

Infant Mortality in Mississippi, 1996-2005: Trend and Risk Analysis

Advisory Committee:

Daniel R. Bender, MHS, Health Services Director
Nicholas Mosca, DDS, State Dental Director
LeDon Langston, MD, Medical Consultant
Rosalyn Walker, MD, Medical Consultant
Louisa Denson, LSW, MPPA, CPM, Women's Health Director
Geneva Cannon, RN, MHS, Child and Adolescent Health Director
Kathy Burk, MSW, LSW, WIC Director
Juanita Graham, MSN, RN, Health Services Chief Nurse
Terry Beck, MSW, Program Consultant

Prepared By:

Lei Zhang, PhD, Director
Sandra Hayes, MPH, Epidemiologist
Charles Sledge, Jr., MS, Research Biostatistician
Vernesia Wilson, MPH, PRAMS Coordinator
Juanita Graham, MSN, RN, Health Services Chief Nurse

Mississippi Department of Health
Bureau of Health Data and Research

February 01, 2007

Acknowledgements

Dick Johnson, Systems Manager
Carl Haydel, Business Systems Analyst

Office of Vital Statistics
Mississippi Department of Health

Table of Contents

	Page
Executive Summary	4
I. Introduction	6
II. Methods	7
III. Data Analysis	8
IV. Risk Factors	16
V. Recommendations	21
VI. Appendices	23
A. Infant mortality rates by county and race, 1996-2005	24
B. Top ten counties on Mississippi infant mortality, 1996-2005	25
C. Infant mortality rates and numbers of deaths by county, 1996-2005	26
D. Infant mortality rates by other factors, 1996-2005	28
E. Social Cognitive Theory Concepts Model	31
F. Glossary of terms	32
G. References	33

Infant Mortality in Mississippi, 1996-2005: Trend and Risk Analysis

Executive Summary

Objective: To describe the pattern of infant mortality, delineate contributing factors, and identify strategies for reducing Mississippi's infant mortality rate.

Background: During the past ten years (1996 to 2005), the rate of Mississippi infants dying in the first year of life has fluctuated with no clear pattern. The rate ranged from 9.7 deaths per 1,000 live births in 2004 to 11.4 in 2005. On average, there were approximately 445 deaths among some 42,300 births each year. In 2003, Mississippi and Alabama tied for 49th in the nation for infant mortality. The Healthy People 2010 goal is to reduce infant mortality in the United States to 4.5 deaths per 1,000 live births by the year 2010 (CDC, 2002). Given Mississippi's 2005 rate of 11.4, an additional reduction of 6.9 deaths per 1,000 live births poses a tremendous challenge.

Methods: Mississippi Vital Statistics serves as the principal data source. Additional data sources include the 2003 Mississippi PRAMS Surveillance Report and results from a study of Mississippi's 1996-2003 linked birth and death certificate files. The descriptive data analysis focuses on infant mortality rate changes between 1996 and 2005. The initial analysis of births and deaths calculated infant mortality rates, which were subsequently divided into neonatal and postneonatal deaths. In Mississippi, the number of deaths on the county level for a single year is very small (e.g., less than 20). Therefore, county level analysis will not generate reliable results. To be statistically meaningful, the 10-year infant mortality rate for each county had to be used. Similar statistical procedures were used to locate counties demonstrating significantly higher rates than the state as a whole. The 5-year infant mortality rates for the periods 1996-2000 and

2001-2005 were calculated. Comparisons between the two periods revealed counties with either improving or worsening infant mortality over time.

Because Sudden Infant Death Syndrome (SIDS) has historically exerted immense impact on postneonatal-mortality rates, further analysis was performed to distinguish the frequency of SIDS-related death. Supplementary analysis was undertaken using the Perinatal Periods of Risk (PPOR) approach. The PPOR approach, as defined by the Centers for Disease Control and Prevention (CDC), CityMatCH, March of Dimes, and the Maternal and Child Health Bureau, requires infant mortality analysis by infant weight (below, at, or above 1,500 grams) and by the period when death occurred. PPOR provides a more detailed analysis of mortality utilizing a variety of risk factors including maternal behaviors.

Conclusions: Of greatest significance, the analysis revealed that 61.3% of infant deaths between 1996 and 2005 occurred during the neonatal period. The remaining 38.7% of infant deaths occurred during the postneonatal period. From 1996 to 2005, 53% of infant deaths were among babies having very low birth weight (< 1,500 grams), 16% were LBW (< 2500 grams) and 31% occurred among babies with weight greater than 2,500 grams. Recommendations include increased utilization of family planning, pregnancy high risk management, and WIC along with increased access to health education, health services for women of childbearing age, and routine comprehensive health services for infants.

Infant Mortality in Mississippi, 1996-2005: Trend and Risk Analysis

I. Introduction

During the past ten years from 1996 to 2005, the rate of Mississippi infants dying in the first year of life has fluctuated with no clear pattern. The rate ranged from 9.7 deaths per 1,000 live births in 2004 to 11.4 in 2005. On average, there were approximately 445 deaths among some 42,300 births each year. In 2003, Mississippi and Alabama tied for 49th in the nation for infant mortality.

