

Low Birthweight in Tennessee

1994-2004

Tennessee Department of Health
Office of Policy, Planning and Assessment
Surveillance, Epidemiology and Evaluation

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Executive Summary

This report provides information about low birthweight in Tennessee from 1994-2004. It describes trends in low birthweight rates and in the prevalence of risk factors for low birthweight in Tennessee, compares low birthweight rates among mothers with and without these risk factors, compares Tennessee with the United States, and provides regional and county level data.

Low Birthweight Rates

- From 1994-2004 the rate of low birthweight in Tennessee increased from 8.8 to 9.4 percent; the rate of very low birthweight did not change significantly during this time period.
- The rate of low birthweight in Tennessee was higher than that of the United States for all years between 1994 and 2004.
- Between 1994-2004 the incidence of low birthweight was:
 - higher among African Americans than among whites
 - higher among non-Hispanics than among Hispanics
 - higher among teenage mothers and mothers older than 34 years of age
 - higher among women with the following risk factors than in women without them: less than a high school education, household income less than \$25,000, unmarried, inadequate prenatal care, cigarette smoking, inadequate pregnancy weight gain, and multiple births (i.e. twins, triplets, etc.).
- Among singleton, low birthweight deliveries in Tennessee between 1994 and 2004, 30.0 percent were small for gestational age (SGA) alone, 55.3 percent were preterm alone, and 12.5 percent were *both* SGA and preterm.

Changes in Risk Factors for Low Birthweight

- Tennessee saw *decreases* in the prevalence of the following risk factors:
 - teenage mothers
 - smoking during pregnancy
 - mothers with less than a high school education
- Tennessee saw *increases* in the prevalence of the following risk factors:
 - older mothers
 - unmarried mothers
 - twin deliveries
 - mothers with inadequate pregnancy weight gain

Regional Trends

- Between 1994 and 2004 there were significant increases in the percentage of low birthweight births in the following Tennessee Department of Health regions: Hamilton, Sullivan, East, Mid-Cumberland, Northeast, Northwest, South Central, Southeast, Southwest, and Upper Cumberland. There were no regions or counties with significant decreases in the percentage of low birthweight.

Introduction

What is Low Birthweight?

Low birthweight is defined as infants weighing less than 2,500 grams (5 lbs., 8 oz.) at birth.¹

The major causes of low birthweight are:

- 1) being born premature (before the 37th week of pregnancy), and/or
- 2) being born underweight for a given gestational age (i.e. intrauterine growth restriction).²

Why is Low Birthweight a Problem?

Low birthweight infants are at increased risk for a variety of health problems including: cerebral palsy, seizure disorders, deafness, blindness, congenital anomalies, attention deficit and hyperactivity disorder, learning disabilities, asthma, upper and lower respiratory infections, and ear infections.^{2,3} In addition, low birthweight is the risk factor most closely associated with neonatal death.¹

What Causes Low Birthweight?

The table below summarizes the risk factors associated with low birthweight. While these risk factors are listed individually, it is important to keep in mind that they are not isolated events in women's lives, but rather are part of a complex web of social, environmental and individual factors.⁴ It is also important to note that while some risk factors are modifiable others are not. For example, lifestyle behaviors such as smoking are within a woman's immediate control and are amenable to intervention. On the other hand, a woman's race or the fact that she herself was a low birthweight baby can not be altered.

Risk Factors for Low Birthweight^{2,5}

A. DEMOGRAPHIC RISKS

- Age (less than 18, over 34)
- Race (black)
- Unmarried
- Low socioeconomic status
- Low level of education

B. MATERNAL FACTORS & MORBIDITY

- Maternal low birthweight
- Low prepregnancy weight
- Poor weight gain during pregnancy
- Hypotension
- Hypertension (chronic)
- Preeclampsia
- Diabetes
- Anemia
- Selected infections
- Uterine/cervical abnormalities

C. FETAL & OBSTETRIC FACTORS

- Parity (0 or more than 4)
- Short interpregnancy interval
- Prior low birthweight delivery
- Multiple pregnancy (twins, etc.)
- Fetal congenital/chromosomal abnormalities

D. BEHAVIORAL RISKS

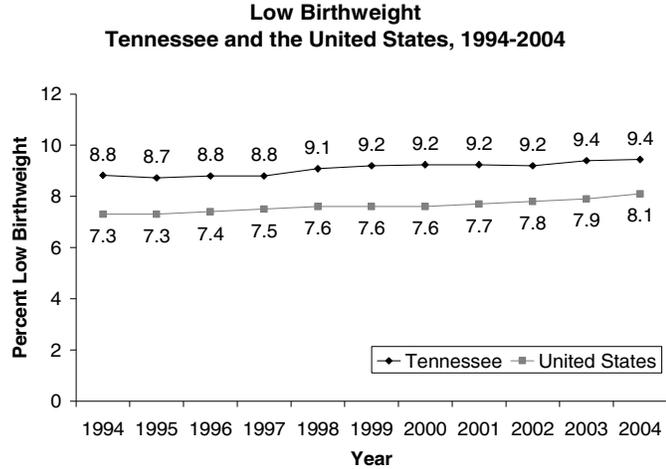
- Smoking
- Alcohol consumption
- Substance abuse
- Poor nutritional status

E. OTHER

- No or inadequate prenatal care
 - Iatrogenic prematurity
-

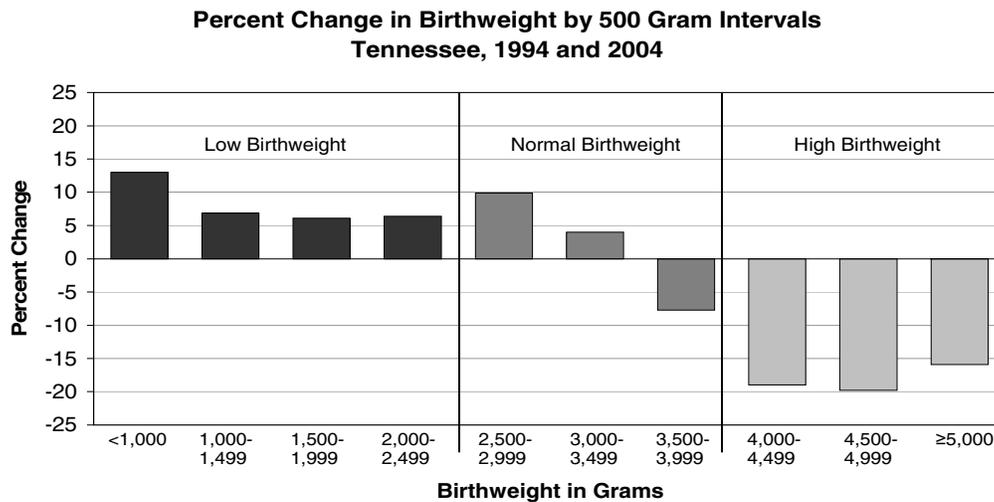
Low Birthweight Time Trends

- Between 1994 and 2004, the rate of low birthweight births in Tennessee was consistently higher than that of the United States.
- In 2004, 9.4 percent of births in Tennessee were low birthweight, while the U.S. rate was 8.1 percent.⁶
- The incidence of low birthweight in Tennessee increased 7 percent between 1994 and 2004 ($p < 0.001$), while the U.S. rate increased 11 percent.*



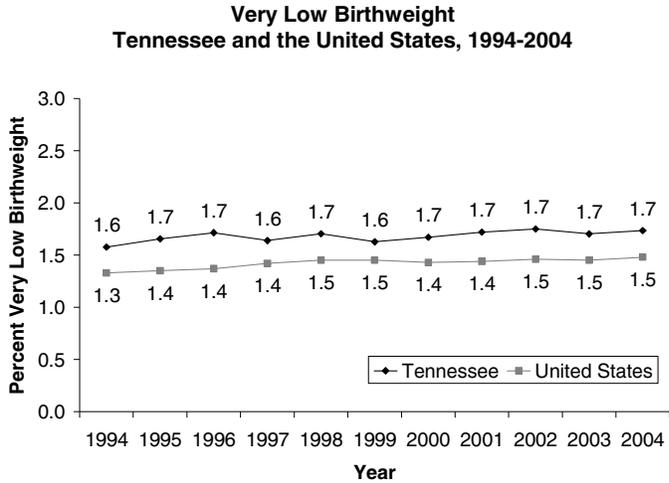
Healthy People 2010 Objective:
Reduce low birthweight to 5.0 percent of live born infants by year 2010.¹

- When birthweight trends were examined by 500 gram intervals, the largest changes were observed for low birthweight infants weighing less than 1,000 grams (*increased* 13 percent between 1994 and 2004) and for high birthweight infants weighing greater than 4,000 grams (*decreased* approximately 15-20 percent).



* See technical notes for explanation of statistical analysis methods.

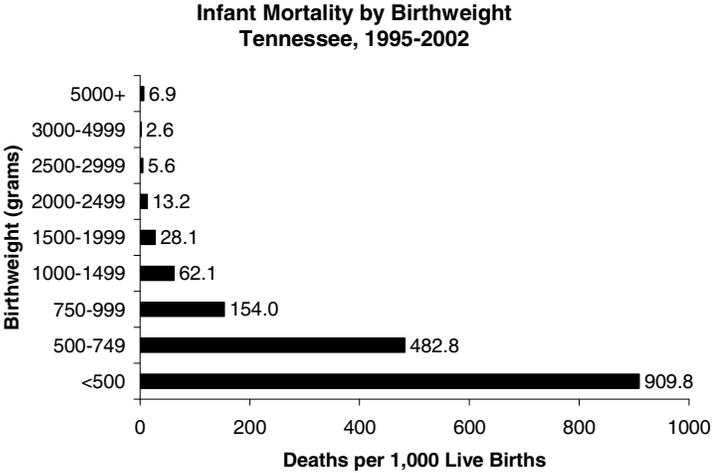
Low Birthweight Time Trends *cont.*



- Very low birthweight refers to a subset of low birthweight infants who are born weighing less than 1,500 grams (3 lbs., 5 oz.). In 2004, 1.7 percent of infants born in Tennessee were very low birthweight, compared to 1.5 percent for the United States.⁶
- The incidence of very low birthweight in Tennessee did not change significantly between 1994 and 2004 ($p=0.2$).

