, the lowest percentage (10.6%) of preterm births was among white infants in 2009. Among black infants, 17.3% of births were preterm and among infants of other races, 11.5% of births were preterm in 2009. Note that as reported Hispanic ethnicity is not mutually exclusive with race.

Percent of Preterm Births (<37 Weeks Gestation) by Race and Hispanic Ethnicity, Delaware 2009

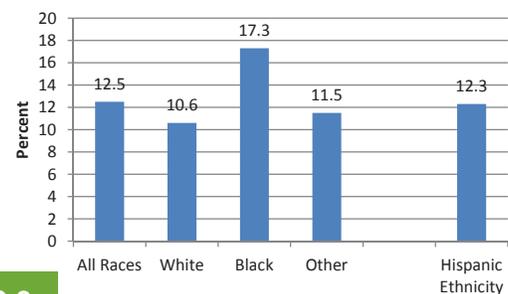
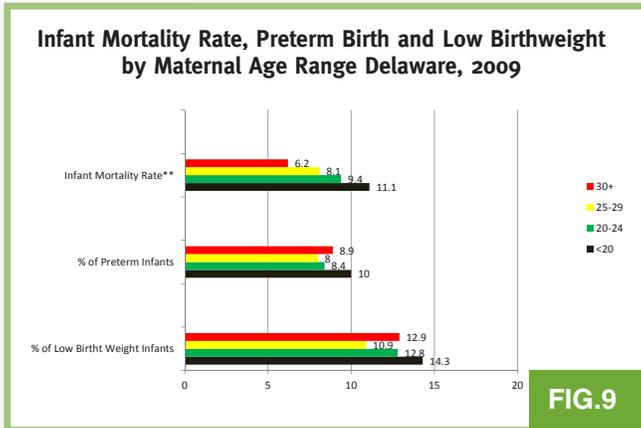


FIG.8

Therefore, Hispanic infants are also included in the white, black and other categories. Among infants with Hispanic ethnicity, 12.3% of births were preterm in 2009 (Figure 8).<sup>iv</sup>

## BIRTH OUTCOMES BY MATERNAL AGE GROUP

When classified into four age groups, less than 20 years of age, 20 to 24 years of age, 25-29 years of age and 30 years and older, the highest rate of infant mortality (for 2004-2008) and the highest percentages of preterm birth (for 2009) and low birth weight (for 2009) are among mothers less than 20 years of age. Among mothers 30 years of age or more, the infant mortality rate for the period 2004-2008 was the lowest (6.2 deaths per 1,000 infants) compared to other age ranges. However, this grouping may mask higher rates of infant mortality at the extreme end of the age range (Figure 9).<sup>iv</sup>



## WHAT ARE THE CAUSES OF INFANT MORTALITY, LOW BIRTH WEIGHT AND PREMATURITY?

The leading causes of infant death nationally include congenital malformations, fetal malnutrition, and sudden infant death syndrome,

and accounted for 44% of all infant deaths in the 2005 reporting period. ‘Preterm-related’ deaths accounted for 37% of infant deaths during the same time period.<sup>v</sup>

In Delaware, from 2005-2009 the five leading causes of infant death were:

- Disorders related to short gestation and fetal malnutrition (prematurity and low birth weight), which accounted for 24.8 percent of infant deaths;
- Congenital anomalies (birth defects), which accounted for 12.7 percent of infant deaths;
- Newborn affected by maternal complications of pregnancy, which accounted for 9.8 percent of infant deaths. Of the 48 deaths attributed to this cause, 46 were due to the newborn being affected by incompetent cervix and premature rupture of membranes;
- Sudden infant death syndrome (SIDS) accounted for 8 percent; and
- Newborn affected by complications of placenta, cord, and membranes (4.5 percent).<sup>iv</sup>

Premature birth and fetal growth restriction are the two main causes of low birth weight deliveries. Preterm labor results in the premature birth of a low birth weight infant. Multiple pregnancies can lead to fetal growth restriction and subsequent low birth weight deliveries. Other factors that may increase the risk of giving birth to a low birth weight infant include maternal medical risks, substance use during pregnancy, inadequate weight gain during pregnancy, placental problems, and socioeconomic factors such



## WHAT ARE THE CAUSES (CONTINUED)

as low income and lack of education.<sup>vi</sup> Prenatal smoking and alcohol consumption can limit fetal growth and result in low birth weight deliveries.<sup>vii,viii,ix</sup> Pregnant women who smoke are nearly twice as likely to deliver a low birth weight infant compared with non-smokers.<sup>vi</sup>

The cause of most preterm births remains unknown. There are two types of preterm birth: spontaneous and medically indicated births. About 75% of preterm births result from spontaneous preterm labor, either by itself, or following spontaneous preterm premature rupture of the membranes (PPROM).<sup>x</sup>