The Healthy People 2010 goal is to reduce infant mortality in the United States to 4.5 deaths per 1,000 live births by the year 2010 (CDC, 2002). Given Mississippi's 2005 rate of 11.4, an additional reduction of 6.9 deaths per 1,000 live births poses a tremendous challenge.

The mission of the Mississippi Department of Health (MDH) is to promote and protect the health of the citizens of Mississippi. MDH Health Services supports that mission with a commitment to reducing infant mortality. This report is part of the Health Services effort to describe the pattern of infant mortality, to delineate contributing factors, and to identify strategies for reducing Mississippi's infant mortality rate. Information about infant, neonatal and postneonatal mortality in Mississippi is presented both for the state as a whole, and for major racial subgroups of the population. The overall 10-year infant mortality rates for counties are listed. County level infant mortality rates are compared for the periods 2001-2005 and 1996-2000. Recommendations are categorized as Maternal Health, Infant Health, Maternal Care, and Infant Care.

II. Methods

Mississippi Vital Statistics serves as the principal data source. Additional data sources include the 2003 Mississippi PRAMS Surveillance Report and results from a study of Mississippi's 1996-2003 linked birth and death certificate files.

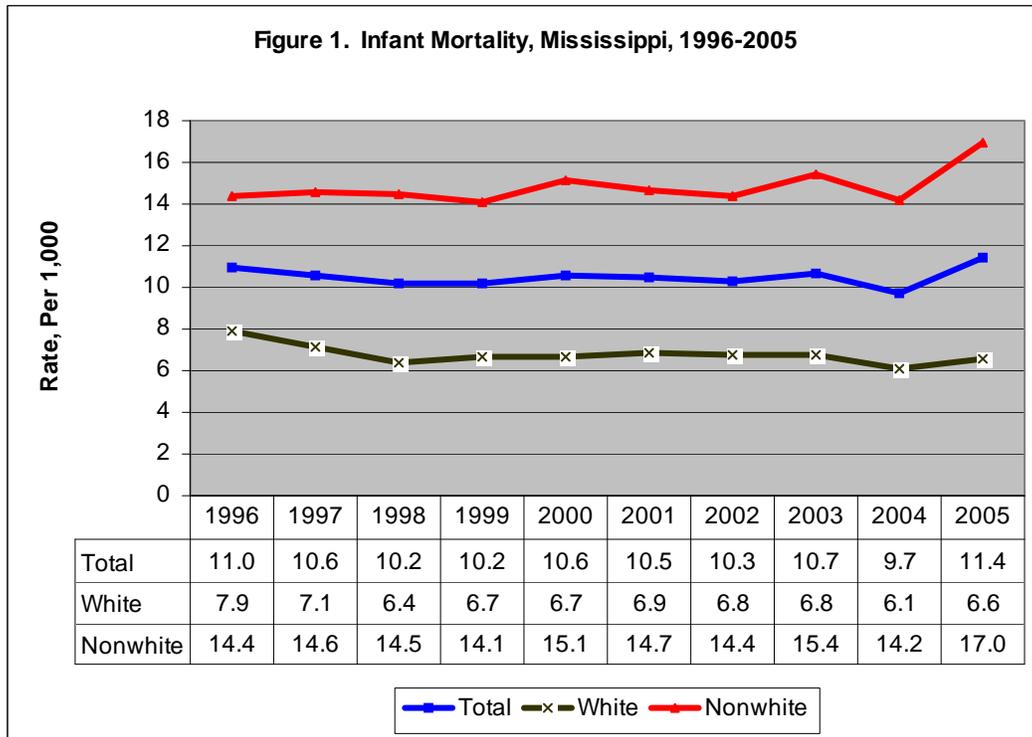
The descriptive data analysis focuses on infant mortality rate changes between 1996 and 2005. The initial analysis of births and deaths calculated infant mortality rates, which were subsequently divided into neonatal and postneonatal deaths. In Mississippi, the number of deaths on the county level for a single year is very small (e.g., less than 20). Therefore, county level analysis will not generate reliable results. To be statistically meaningful, the 10-year infant mortality rate for each county had to be used. Similar statistical procedures were used to locate counties demonstrating significantly higher rates than the state as a whole. The 5-year infant mortality rates for the periods 1996-2000 and 2001-2005 were calculated. Comparisons between the two periods revealed counties with either improving or worsening infant mortality over time.

Because Sudden Infant Death Syndrome (SIDS) has historically exerted immense impact on postneonatal mortality rates, further analysis was performed to distinguish the frequency of SIDS-related death.

Supplementary analysis was undertaken using the Perinatal Periods of Risk (PPOR) approach. The PPOR approach, as defined by the Centers for Diseases Control and Prevention (CDC), CityMatCH, March of Dimes, and the Maternal and Child Health Bureau, requires infant mortality analysis by infant weight (below, at, or above 1,500 grams) and by the period when death occurred. PPRO provides a more detailed analysis of mortality utilizing a variety of risk factors including maternal behaviors.