Healthy People 2010 Objective:
Reduce very low birthweight to 0.9 percent of live born infants by year 2010.¹

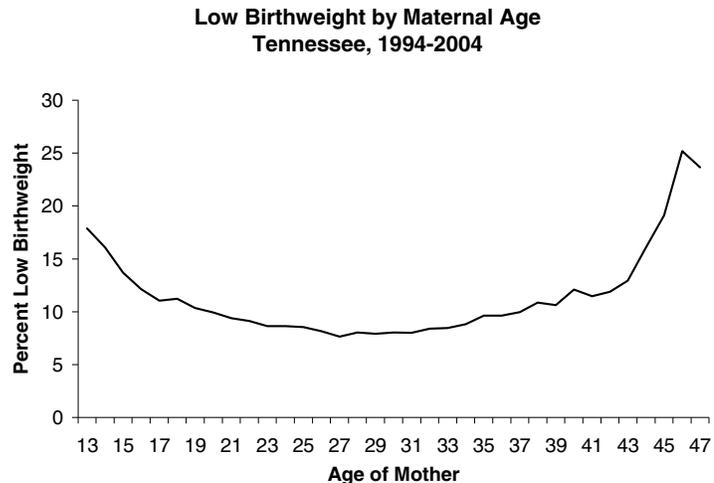
- Very low birthweight infants are at high risk of dying in their first year of life. Between 1995 and 2002, the mortality rate for these babies in Tennessee was 255.5 deaths per 1,000 live births, more than three times higher than low birthweight infants (61.2/1,000) and seventy-six times higher than normal weight infants (3.3/1,000).⁷



- Among very low birthweight infants, infant mortality increased from 62.1 deaths per 1,000 live births among infants weighing 1,000-1,499 grams to 909.8/1,000 for those weighing less than 500 grams.⁷ In other words, approximately 91 percent of infants born at less than 500 grams died within their first year of life.

Low Birthweight and Maternal Age

- Between 1994 and 2004, the incidence of low birthweight in Tennessee was highest among teenage mothers and among mothers older than 34 years of age.
- Compared to women aged 18-34 years, those less than 18 years old were 40 percent more likely to deliver a low birthweight infant ($p<0.001$).
- Compared to women aged 18-34 years, those older than 34 years old were 20 percent more likely to deliver a low birthweight infant ($p<0.001$).



Maternal age can affect birthweight through biologic pathways, social factors or both. It is generally believed that maternal age effects among older women are biologic, while the effects among very young mothers are due to social factors.⁸

Teenage mothers are more likely to be unmarried, poor, uneducated and late to prenatal care.²

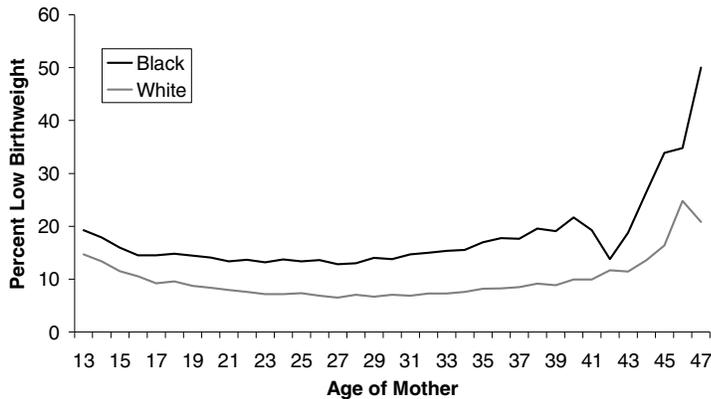
Older mothers are more likely to have hypertension, preeclampsia, gestational diabetes, chromosomal abnormalities, multiple gestations, and to use artificial reproductive technologies.^{9,10}

Low Birthweight Rate by Maternal Age Tennessee, 1994-2004

Maternal Age	Low Birthweight
≤ 14	16.5%
15-17	11.8%
18-19	10.7%
20-24	9.2%
25-29	8.1%
30-34	8.3%
35-39	10.0%
≥ 40	12.6%

Low Birthweight and Maternal Age *cont.*

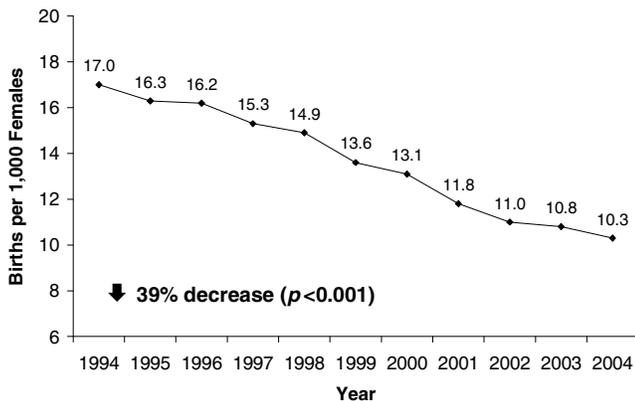
Low Birthweight by Maternal Age and Race
Tennessee, 1994-2004



- Blacks had higher rates of low birthweight than whites at all ages.
- The difference in low birthweight between blacks and whites was smallest for girls less than 17 years of age. As age increased this gap widened.

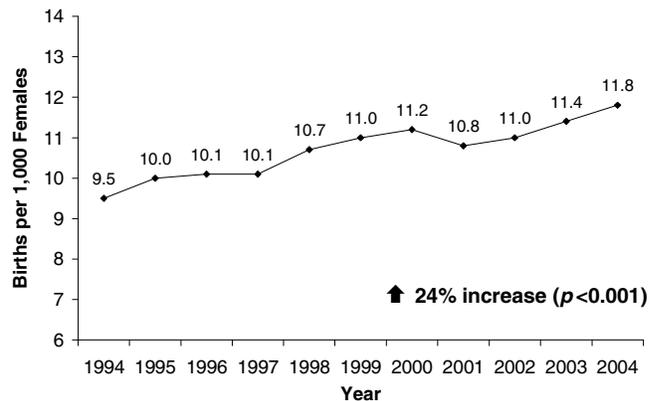
- Between 1994 and 2004, mean maternal age increased for both blacks (24.1 to 24.8 years) and for whites (25.6 to 26.7 years). For all races combined, mean maternal age increased from 25.0 to 26.1 years.
- Between 1994 and 2004 the birth rate among teenage girls aged 10-17 years decreased by 39 percent ($p < 0.001$) and the birth rate among women aged 35-49 years increased by 24 percent ($p < 0.001$).

Birth Rate Among 10-17 Year Olds
Tennessee, 1994-2004



In 2004, the birth rate among black teens (17.4/1000) was approximately double that among white teens (8.4/1000).

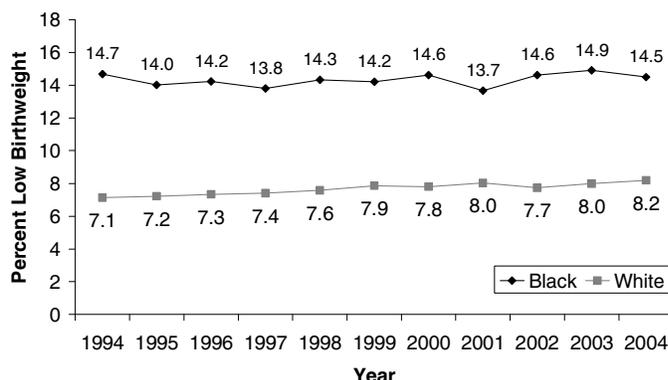
Birth Rate Among 35-49 Year Olds
Tennessee, 1994-2004



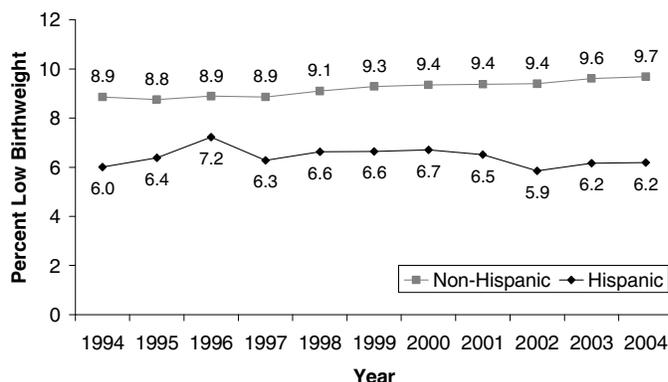
In 2004, the birth rate among white women aged 35-49 (12.1/1000) was slightly higher than that among black women (10.0/1000).