A previous history of preterm birth or delivery of a low birth weight infant is a major predictor of subsequent preterm delivery. Mercer et al (1999) found that women with a prior spontaneous preterm delivery carried a 2.5-fold increased risk of spontaneous preterm delivery compared with those with no prior spontaneous preterm delivery (21.7% versus 8.8%;  $p = \leq .001$ ).<sup>xi</sup>

Maternal demographic characteristics associated with preterm birth include non-White race, low socioeconomic and educational status, very young or advanced maternal age, single marital status. Low pre-pregnancy Body Mass Index, maternal medical conditions such as diabetes, high blood pressure, or obesity, and nutritional status have also been linked with preterm delivery.<sup>xii-xvii</sup> Women with low serum concentrations of iron, folate or zinc are more likely to experience preterm births compared with those with concentrations within the normal range.<sup>xiii,xix</sup> In a study conducted by Scholl et al (2005), women with low folate intake ( $\leq 240$  ug/d) had a more than three times greater preterm delivery than women with folate intake  $\geq 240$  ug/d ( $p < .05$ ).<sup>xix</sup> In another study conducted by Siega-Riz et al (2004), low folic acid intake, as measured by both diet and biological markers, was associated with increased risk of preterm birth (RR: 1.8, 95% CI: 1.4-2.6).<sup>xx</sup>

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**“A PREVIOUS HISTORY OF PRETERM BIRTH OR DELIVERY OF A LOW BIRTH WEIGHT INFANT IS A MAJOR PREDICTOR OF SUBSEQUENT PRETERM DELIVERY.”**  
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Pregnancy characteristics associated with preterm birth include multiple gestations, vaginal bleeding,

and infections.<sup>xxi</sup> Intrauterine infection is a frequent and important mechanism leading to preterm birth.<sup>xxii,xxiii</sup> Sexually transmitted infections such as trichomoniasis have been identified as a cause of preterm delivery.<sup>xxiv,xxv</sup> A prospective cohort study conducted by Cotch et al (1997) concluded that pregnant women infected with trichomonas vaginalis during the second trimester were statistically more likely to deliver a premature infant compared with those not infected by trichomonas vaginalis.<sup>xxv</sup> Bacterial vaginosis has been associated with a 1.5 fold to 3-fold increase in the rate of preterm birth.<sup>xxiv,xxvi</sup>

Other factors that may increase the risk of preterm birth include late or no prenatal care, lack of social support, domestic violence, inadequate birth spacing, substance use during pregnancy, inadequate weight gain during pregnancy, depression, and high stress levels.<sup>xxxi</sup> Cooper et al (1996) found that women experiencing psychosocial stress had a significantly increased risk for spontaneous preterm birth compared with women experiencing no psychosocial stress (OR: 1.16,  $p = .003$ ).<sup>xxvii</sup> A prospective study conducted by Lobel et al (1992) found that social stress significantly predicted preterm delivery among a group of 130 socio-economically

disadvantaged women ( $r = .30, p = < .03$ ).<sup>xxviii</sup>

The Pregnancy, Infection, and Nutrition Study conducted by Dole et al (2002) found an increased risk of preterm birth among women with high levels of pregnancy-related anxiety compared with those experiencing low levels of pregnancy-related anxiety (RR: 2.81, 95% CI: 1.5-3.0).<sup>xxix</sup>

## STRATEGIES FOR IMPROVING BIRTH OUTCOMES

In 2006, the Centers for Disease Control and Prevention identified four goals to improve preconception health and achieve optimal birth outcomes in the population. These goals are:

- Improve the knowledge and attitudes and behaviors of men and women related to preconception health.
- Assure that all women of childbearing age in the United States receive preconception care services (i.e., evidence-based risk screening, health promotion, and interventions) that will enable them to enter pregnancy in optimal health.
- Reduce risks indicated by a previous adverse pregnancy outcome through interventions during the interconception period, which can prevent or minimize health problems for a mother and her future children.
- Reduce the disparities in adverse pregnancy outcomes.



## STRATEGIES FOR IMPROVING BIRTH OUTCOMES *(CONTINUED)*

Ten recommendations supported these goals:

- **Recommendation 1.** Each woman, man, and couple should be encouraged to have a reproductive life plan.
- **Recommendation 2.** Increase public awareness of the importance of preconception health behaviors and preconception care services by using information and tools appropriate across various ages; literacy, including health literacy; and cultural/linguistic contexts.
- **Recommendation 3.** As a part of primary care visits, provide risk assessment and educational and health promotion counseling to all women of childbearing age to reduce reproductive risks and improve pregnancy outcomes.
- **Recommendation 4.** Increase the proportion of women who receive interventions as follow-up to preconception risk screening, focusing on high priority interventions (i.e., those with evidence of effectiveness and greatest potential impact).
- **Recommendation 5.** Use the interconception period to provide additional intensive interventions to women who have had a previous pregnancy that ended in an adverse outcome (i.e., infant death, fetal loss, birth defects, low birthweight, or preterm birth).
- **Recommendation 6.** Offer, as a component of maternity care, one prepregnancy visit for couples and persons planning pregnancy.
- **Recommendation 7.** Increase public and private health insurance coverage for women with low incomes to improve access to preventive women's health and preconception and interconception care.
- **Recommendation 8.** Integrate components of preconception health into existing local public health and related programs, including emphasis on interconception interventions for women with previous adverse outcomes.
- **Recommendation 9.** Increase the evidence base and promote the use of the evidence to improve preconception health.
- **Recommendation 10.** Maximize public health surveillance and related research mechanisms to monitor preconception health.<sup>xxx</sup>

# INFANT MORTALITY, LOW BIRTH WEIGHT AND PRETERM BIRTH AND MATERNAL AND CHILD HEALTH PROGRAMS

The reduction of fetal and infant deaths, as well as the reduction of the rates of low birth weight and preterm birth are each objectives of Healthy People 2020.<sup>xxxi</sup>

Working to improve birth outcomes and maternal health are public health functions and the Delaware Division of Public Health's Family Health Systems/Maternal and Child Health Bureau and Center for Family Health Research and Epidemiology are involved with planning, implementing and evaluating interventions to address these needs.

Identified priorities of Delaware's efforts to improve outcomes include reductions in the rates of infant mortality, low birth weight and preterm birth, as well as a reduction in disparities for these indicators. Three main sources of support for achieving these objectives are the Title V, Maternal and Child Health Block Grant and the Home Visiting Program managed by the Maternal and Child Health Bureau and the Delaware Healthy Mother and Infant Consortium assisted by the Center for Family Health Research and Epidemiology.

Pregnant women and mothers, infants less than one year of age, and women of childbearing age who may become pregnant are included as identified priority populations for the Title V, Maternal and Child Health Block Grant. This program funds an assortment of services, interventions and initiatives that include:

- Infrastructure building services that lay the foundations for policies and programs that can improve health and well-being;
- Population based services that include primary prevention and screening programs that reach everyone that might be affected or in need;
- Enabling services that help families access and use health services; and
- Direct health care services.

Services offered under the Title V State-Federal Partnership relevant to birth outcomes and infant mortality include newborn metabolic and hearing screening, the state's birth defects registry and direct and enabling services for women and infants available through the state's public health clinics.

For high risk pregnant women, services are available under the State's Home Visiting program, Smart Start. The program reaches women early in pregnancy to connect them with a medical home.



## INFANT MORTALITY, LOW BIRTH WEIGHT, PRETERM BIRTH PROGRAMS

(CONTINUED)

Smart Start utilizes an evidence-based model, Healthy Families America. Services are concentrated on women residing in high-risk communities and provide women with the skills and knowledge to:

- care for themselves during pregnancy;
- soothe their infants after birth;
- ensure children are receiving proper nutrition
- bond with an infant and ensure healthy child development; and
- create a safe home environment.

The home visiting program also uses Health Ambassadors to work within the community to build social capital and cohesion within communities and increase access to medical and social services.

In addition to supporting the efforts of the Delaware Healthy Mother and Infant Consortium, a Governor-appointed board focused on the reduction of infant mortality, the Bureau of Family Health Research and Epidemiology also

manages the Pregnancy Risk Assessment and Monitoring Survey (PRAMS) and the Healthy Women, Healthy Babies Program. This program provides preconception and prenatal care to at-risk women and is based on a life course perspective. At-risk women include African-Americans and women with a history of poor birth outcomes. Services include preconception care, psychosocial care, prenatal care and nutrition.

## MATERNAL AND CHILD HEALTH (MCH) SURVEILLANCE OF PROGRESS IN REDUCING INFANT MORTALITY, LOW BIRTH WEIGHT AND PRETERM BIRTH

**Maternal and Child Health Block Grant.** Annually, the State of Delaware submits the Title V Maternal and Child Health Block Grant application that specifies priority areas for resource allocation. State Performance Measure #1 tracks the infant mortality rate, State Performance Measure #2 tracks the preterm birth rate and State Performance Measure #3 tracks the low birth rate. Additionally, these indicators, as well as the disparity ratio for infant mortality, are tracked through national outcome measures reported annually.

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*DELAWARE HEALTH AND SOCIAL SERVICES*

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Division of Public Health

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Center for Family Health Research and Epidemiology

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DELAWARE DIVISION OF PUBLIC HEALTH  
MATERNAL AND CHILD HEALTH PROGRAMS

Jesse Cooper Building

417 Federal Street Dover, DE 19901

(302) 744-4551

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