III. Data Analysis

Infant mortality trend: The rate decreased from 11.0 deaths per 1,000 live births in 1996 to 10.2 in 1999. It then increased to 10.7 in 2003. In 2004, the rate decreased to a single digit - 9.7 deaths per 1,000 live births. This signifies the lowest rate ever recorded in Mississippi, since recording began in 1917. However, it skyrocketed to 11.4 deaths per 1,000 live births in 2005 - an increase of 17.5% from the previous year. The 2005 rate was the highest rate since 1993 when it was also 11.4 deaths per 1,000 live births (Figure 1).

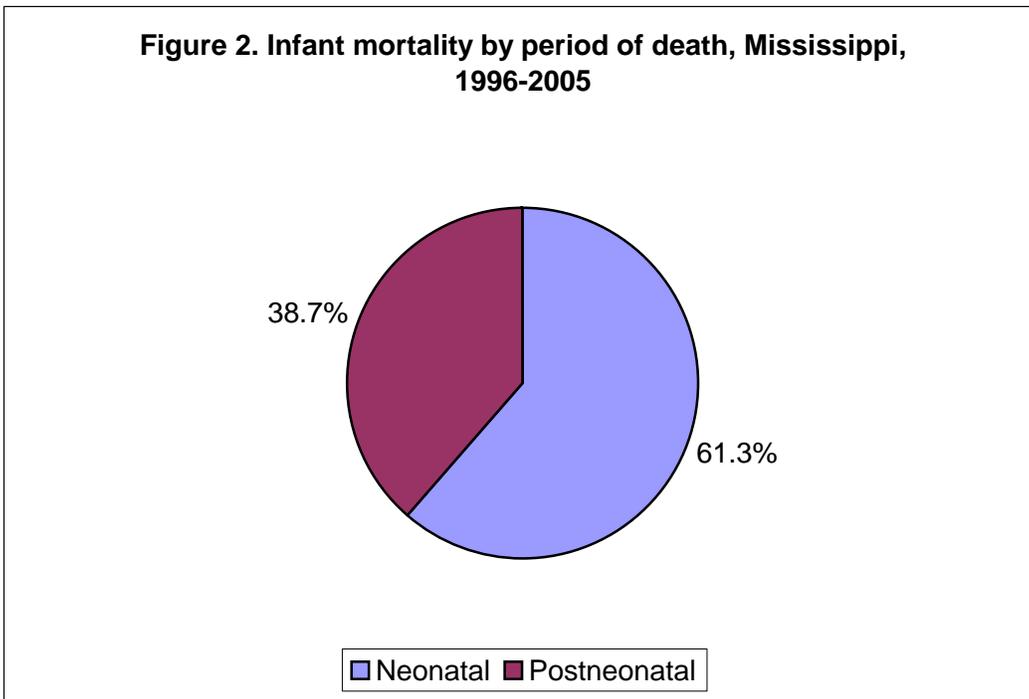


Infant mortality rate by county: During the period of 1996-2005, the average infant mortality rate was 10.5 deaths per 1,000 live births in the state. However, the rate has shown great variation among 82 counties, ranging from 6.0 deaths per 1,000 live births in Pontotoc County to 21.3 in Noxubee County (Appendix A). The counties with the highest infant mortality rates were Noxubee, Tunica, Coahoma, Montgomery, Sunflower, Humphreys, Claiborne, Copiah, Leflore, Clay, Hinds, and Newton (Appendix B). These counties contributed greatly to the high infant mortality in the state. Among the total of 12 counties, there were seven counties (Noxubee,

Tunica, Coahoma, Sunflower, Copiah, Leflore, and Hinds) having significantly higher rates than the state average (Appendix C).