Low Birthweight and Maternal Race & Ethnicity

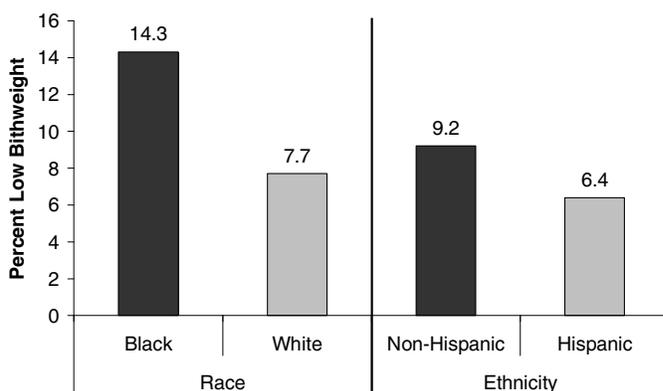
Low Birthweight by Race
Tennessee, 1994-2004



Low Birthweight by Ethnicity
Tennessee, 1994-2004

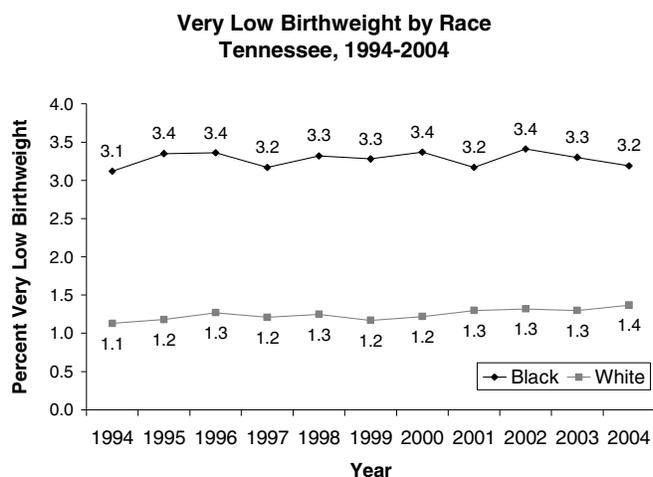


Low Birthweight by Race or Ethnicity
Tennessee, 1994-2004



- Although the gap in low birthweight between blacks and whites decreased slightly between 1994 and 2004, this decrease was not due to an improvement in low birthweight among black mothers, but rather to a worsening among white mothers.
- The rate of low birthweight among white mothers increased from 7.1 percent in 1994 to 8.2 percent in 2004 ($p < 0.001$). The rate of low birthweight among black mothers did not change significantly during this time period ($p = 0.4$).
- Between 1994 and 2004, the rate of low birthweight among black women (14.3 percent) was approximately twice that of white women (7.7 percent) ($p < 0.001$).
- The rate of low birthweight among non-Hispanic mothers increased from 8.9 percent in 1994 to 9.7 percent in 2004 ($p < 0.001$). The rate of low birthweight among Hispanic mothers did not change significantly during this time period ($p = 0.4$).
- Between 1994 and 2004, the rate of low birthweight among Hispanic women (6.4 percent) was lower than that among non-Hispanic women (9.2 percent) ($p < 0.001$).

Low Birthweight and Maternal Race & Ethnicity *cont.*



- The rate of very low birthweight among white mothers increased from 1.1 percent in 1994 to 1.4 percent in 2004 ($p<0.05$). The rate of very low birthweight among black mothers did not change significantly during this time period ($p=0.9$).
- Between 1994 and 2004, the rate of very low birthweight among black women (3.3 percent) was 1.5 times higher than that among white women (1.3 percent) ($p<0.001$).

Reasons for the higher risk of low birthweight among blacks are not clear. While the relationship between race/ethnicity and socioeconomic status (SES) is strong, it does not completely explain the large disparity in rates of low birthweight between blacks and whites – these disparities persist even after controlling for various measures of SES, such as income and education. In addition, differences in demographics, use of tobacco and other drugs, and maternal illnesses also fail to account completely for racial disparities.⁴

Although infant mortality in the United States decreased among all races between 1980 and 2000, the overall black-white gap for infant mortality widened. In other words, infant mortality decreased at a lower rate for blacks than for whites. The lack of progress in closing this gap is largely due to the persistence of an approximately twofold higher risk for low birthweight among black infants compared with white infants.¹¹

Note: In Tennessee, the infant mortality gap between blacks and whites did not change between 1995 and 2004.⁷

Low Birthweight and Maternal Race & Ethnicity *cont.*

- The prevalence of the following low birthweight risk factors was higher among black women than among white women: less than 18 years old, unmarried, less than a high school education, annual income less than \$25,000, no or inadequate prenatal care, inadequate pregnancy weight gain, and multiple gestation.[†]
- The prevalence of the following low birthweight risk factors was higher among white women than among black women: greater than 34 years of age and smoking during pregnancy.[†]
- Although the prevalence of the low birthweight risk factors listed below varied by race, the relative risk for low birthweight was similar for blacks and for whites for most of the risk factors. The major exception was multiple births, for which white mothers had a relative risk for low birthweight almost twice as high as black mothers.[‡]

Low Birthweight Risk Factors and Relative Risk by Maternal Race, Tennessee 1994-2004

Risk Factor	Risk Factor Prevalence (%) [†]		Relative Risk of LBW [‡]	
	African American	White	African American	White
Age < 18 years	9.1	3.8	1.1	1.3
Age > 34 years	7.3	10.1	1.3	1.2
Not Married	73.5	24.7	1.2	1.4
< High School Education	28.7	20.1	1.2	1.4
Annual Income < \$25,000*	76.3	41.4	1.5	1.3
Smoked During Pregnancy*	8.7	20.0	1.7	2.0
No or Inadequate Prenatal Care	13.6	5.6	1.4	1.6
Inadequate Pregnancy Weight Gain	17.5	11.5	2.0	2.0
Multiple Births	3.2	2.9	5.5	10.0

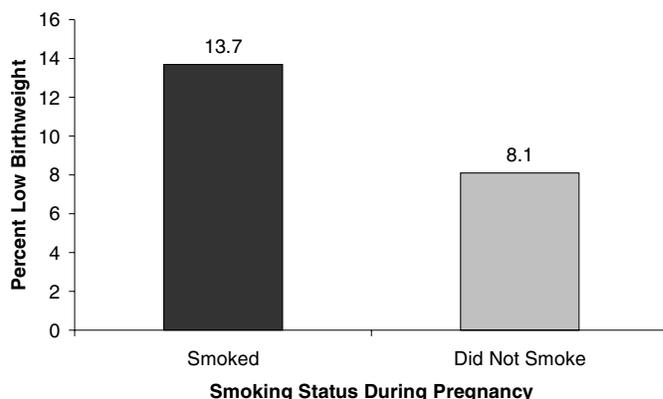
*Annual income was based on 2004 data and smoking status was based on 1994-2003 data.

[†] P-values for all comparisons of risk factor prevalence were significant at $p < .001$.

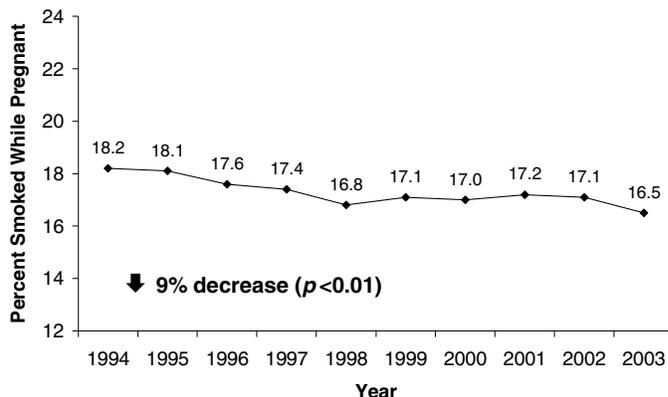
[‡] Relative risk is a measure of the strength of the association between a risk factor and an outcome. A relative risk greater than 1 indicates elevated risk. For example, a relative risk of 1.3 means that the risk of low birthweight among women with a certain risk factor is 30% higher than among women without that same risk factor. All relative risk estimates were significant (confidence intervals did not include 1). Confidence intervals for blacks and for whites overlapped for the following risk factors: income <\$25,000, no or inadequate prenatal care and inadequate pregnancy weight gain.

Low Birthweight and Smoking

**Low Birthweight by Maternal Tobacco Use
Tennessee, 1994-2003**



**Maternal Tobacco Use
Tennessee, 1994-2003**



- Between 1994 and 2003, the rate of low birthweight births was 69 percent higher among women who smoked cigarettes during pregnancy (13.7 percent) than among women who did *not* smoke during pregnancy (8.1 percent) ($p < 0.001$).
- The percentage of women who smoked cigarettes during pregnancy decreased from 18.2 percent in 1994 to 16.5 percent in 2003 ($p < 0.01$). The wording of this question changed on the 2004 birth certificate and data on tobacco use are therefore not directly comparable to earlier years.

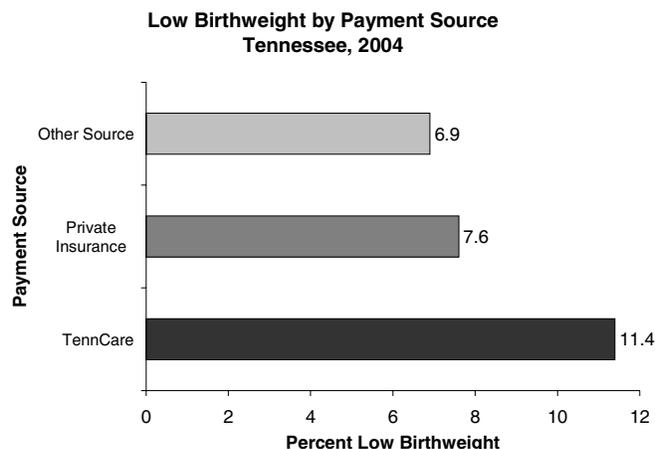
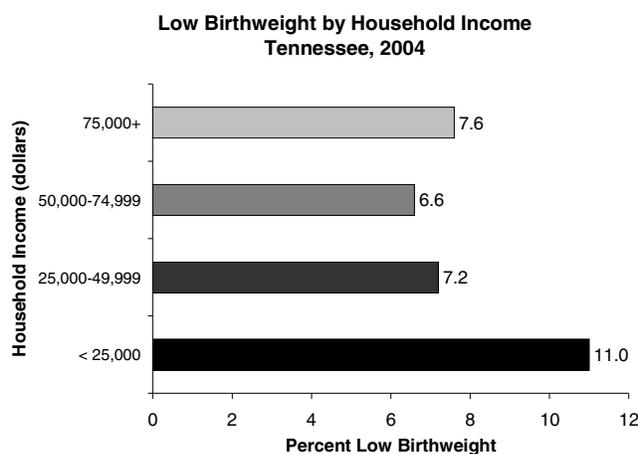
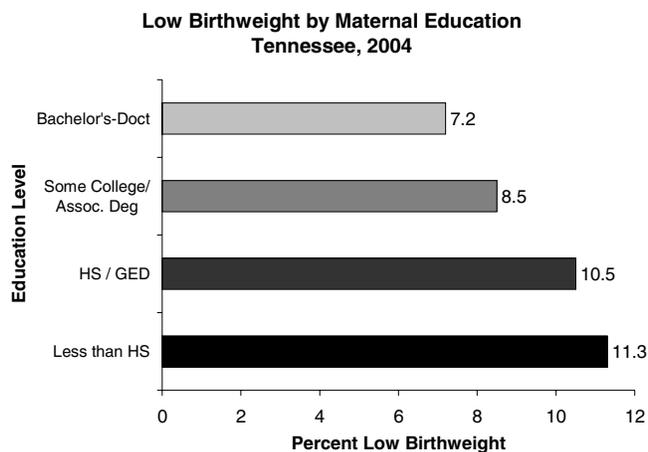
Smoking is the largest and most important known modifiable risk factor for low birthweight, accounting for 20-30 percent of all low birthweight deliveries in the United States.^{1,4} The effect of smoking appears to be attributable to intrauterine growth restriction rather than to preterm delivery.⁴

A dose-response relationship exists between the amount smoked and birthweight: the percent of low birthweight births increases with increasing number of cigarettes smoked during pregnancy.⁴

Most fetal growth takes place in the last trimester, so that quitting early in pregnancy can decrease the negative effect of smoking on birthweight. However, studies of women who quit cigarette smoking at almost *any* point during pregnancy show lower rates of low birthweight.⁴

Low Birthweight and Socioeconomic Status

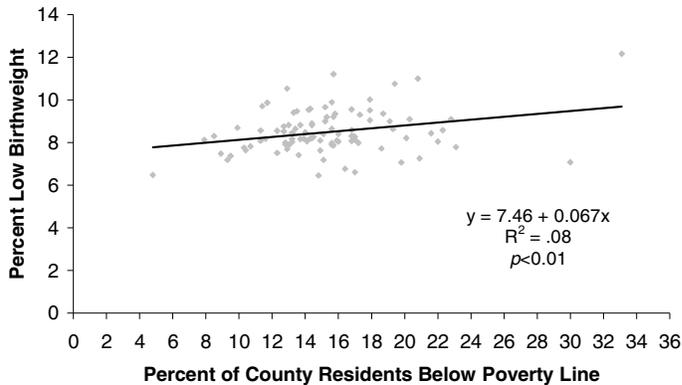
- In 2004, the incidence of low birthweight decreased with increasing maternal education level, from 11.3 percent among women with less than a high school education to 7.2 percent among those with a bachelor's or higher level college degree.
- Women with less than a high school education were 40 percent more likely to deliver a low birthweight infant than women with higher levels of education ($p < 0.001$).
- The incidence of low birthweight was highest among women with a household income of less than \$25,000 (11.0 percent).[§]
- Compared to women with a household income of \$25,000 or more, those earning less than \$25,000 were 54 percent more likely to deliver a low birthweight infant ($p < 0.001$).
- In 2004, mothers who received Medicaid or TennCare (11.4 percent) had a higher rate of low birthweight than mothers with private insurance (7.6 percent) and those using other sources of payment (6.9 percent).



[§] Information on income and payment were newly added to the 2004 birth certificate – please see Technical Notes.

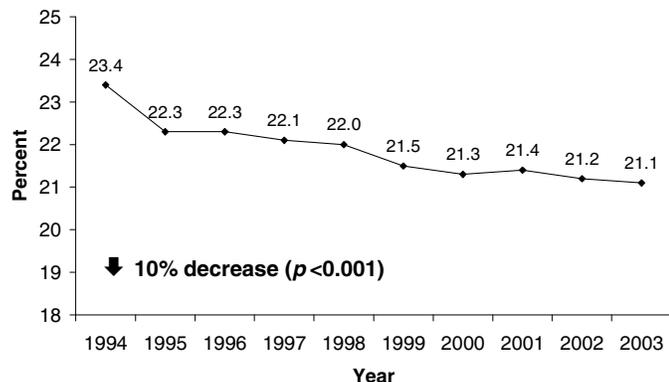
Low Birthweight and Socioeconomic Status *cont.*

**Low Birthweight by Poverty Level
Tennessee Counties, 1994-2004**



- Between 1994 and 2003, the percentage of mothers with less than a high school education decreased from 23.4 percent to 21.1 percent ($p < 0.001$). In 2004 the percentage of mothers with less than a high school education was 22.5 percent. However, the wording of this question changed on the 2004 birth certificate and education data are therefore not directly comparable to earlier years.

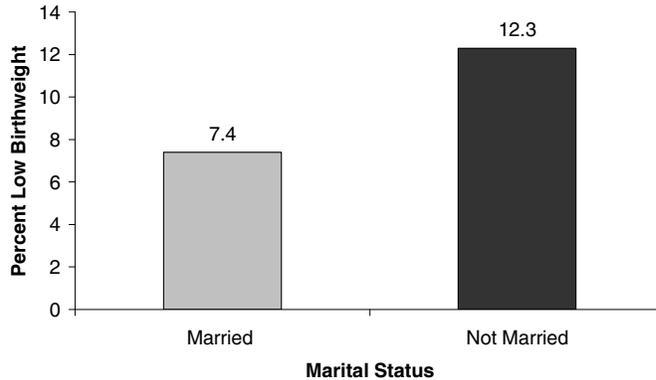
**Mothers with Less Than a High School Education
Tennessee, 1994-2003**



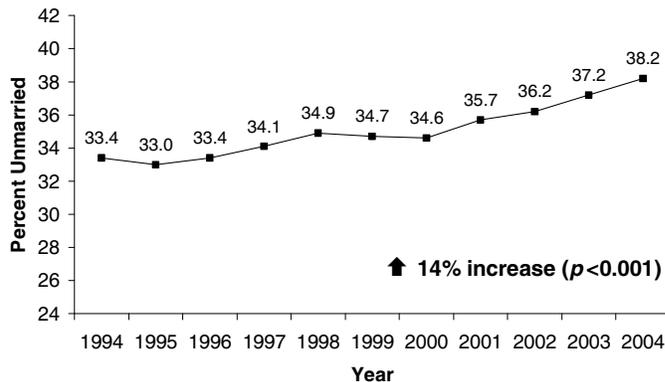
Like many other health conditions, low birthweight is strongly associated with socioeconomic status (SES). This association persists across various measures of SES, including income, education and occupation. It is thought that poverty – which is associated with reduced access to health care, poor nutrition, lower education, and inadequate housing – may be responsible for some of the increased risk.¹² In addition, low SES is linked to other risk factors such as race, smoking, some types of genitourinary tract infections, and maternal age and marital status.^{2,4,12} It has also been hypothesized that economic disadvantage may be a risk factor for low birthweight partly because of the high levels of stress and negative life events that are associated with being poor.⁴ The effect of SES probably represents the sum of many factors, each of which may increase the risk of poor pregnancy outcomes.²

Low Birthweight and Marital Status

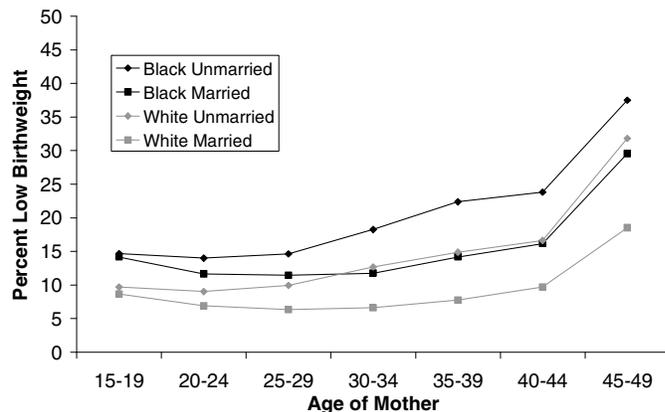
**Low Birthweight by Marital Status
Tennessee, 1994-2004**



**Unmarried Mothers
Tennessee, 1994-2004**



**Low Birthweight by Maternal Age, Race and Marital Status
Tennessee, 1994-2004**



- Between 1994 and 2004, the incidence of low birthweight births was 66 percent higher among women who were *not* married (12.3 percent) than among women who were (7.4 percent) ($p < 0.001$).
- The percentage of births to unmarried mothers increased by 14 percent between 1994 and 2004, from 33.4 percent to 38.2 percent ($p < 0.001$).