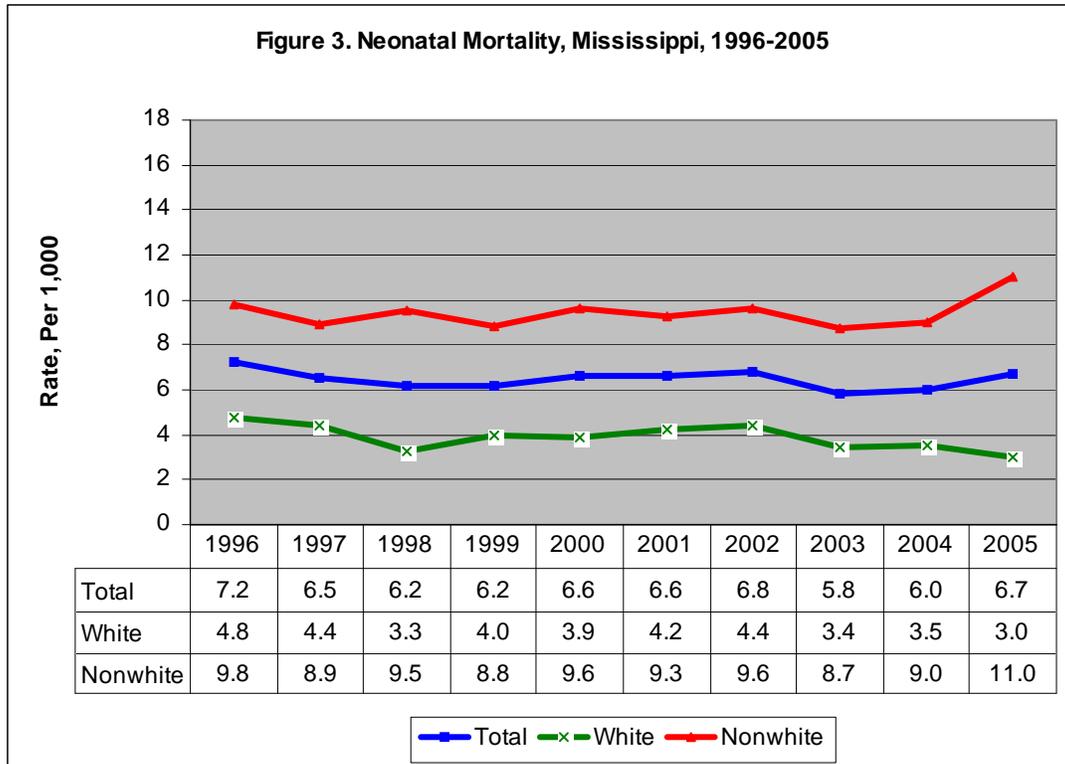
From the 1996-2000 term to the 2001-2005 term, the infant mortality rate for the state did not change. It remained at 10.5 deaths per 1,000 live births. However, it increased in 47 counties. The counties with infant mortality rates above the state average that still experienced a more than 20% increase were Scott (by 62.6%), Coahoma (by 53.6%), Leflore (by 40.0%), and Sunflower (21.4%). The counties with infant mortality rates below the state average that still experienced a more than 20% increase were Forrest, Marshall, and Rankin Counties. The rates for these three counties increased by 93.9%, 75%, and 26.8%, respectively (Appendix C).

Infant mortality by period of death: From 1996 to 2005, 61.3% of infant deaths occurred during the neonatal period and 38.7% of infant deaths occurred during the postneonatal period. Neonatal deaths take place prior to the 28th day of life. The postneonatal deaths occurred between the 28th day of life and the 1st birthday (Figure 2).

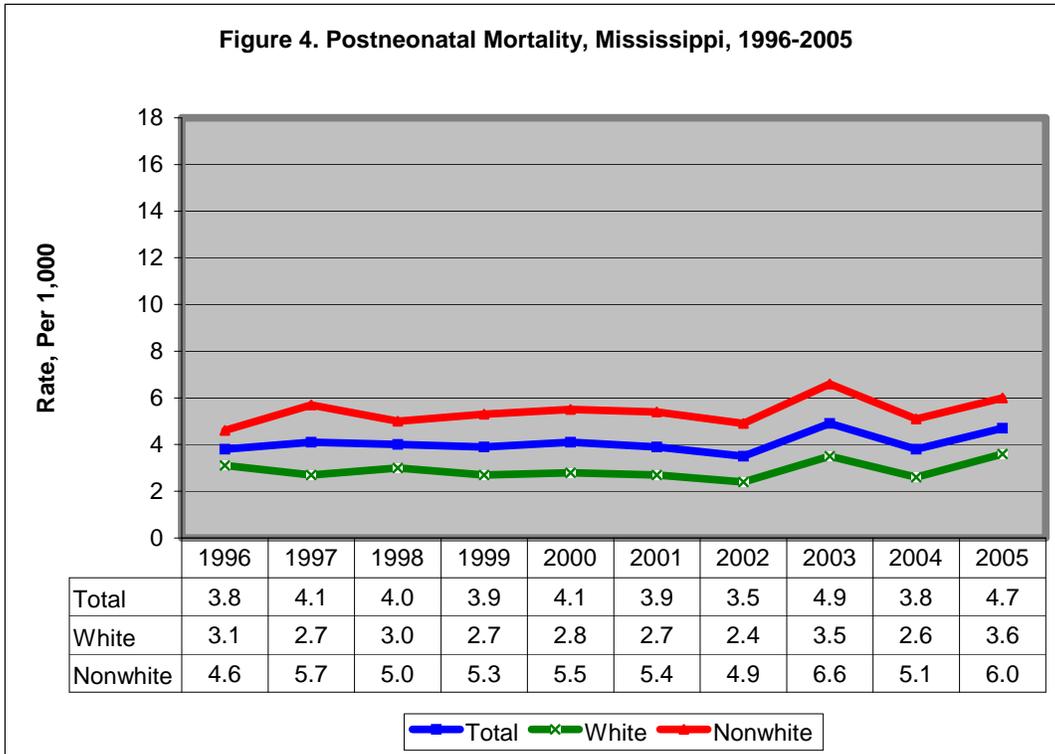


Neonatal deaths by race: Neonatal death rates for nonwhites were more than twice those for whites. Except for the years 1998 and 2005, changes in neonatal death rates for white and

nonwhite followed the same pattern. Changes were consistent with the infant mortality trend. While the neonatal death rate for white decreased by 14.3% from 3.5 in 2004 to 3.0 in 2005, the neonatal death rate for nonwhites increased by 22.2% from 9.0 to 11.0 during the same period. Given that the majority of infant deaths occurred during the neonatal period, this may partially explain that the increase in infant mortality during 2005 was largely related to an increase in neonatal deaths in the nonwhite group (Figure 3).



Postneonatal deaths by race: Compared to neonatal death rates, the gap for postneonatal death rates between white and nonwhite groups was relatively small. Except for the year 1997, changes in postneonatal death rates for white and nonwhite groups followed the same pattern. The changes were different from neonatal death rates. The postneonatal death rate for whites increased by 38.5% from 2.6 in 2004 to 3.6 in 2005, while the rate for nonwhites increased by 17.6% from 5.1 in 2004 to 6.0 in 2005 (Figure 4).



Sudden Infant Death Syndrome (SIDS): SIDS is defined as the sudden unexpected death of an infant which remains unexplained after a thorough post-mortem examination, a death scene investigation, and review of the medical history. The changes in SIDS rates were almost parallel to the changes in postneonatal death rates from 1996 to 2005. It's easy to draw the conclusion that the increase in SIDS rate contributed to the increase in postneonatal death rate, and hence, the increase in infant mortality (Figure 5). However, the increase in the SIDS rate was not uniform by infant race. The SIDS rate among whites increased by 42.8%, from 1.4 in 2004 to 2.0 in 2005. The SIDS rate among nonwhites increased by 15.0%, from 2.0 to 2.3 during the same period (Figure 6).

Figure 5. Comparison among SIDS rate and neonatal and postneonatal rate, Mississippi, 1996-2005