Out-of-wedlock birth has long been recognized as one of the demographic risk factors associated with low birthweight. However, the relationship between marital status and low birthweight varies considerably by race and age.¹³

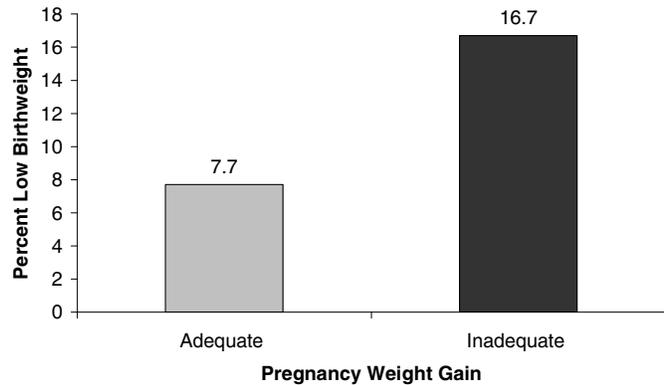
Low birthweight levels are higher for nonmarital versus marital births at all ages. However, marital status has less impact on low birthweight levels for births to teens (both black and white). This pattern is seen in both U.S. and Tennessee data.¹⁴

The principle benefits of marriage are economic and social support. However, teen mothers are more likely to have unstable marriages than are older married persons. In addition, married teens are more likely to establish independent households, thereby estranging themselves from financial and child-care support from relatives.^{13,14,15}

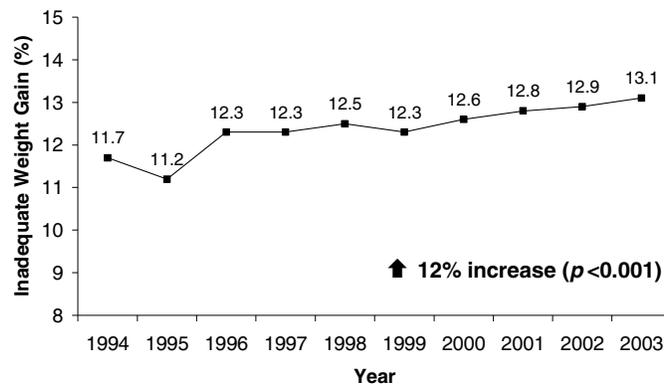
Low Birthweight and Pregnancy Weight Gain

- Between 1994 and 2003, the rate of low birthweight among women with inadequate pregnancy weight gain (defined as less than 16 lbs.)⁶ was approximately double that of women with adequate weight gain (16.7 vs. 7.7 percent, respectively) ($p < 0.001$).
- The percentage of mothers with inadequate pregnancy weight gain increased from 11.7 in 1994 to 13.1 in 2003 ($p < 0.001$). In 2004 the percentage of mothers with inadequate weight gain was 16.6 percent. However, the wording of this question changed on the 2004 birth certificate and data on pregnancy weight gain are therefore not directly comparable to earlier years.

Low Birthweight by Pregnancy Weight Gain
Tennessee, 1994-2003



Inadequate Pregnancy Weight Gain
Tennessee, 1994-2003



Inadequate pregnancy weight gain has been associated with an increased risk of intrauterine growth restriction, shortened gestational age, low birthweight and perinatal mortality.⁶

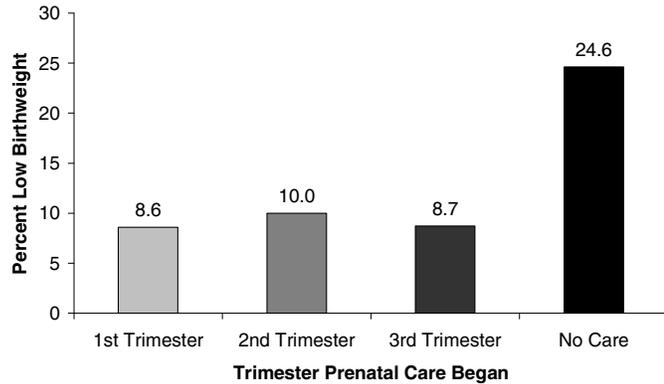
Maternal weight gain during pregnancy results from a variety of factors, including maternal dietary intake, prepregnancy weight and height, length of gestation and size of the fetus.⁴

Women at particular risk of poor dietary intake during pregnancy may require nutritional counseling and/or dietary supplementation. These women include pregnant adolescents; women with low income or limited food budgets; and women with poor knowledge of nutrition due to lack of education or illiteracy.⁴

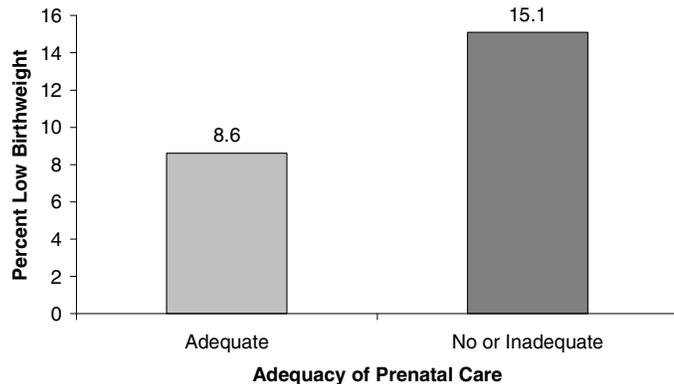
Low Birthweight and Prenatal Care

- Between 1994 and 2003, the rate of low birthweight deliveries was approximately three times higher in women receiving no prenatal care (24.6 percent) than in women who did receive prenatal care (8.7 percent) ($p < 0.001$).
- The low birthweight rates for women beginning prenatal care in the first, second or third trimester were similar (8.6, 10.0, and 8.7 percent, respectively), compared to women receiving no prenatal care (24.6 percent).
- Adequacy of prenatal care was also examined using the Kessner Adequacy of Prenatal Care Index, which considers both the timing of the first prenatal care visit as well as the total number of visits.¹⁶ The rate of low birthweight was 76% higher among women receiving no or inadequate prenatal care (15.1 percent) than among those receiving adequate care (8.6 percent) ($p < 0.001$).
- There was no significant change in the percentage of women receiving no or inadequate prenatal care between 1994 and 2003 ($p = 0.3$). In 2004 the percentage of mothers with no or inadequate prenatal care was 14.3 percent. However, the wording of this question changed on the 2004 birth certificate and data on prenatal care are therefore not directly comparable to earlier years.

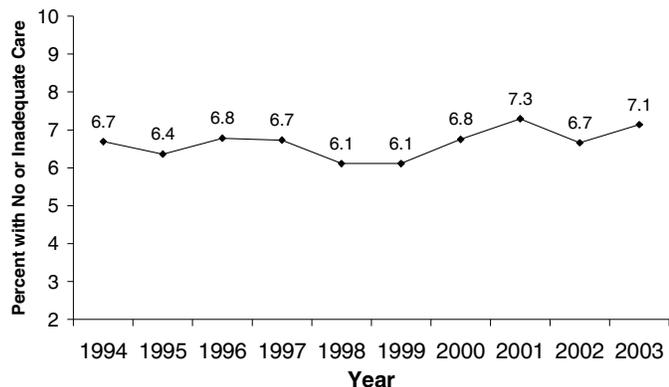
Low Birthweight by Prenatal Care Start Date
Tennessee, 1994-2003



Low Birthweight by Adequacy of Prenatal Care
Tennessee, 1994-2003

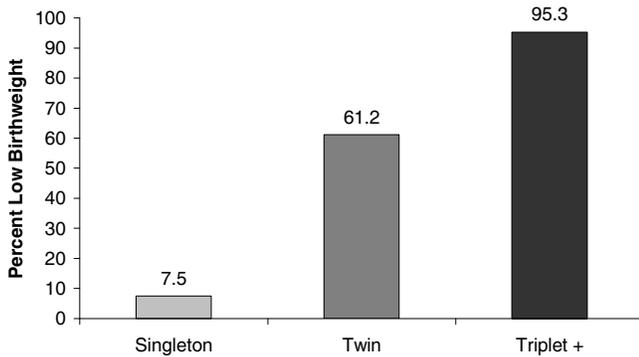


No or Inadequate Prenatal Care
Tennessee, 1994-2003

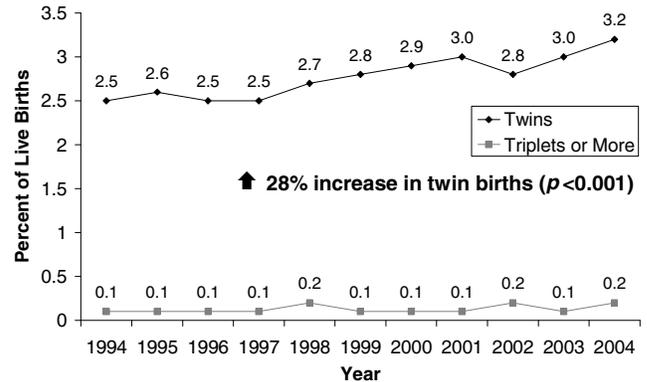


Low Birthweight and Multiple Births

**Low Birthweight by Single vs. Multiple Birth
Tennessee, 1994-2004**



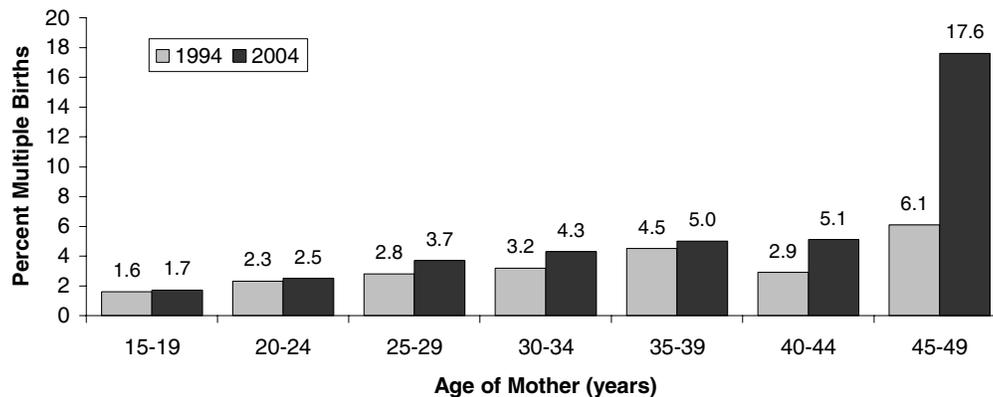
**Twins and Higher Order Multiple Births
Tennessee, 1994-2004**



- Between 1994 and 2004, 7.5 percent of singleton births were low birthweight, compared to 61.2 percent of twin births and 95.3 percent of triplet and higher order births.
- Multiples were 7 times more likely than singletons to be born low birthweight ($p < 0.001$).
- The percentage of births that were twins increased from 2.5 in 1994 to 3.2 in 2004 ($p < 0.001$). The percentage of triplet and higher order births did not change significantly during this time.
- The greatest increase in multiple births occurred among women 45-49 years old (a 190% increase).

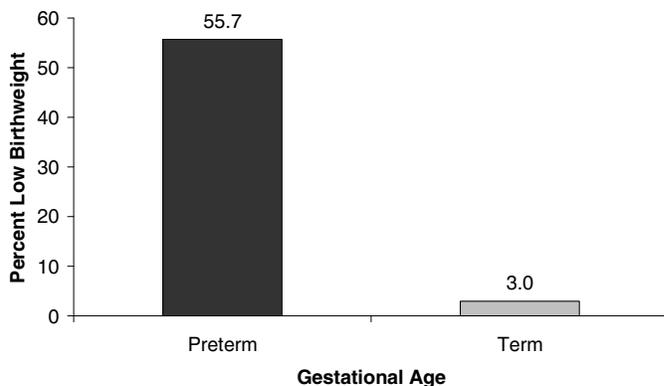
Older mothers are more likely than younger mothers to conceive multiples (twins, triplets, etc.) spontaneously. In addition, multiple deliveries are associated with fertility-enhancing therapies. Such therapies have been linked to increases in the birth rates for women 35 years and over which have been observed in the U.S. over the past 20 years.¹⁷

**Multiple Births by Maternal Age
Tennessee, 1994 and 2004**



Preterm Birth & Small for Gestational Age

**Low Birthweight by Gestational Age
Tennessee, 1994-2004**

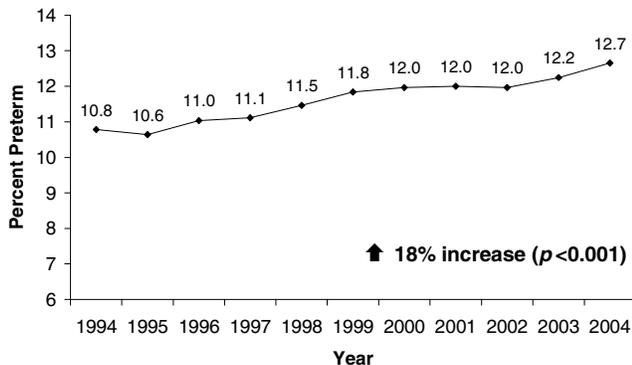


Preterm birth is defined as delivery before 37 completed weeks of gestation.

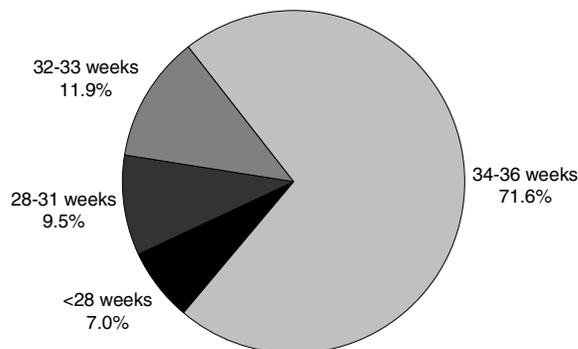
In Tennessee, fatal conditions resulting from preterm birth and/or low birthweight were the leading cause of infant mortality among blacks and the second leading cause among whites between 1999 and 2004.⁷

- Between 1994 and 2004, the rate of low birthweight among preterm infants (55.7 percent) was 18 times higher than that among term infants (3.0 percent) ($p < 0.001$).
- The rate of preterm birth increased from 10.8 percent in 1994 to 12.7 percent in 2004 ($p < 0.001$). Between 1994 and 2004 the majority of preterm infants were late preterm (34-36 weeks gestation).

**Preterm Birth
Tennessee, 1994-2004**



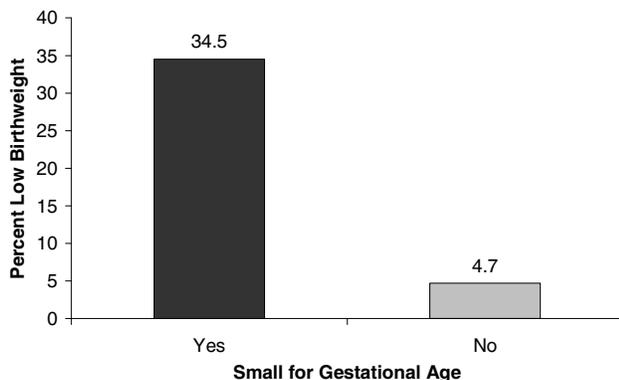
**Distribution of Preterm Births by Gestational Age
Tennessee, 1994-2004**



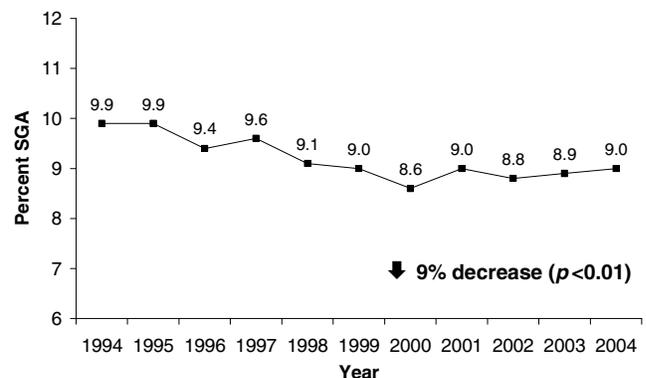
Preterm Birth and Small for Gestational Age *cont.*

- Between 1994 and 2004, the rate of low birthweight among singleton infants that were born small for gestational age (SGA) was 6 times higher than that among babies that were not SGA (34.5 percent vs. 4.7 percent) ($p < 0.001$).
- The percentage of singleton infants that were born small for gestational age decreased from 9.9 percent in 1994 to 9.0 percent in 2004 ($p < 0.01$).
- Among singleton, low birthweight deliveries in Tennessee between 1994 and 2004, 30.0 percent were SGA alone, 55.3 percent were preterm alone, and 12.5 percent were *both* SGA and preterm.

Low Birthweight by Small for Gestational Age
Tennessee, 1994-2004



Small for Gestational Age
Tennessee, 1994-2004



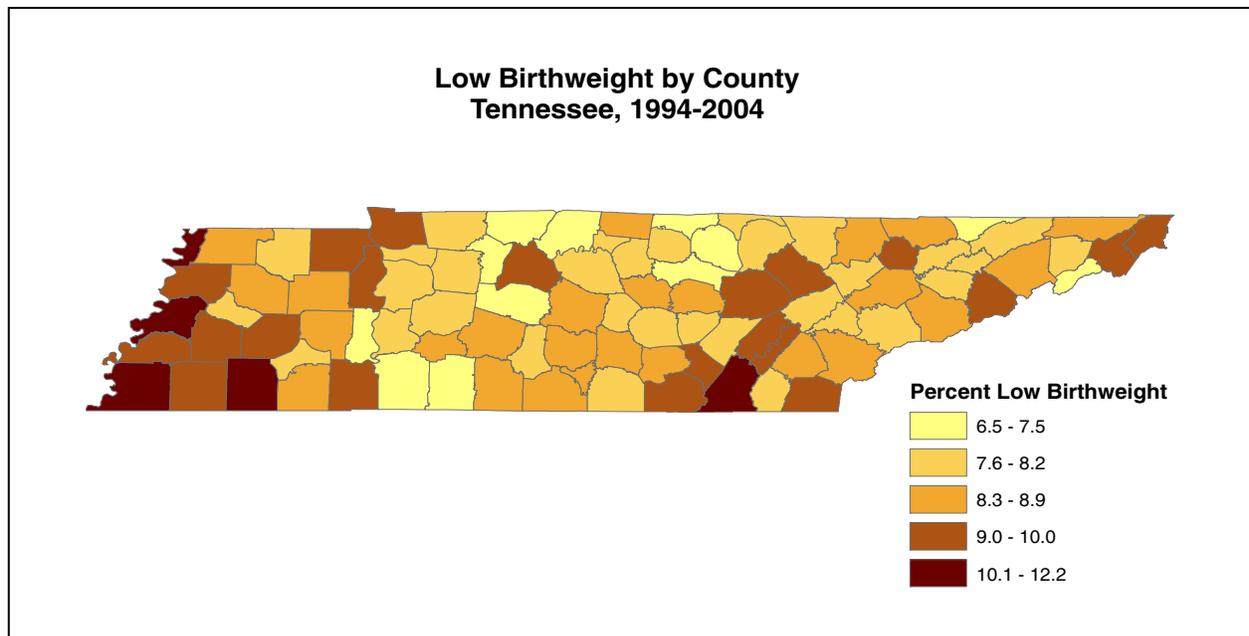
Intrauterine growth restriction (IUGR) is a condition in which a fetus fails to reach its expected size at a given gestational age.¹⁸ Perinatal mortality among IUGR infants is six to ten times that of infants with normal growth.¹ Causes of IUGR include the following: placental insufficiency, chronic maternal disease, genetic disorders, infections, and substance abuse.¹⁹

Small for gestational age (SGA) refers to infants born in the smallest 10th percentile of birthweight at any given gestational age.¹⁸