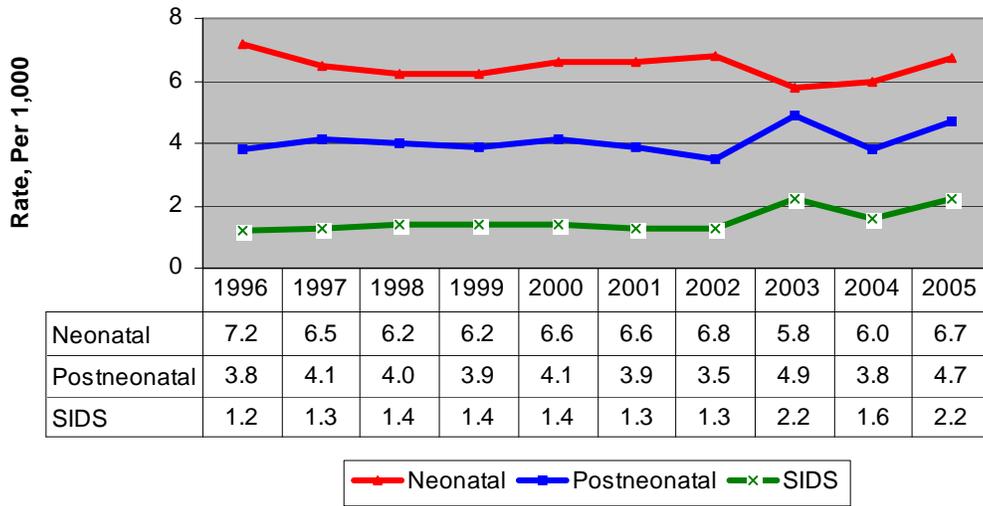
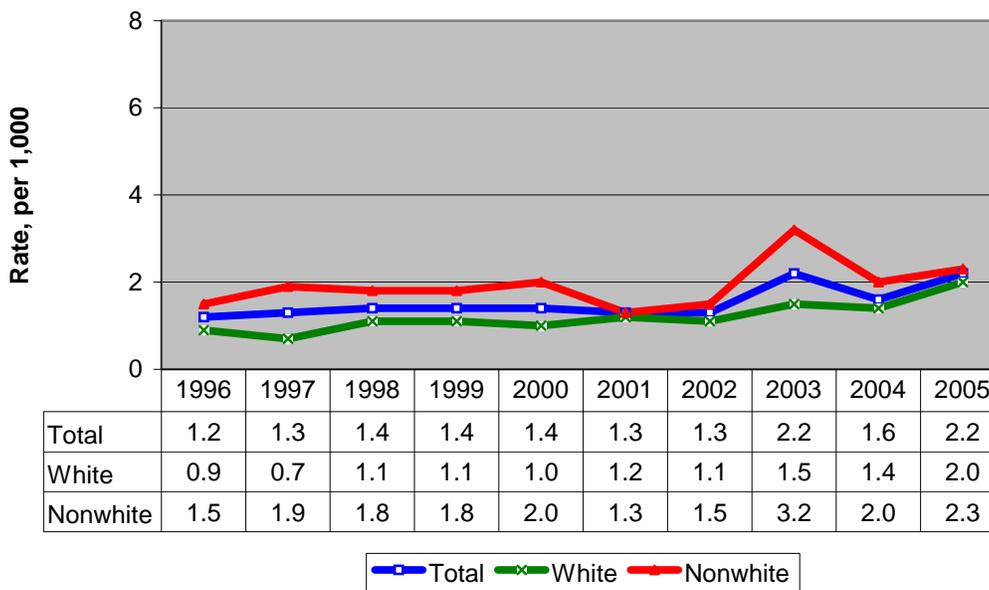
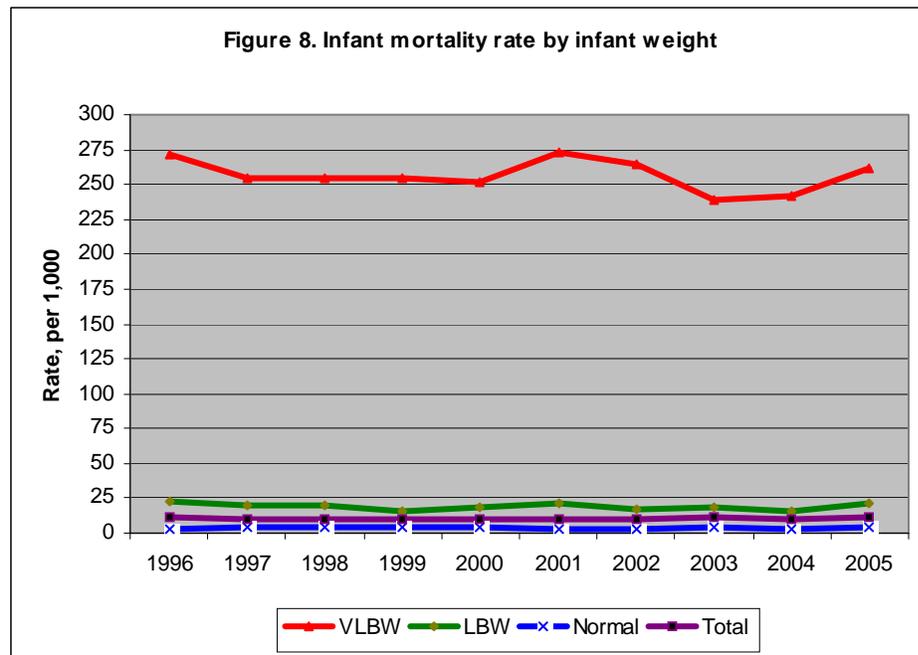
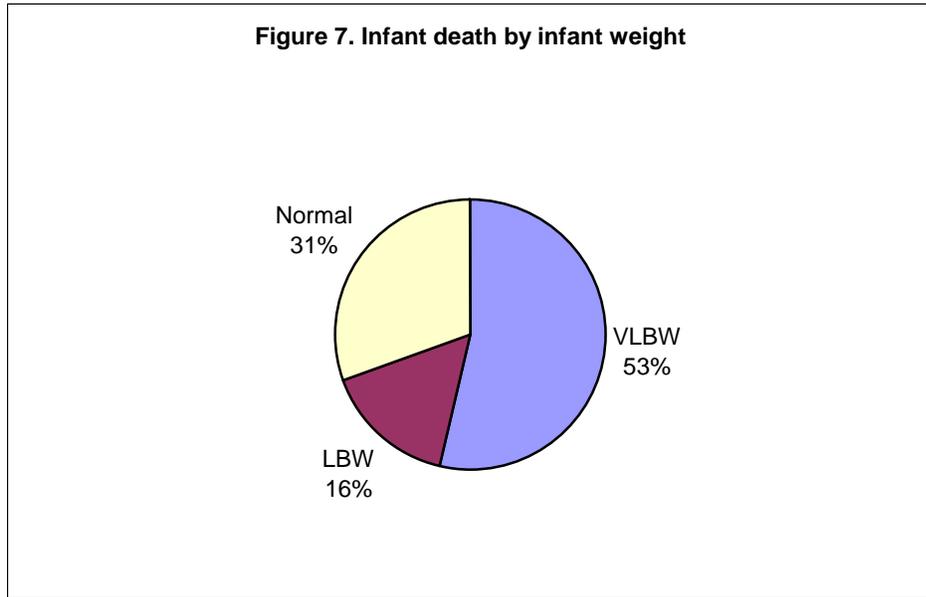