Although the terms IUGR and SGA are sometimes used interchangeably, it should be noted that not all SGA infants are growth restricted. Approximately 30 percent of fetuses with a birthweight below the 10th percentile are IUGR. The remaining 70 percent are constitutionally small, meaning that they are small but are well proportioned and developmentally normal, and have reached their appropriate growth potential.¹⁹

Regional and County Data

- Low birthweight rates varied substantially based on mother's county of residence. The map below depicts low birthweight rates across Tennessee by county, based on combined data from 1994 through 2004.
- For this 11-year time period, the average low birthweight rate ranged from 6.5 percent in Lawrence and Williamson Counties to 12.2 percent in Lake County. No counties met the Healthy People 2010 goal of a 5 percent low birthweight rate.
- The ten counties with the highest low birthweight rates were: Lake (12.2%), Shelby (11.2%), Hardeman (11.0%), Lauderdale (10.8%), Hamilton (10.5%), Haywood (10.0%), Polk (9.9%), Tipton (9.9%), Fayette (9.7%), Rhea (9.7%).
- The ten counties with the lowest low birthweight rates were: Lawrence (6.5%), Williamson (6.5%), Overton (6.6%), Decatur (6.8%), Clay (7.1%), Hancock (7.1%), Putnam (7.2%), Sumner (7.2%), Wayne (7.3%), Robertson (7.4%).
- In general, rates were higher in urban areas. Overall, the low birthweight rate for urban counties was 10.1 percent compared to 8.3 percent for rural counties.
- Among urban counties, Sullivan and Knox had the lowest percentage of low birthweight deliveries (8.5 and 8.6 percent, respectively), whereas Shelby had the highest (11.2 percent).
- Among rural counties, Lawrence and Williamson had the lowest percentage of low birthweight deliveries (both 6.5 percent) and Lake had the highest (12.2 percent).



Regional and County Data *cont.*

The following tables present the number and rate of low birthweight (LBW) deliveries by county and region for the years 1994-2004 combined. Also included are the low birthweight rates for the individual years 1994 and 2004. Among the 14 Tennessee Department of Health regions, all rural regions and two metropolitan regions (Hamilton and Sullivan) had statistically significant *increases* in low birthweight during this time period. Twenty-four counties had significant *increases* in the rate of low birthweight. *No* counties had significant *decreases* in low birthweight. [Only those time trends that are significant are included in the tables. Annual rates are not shown for those counties with less than 100 births in 1994 and/or 2004.]

Metropolitan Regions

County	1994-2004 Combined Data			1994-2004 Trend		
	LBW Births (#)	Total Births (#)	LBW Rate (%)	1994 LBW Rate (%)	2004 LBW Rate (%)	Trend (<i>p</i> <.05)
Davidson	8,878	94,456	9.4	9.7	9.3	
Hamilton	4,528	43,006	10.5	8.5	11.6	increasing
Knox	4,502	52,652	8.6	8.2	8.6	
Madison	1,350	14,092	9.6	8.7	9.0	
Shelby	18,016	160,911	11.2	11.9	11.3	
Sullivan	1,584	18,584	8.5	7.4	10.1	increasing

East Region

County	1994-2004 Combined Data			1994-2004 Trend		
	LBW Births (#)	Total Births (#)	LBW Rate (%)	1994 LBW Rate (%)	2004 LBW Rate (%)	Trend (<i>p</i> <.05)
Anderson	677	8,800	7.7	5.9	8.5	
Blount	1,052	13,578	7.8	7.8	9.2	increasing
Campbell	441	5,234	8.4	7.5	9.1	increasing
Claiborne	336	3,895	8.6	7.4	10.1	increasing
Cocke	406	4,464	9.1	12.4	9.7	
Grainger	221	2,738	8.1	6.1	11.1	
Hamblen	706	8,628	8.2	10.8	7.7	
Jefferson	438	5,442	8.1	5.5	8.2	increasing
Loudon	394	5,161	7.6	7.3	7.3	
Monroe	449	5,425	8.3	7.0	9.0	increasing
Morgan	228	2,439	9.4	5.7	10.7	
Roane	500	6,232	8.0	9.5	6.2	
Scott	265	3,297	8.0	8.3	5.4	
Sevier	852	9,657	8.8	9.3	9.4	
Union	227	2,387	9.5	9.1	7.0	
Region Total	7,192	87,377	8.2	8.1	8.6	increasing

Mid-Cumberland Region **

County	1994-2004 Combined Data			1994-2004 Trend		
	LBW Births (#)	Total Births (#)	LBW Rate (%)	1994 LBW Rate (%)	2004 LBW Rate (%)	Trend ($p < .05$)
Cheatham	392	5,245	7.5	5.2	9.8	
Dickson	541	6,624	8.2	8.1	6.8	
Houston	93	1,133	8.2	5.5	10.1	
Humphreys	182	2,301	7.9	4.7	8.9	
Montgomery	2,105	26,064	8.1	8.0	9.3	increasing
Robertson	650	8,821	7.4	7.1	8.1	
Rutherford	2,491	30,011	8.3	8.17	8.22	increasing
Stewart	147	1,552	9.5	5.3	13.6	
Sumner	1,343	18,692	7.2	6.1	7.9	increasing
Trousdale	82	1,002	8.2	--	--	
Williamson	1,128	17,446	6.5	4.8	6.5	
Wilson	1,033	12,703	8.1	6.6	9.0	increasing
Region Total	10,187	131,594	7.7	7.0	8.2	increasing

Northeast Region **

County	1994-2004 Combined Data			1994-2004 Trend		
	LBW Births (#)	Total Births (#)	LBW Rate (%)	1994 LBW Rate (%)	2004 LBW Rate (%)	Trend ($p < .05$)
Carter	596	6,411	9.3	7.6	10.4	increasing
Greene	650	7,866	8.3	9.2	8.8	
Hancock	58	820	7.1	--	--	
Hawkins	520	6,824	7.6	7.1	6.9	
Johnson	157	1,728	9.1	6.8	13.3	increasing
Unicoi	153	2,065	7.4	7.2	6.8	
Washington	1,152	14,115	8.2	7.5	10.6	increasing
Region Total	3,286	39,829	8.3	7.8	9.6	increasing

Northwest Region **

County	1994-2004 Combined Data			1994-2004 Trend		
	LBW Births (#)	Total Births (#)	LBW Rate (%)	1994 LBW Rate (%)	2004 LBW Rate (%)	Trend ($p < .05$)
Benton	178	1,864	9.6	9.3	13.0	
Carroll	336	4,005	8.4	9.8	7.9	
Crockett	157	1,971	8.0	7.0	5.1	
Dyer	507	5,508	9.2	7.9	10.4	
Gibson	581	6,596	8.8	6.2	8.8	
Henry	359	3,908	9.2	6.4	8.3	
Lake	107	880	12.2	--	--	
Obion	393	4,492	8.8	6.2	11.4	increasing
Weakley	324	4,105	7.9	8.8	7.0	
Region Total	2,942	33,329	8.8	7.9	9.3	increasing

South Central Region **

County	1994-2004 Combined Data			1994-2004 Trend		
	LBW Births (#)	Total Births (#)	LBW Rate (%)	1994 LBW Rate (%)	2004 LBW Rate (%)	Trend ($p < .05$)
Bedford	514	6,105	8.4	6.7	7.5	
Coffee	625	7,090	8.8	8.3	7.5	
Giles	320	3,786	8.5	7.9	6.3	
Hickman	239	2,955	8.1	5.4	6.0	
Lawrence	399	6,185	6.5	6.1	5.2	
Lewis	127	1,536	8.3	3.2	7.6	
Lincoln	354	4,095	8.6	7.9	12.7	
Marshall	295	3,773	7.8	10.6	8.7	
Maury	899	10,497	8.6	7.4	8.6	
Moore	51	587	8.7	--	--	
Perry	81	1,030	7.9	--	--	
Wayne	134	1,848	7.3	6.7	11.2	
Region Total	4,038	49,487	8.2	7.2	8.1	increasing

Southeast Region

County	1994-2004 Combined Data			1994-2004 Trend		
	LBW Births (#)	Total Births (#)	LBW Rate (%)	1994 LBW Rate (%)	2004 LBW Rate (%)	Trend ($p < .05$)
Bledsoe	115	1,401	8.2	9.3	9.0	increasing
Bradley	1,008	12,615	8.0	8.9	7.2	
Franklin	385	4,896	7.9	6.2	9.9	
Grundy	187	2,179	8.6	5.1	10.3	
Marion	354	3,715	9.5	11.1	7.4	
McMinn	574	6,449	8.9	8.4	9.3	increasing
Meigs	134	1,483	9.0	4.5	6.0	
Polk	210	2,123	9.9	9.4	12.0	increasing
Rhea	403	4,170	9.7	6.9	10.4	increasing
Sequatchie	146	1,564	9.3	9.0	6.3	
Region Total	3,516	40,595	8.7	8.2	8.6	increasing

Southwest Region

County	1994-2004 Combined Data			1994-2004 Trend		
	LBW Births (#)	Total Births (#)	LBW Rate (%)	1994 LBW Rate (%)	2004 LBW Rate (%)	Trend (p<.05)
Chester	159	1,966	8.1	8.2	8.1	
Decatur	97	1,434	6.8	5.6	4.3	
Fayette	417	4,300	9.7	7.4	11.3	
Hardeman	408	3,709	11.0	8.8	12.7	increasing
Hardin	279	3,104	9.0	3.6	11.4	increasing
Haywood	320	3,198	10.0	7.6	8.4	
Henderson	316	3,729	8.5	11.4	8.3	
Lauderdale	461	4,288	10.8	8.7	11.8	
McNairy	304	3,537	8.6	9.7	10.8	
Tipton	761	7,718	9.9	7.9	8.9	
Region Total	3,522	36,983	9.5	8.1	10.0	increasing