Figure 6. SIDS rate by race, Mississippi, 1996-2005

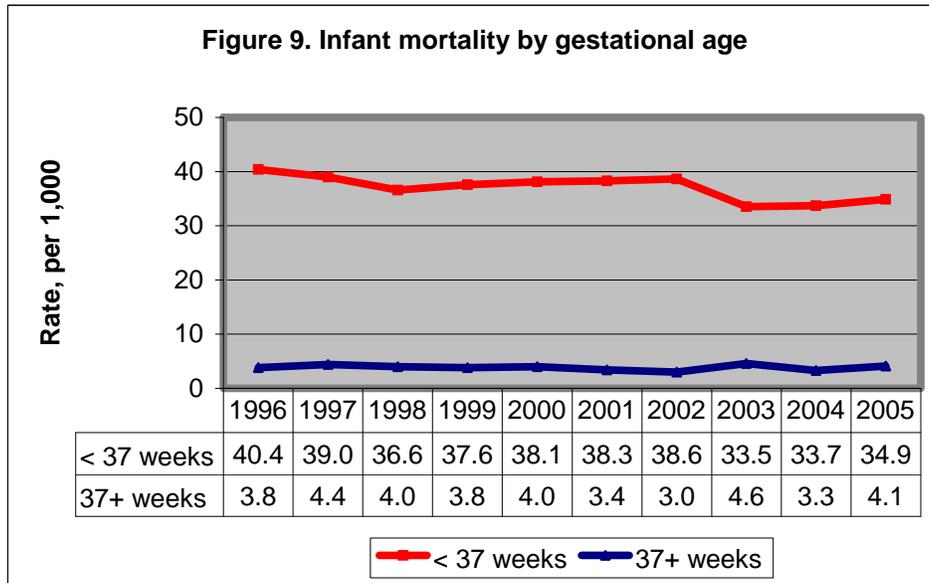


Infant mortality rate by birth weight: Following birth defects, prematurity, including preterm birth (PTB) and low birth weight (LBW), is the most common cause of neonatal death. From 1996 to 2005, 53% of infant deaths were among babies having very low birth weight (VLBW, less than 1,500 grams). Another 16% were those having LBW (less than 2,500 grams). Less than

one third (31%) of infant deaths occurred among babies weighing greater than 2,500 grams (Figure 7). On average, the infant mortality rate for VLBW babies was more than 20 times higher than babies weighing at least 2,500 grams (Figure 8).

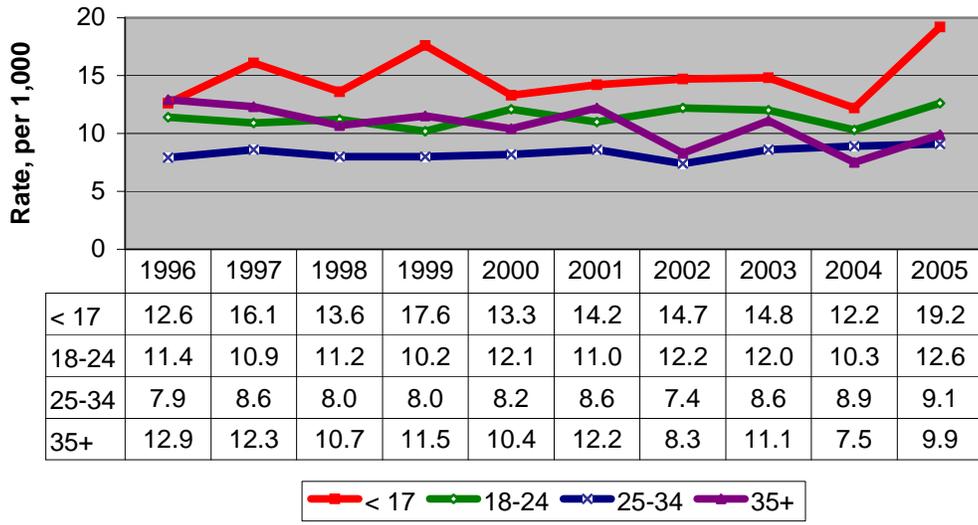


Infant mortality by gestational age: From 1996 to 2005, 57.4% of infant deaths were among babies with a gestational age of less than 37 weeks. The rates were about 8 to 12 times higher than babies with gestational ages equal to or greater than 37 weeks. Overall, the rates for babies with gestational ages less than 37 weeks have shown a downward trend. The rates for babies with gestational ages equal to or greater than 37 weeks have leveled (Figure 9).



Infant mortality by mother's age: Infant mortality rates were associated with mother's age. There were 436 (9.8%) infants that died between 1996 and 2005, whose mothers were less than 17 years of age. The mortality rates for babies with mothers less than 17 years of age were almost twice the rates of those with mothers between ages 25 and 34 (Figure 10). Though teen pregnancy rates declined in the state from 1996 to 2005, infant mortality rates for teen mothers fluctuated. Specifically, the infant mortality rate increased by 57.4%, from 12.2 in 2004 to 19.2 in 2005.

Figure 10. Infant mortality by mother's age (in years)



IV. Risk Factors

The preceding data indicate that the primary causes of infant mortality in Mississippi between 1996 and 2005 were premature and /or LBW infants. According to data gathered by the United Health Foundation (2005), *infant mortality* represents many factors surrounding birth, including but not limited to: the health of the mother, prenatal care, the quality of the health services delivered to the mother, and infant/child health care. Additionally, high infant mortality rates are often considered preventable and thus can be influenced by various education and healthcare programs.

In Mississippi, distinct disparities in maternal and child health exist. Understanding the underlying causes of these persistent differences is believed to be fundamental to addressing longstanding racial disparities in infant health. Infant mortality rates where certain maternal and infant factors exist are provided in Appendix D. The following paragraphs further discuss specific factors relevant to negative birth outcomes and available Mississippi Data.