Upper Cumberland Region **

County	1994-2004 Combined Data			1994-2004 Trend		
	LBW Births (#)	Total Births (#)	LBW Rate (%)	1994 LBW Rate (%)	2004 LBW Rate (%)	Trend (p<.05)
Cannon	131	1,604	8.2	9.4	12.6	
Clay	64	906	7.1	--	--	
Cumberland	488	5,425	9.0	6.9	11.3	increasing
Dekalb	199	2,302	8.6	8.6	11.8	
Fentress	177	2,275	7.8	10.9	11.1	
Jackson	94	1,217	7.7	12.7	4.8	
Macon	233	2,808	8.3	7.1	12.7	
Overton	168	2,545	6.6	10.0	10.4	
Pickett	47	589	8.0	--	--	
Putnam	641	8,931	7.2	5.8	9.0	increasing
Smith	176	2,345	7.5	3.4	7.0	
Van Buren	51	627	8.1	--	--	
Warren	456	5,671	8.0	8.7	8.2	
White	261	3,112	8.4	6.9	10.5	increasing
Region Total	3,186	40,357	7.9	7.4	9.7	increasing

** Rates are not reported for those counties with less than 100 births in 1994 and/or 2004 (indicated by "--").

Summary

Rates of low birthweight in Tennessee have increased slightly over the past ten years and have remained consistently higher than U.S. rates. The groups at greatest risk include African Americans, teenage mothers, older mothers, unmarried mothers, smokers, those who receive no or inadequate prenatal care, those with low socioeconomic status, and those with maternal or fetal factors such as inadequate pregnancy weight gain and multiple births. Racial disparities exist both in the incidence of low birthweight and in the prevalence of the recognized risk factors associated with low birthweight. These risk factors will need to be addressed if Tennessee is to reach the Healthy People 2010 goal of reducing low birthweight to 5.0 percent of live-born infants.

The appendix lists some of the Tennessee Department of Health Programs already in place to provide preconception and prenatal services to women and their families. These programs are critical not only for addressing the problem of low birthweight but also for reducing infant mortality and improving the overall health of women and children. However, such programs are only part of the solution. Future improvements in rates of low birthweight both in Tennessee and in the nation will require attention to larger societal issues such as poverty and education, as well as access to and utilization of high quality health care.

Appendix. TDH Programs Providing Preconception and Prenatal Services

ABSTINENCE EDUCATION

The Department's abstinence education program administers several community and school-based sites equipping youth with information on abstinence and making positive, beneficial decisions. In addition, the program offers informational brochures for parents who are interested in learning how to talk to their children about abstinence, as well as brochures for youth regarding abstinence, building resistance skills, avoiding negative peer pressure, how alcohol and other drugs affect decision making, and building self-esteem.

FOR MORE INFORMATION, CALL YOUR LOCAL HEALTH DEPARTMENT OR CALL 1-800-521-TEEN.

TENNESSEE ADOLESCENT PREGNANCY PREVENTION PROGRAM (TAPPP)

TAPPP has three primary goals: (1) to promote community awareness and involvement in adolescent pregnancy and parenting issues; (2) to facilitate collaboration among various sectors of the community to enhance and increase prevention efforts; and (3) to coordinate, improve and expand services available to pregnant and parenting adolescents. There are thirteen regional and metro TAPPP coordinators for the state.

FOR MORE INFORMATION, CALL YOUR LOCAL HEALTH DEPARTMENT OR CALL (615) 741-7353.

COMMUNITY PREVENTION INITIATIVE

Community Prevention Initiative Programs target children 8-16 years of age. These programs focus on substance abuse prevention and adolescent pregnancy prevention.

FOR MORE INFORMATION, CALL YOUR LOCAL HEALTH DEPARTMENT OR CALL (615) 532-8481.

PERINATAL REGIONALIZATION

The perinatal regionalization program was established to provide for the diagnosis and treatment of certain life-threatening conditions of pregnant women and newborn infants. The five regional perinatal centers across the state have made this specialized care available by providing a statewide mechanism to health care providers for consultation and referral of high risk patients; transport of these patients, if necessary; personnel skilled in high risk perinatal care; post-graduate education for physicians, nurses, and other medical personnel; and site visits to local hospitals.

FOR MORE INFORMATION, CALL YOUR LOCAL HEALTH DEPARTMENT OR CALL (615) 741-7353.

PRENATAL CARE

Basic prenatal care services are provided at all local health department clinics and include pregnancy testing, education, presumptive eligibility, referral for WIC, and referral for obstetric medical management. Selected counties across the state provide full service obstetrical care for pregnancy women.

FOR MORE INFORMATION, CALL YOUR LOCAL HEALTH DEPARTMENT OR CALL (615) 741-7353.

HELP US GROW SUCCESSFULLY (HUGS)

HUGS is a home-based program where staff assist pregnant women, postpartum women for up to two years, and infants and children up to age six in gaining access to medical, social, and educational services. HUGS services are available throughout the state.

FOR MORE INFORMATION, CALL YOUR LOCAL HEALTH DEPARTMENT OR CALL (615) 741-0329.

CHILD HEALTH AND DEVELOPMENT (CHAD)

CHAD is a home-based program available in several counties for pregnant women and children ages birth to six. CHAD helps prevent or reduce abuse, neglect and developmental delays by providing parent support and education services.

FOR MORE INFORMATION, CALL YOUR LOCAL HEALTH DEPARTMENT OR CALL (615) 741-0329.

GENETICS AND NEWBORN SCREENING

The Genetics and Newborn Screening program provides access to genetic screening, diagnostic testing, and counseling services for individuals and families who have, or are at risk for, genetic disorders. The newborn screening program screens all babies born in Tennessee for certain genetic conditions and then refers those identified for further diagnosis and treatment. Most babies born in Tennessee receive hearing screening shortly after birth usually prior to hospital discharge.

FOR MORE INFORMATION, CALL (615) 262-6304.

FAMILY PLANNING PROGRAM

The family planning program provides education and counseling, medical examinations, laboratory tests, and contraceptive supplies for any person of reproductive age. Services are available in all 95 counties at 131 clinic sites which include all local health departments, Planned Parenthood clinics, some student health clinics, and primary care clinics.

FOR MORE INFORMATION, CALL YOUR LOCAL HEALTH DEPARTMENT OR CALL (615) 741-7353.

WOMEN, INFANTS, AND CHILDREN (WIC)

Food, nutrition counseling, and access to health services are provided to low-income women, infants, and children under the Special Supplemental Nutrition Program for Women, Infants, and Children, popularly known as WIC. WIC provides federal funds to Tennessee to provide supplemental foods, health care referrals, and nutrition education for low-income pregnant, breastfeeding, and non-breastfeeding postpartum women, and to infants and children who are found to be at nutritional risk.

FOR MORE INFORMATION, CALL YOUR LOCAL HEALTH DEPARTMENT OR CALL 1-800-DIAL-WIC (1-800-342-5942).

Technical Notes

Data shown in this report are based on birth certificate data collected by the Tennessee Department of Health. All data are for resident births that occurred both in and out of state. Data were collected on the 1989 Revision of the Tennessee version of the U.S. Standard Certificate of Live Birth for 2003 and earlier. Beginning in 2004, data were collected on the 2003 revision of the Tennessee version of the U.S. Standard Certificate of Live Birth. The questions used to obtain mother's highest level of education, prenatal care, pregnancy weight gain, and smoking status in 2004 were modified from the questions used to gather the same information in 2003 and earlier. The questions used to obtain annual household income and payment source were also newly added to the 2004 birth certificate. County poverty level was based on 2002 U.S. Census data. Race of white and black populations includes ethnic groups such as Hispanic. In this report, "Urban" refers to a resident in one of the six metropolitan counties: Shelby, Madison, Davidson, Knox, Hamilton and Sullivan. "Rural" counties are all other counties. The Kessler Adequacy of Prenatal Care Index was determined using calculated gestational age (i.e. based on last menstrual period). Small for gestational age was calculated as less than the 10th percentile of birthweight by gender and gestational age for singleton births based on Tennessee's 1994-2004 birth data. Data were analyzed using SAS version 9.1. Categorical variables were compared and tested for statistical significance using a chi-square test. Time trends of low birthweight prevalence and risk factor prevalence were analyzed using linear regression.

Definitions^{2,18}

Eclampsia/preeclampsia: A specific syndrome of pregnancy characterized by hypertension, edema, and proteinuria. When convulsions and coma are associated, it is called eclampsia.

Infant death: Death of an infant less than 1 year old.

Infant mortality rate: The number of infant deaths per 1,000 live births in a population.

Iatrogenic prematurity: Premature delivery of an infant as a result of medical intervention intended to avert more serious consequences for the mother or infant.

Interpregnancy interval: Time between the previous birth and conception of the next pregnancy.

Intrauterine growth restriction (IUGR): The failure of a fetus to maintain its expected growth potential at any stage of gestation. Infants with IUGR may be born at full term but are smaller than expected.

Low birthweight: Weight at birth of less than 2,500 grams (5 lbs., 8 oz.).

Multiple birth: The birth of two or more children from a single term of pregnancy.

Neonatal death: The death of an infant less than 28 days after birth.

Parity: The number of live-born children a woman has delivered.

Premature/preterm birth: Birth occurring before 37 weeks of pregnancy.

Prenatal care: Pregnancy-related health care services provided to a woman between conception and delivery.

Small for gestational age (SGA): The smallest 10th percentile of birthweight at any given gestational age.

TennCare: Tennessee's expanded Medicaid program. It provides health insurance for low income persons who are Medicaid eligible, as well as for Medicaid *ineligible* persons who meet the State's criteria as being either uninsured or uninsurable.

Very low birthweight: Weight at birth of less than 1,500 grams (3 lbs., 5 oz.).

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