Preterm Birth: Risk factors for having a spontaneous preterm birth include demographic and genetic characteristics, behavioral and environmental factors, and medical and obstetrical history (CDC, 2004). Nationwide, the most commonly identified risk factors include a history of preterm birth, current multifetal pregnancy and some uterine and/or cervical abnormalities. Other possible risk factors include genitourinary infection, diabetes mellitus, hypertension, late or no prenatal care, smoking, alcohol and illicit drug use. Among Mississippi women with a previous live birth, 13.3% report preterm birth for that infant. Preterm birth (PTB) was more common among nonwhite women than white women. PTB was more common among women who had finished high school than those who attended at least some college and more common among women who received income from aid or had Medicaid as payer for prenatal care and/or delivery. Differences between age groups or between married and non-married women were not statistically significant.

Among women reporting a previous live birth, 11.7% reported LBW for that infant. LBW was more common among nonwhite women, unmarried women, women who received income from aid, or who had Medicaid as payer for prenatal care and/or delivery. Previous LBW was also

more likely among women with educational level of less than high school than either some college or college graduate, or high school than college graduate. Previous LBW seemed more common among the youngest or oldest age groups than ages 20 to 24 or ages 25 to 34, but the differences were not statistically significant.

Figure 11: Percent Previous Low Birth weight Infant Among Women With Previous Live Birth Classified By Age

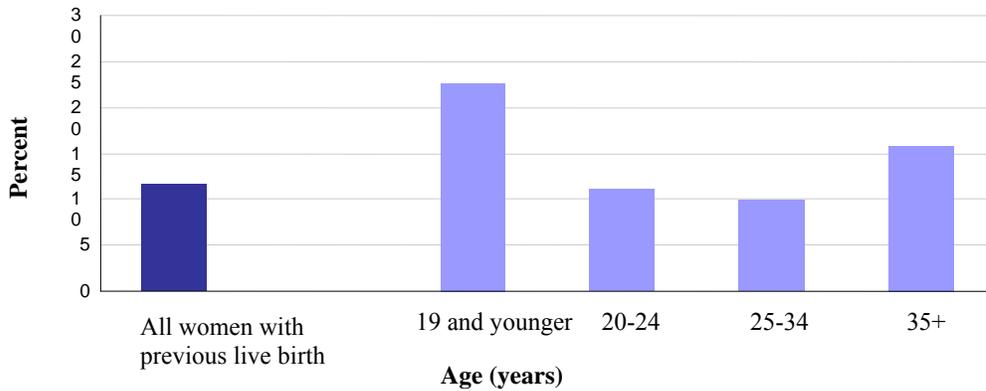
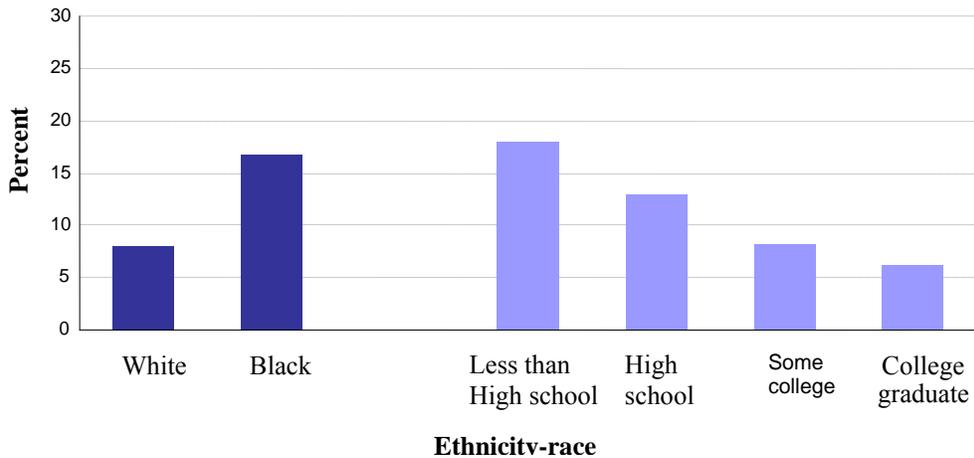


Figure 12: Percent Previous Low Birth weight Infant Among Women With Previous Live Birth Classified By Ethnicity-Race And Education



Smoking/Alcohol: Smoking, alcohol, and drug use are serious risk factors for adverse birth outcomes such as birth defects, developmental disabilities, preterm birth and infant mortality. In Mississippi, among all women, 20.0% reported smoking at the time of the survey. This behavior was similar among women of all age groups except ages 25 to 34, who were less likely to

currently smoke than women ages 19 years or younger, or than ages 20 to 24. Current smoking was more likely among white than nonwhite women, or women who had Medicaid as payer for prenatal care and/or delivery. This behavior appeared to increase with decreasing educational level (except for similar rates among women with some college and college graduates). Marital status and income from aid were not associated with current smoking.

Figure 13: Percent Of Women Who Smoke Cigarettes Currently Classified By Age

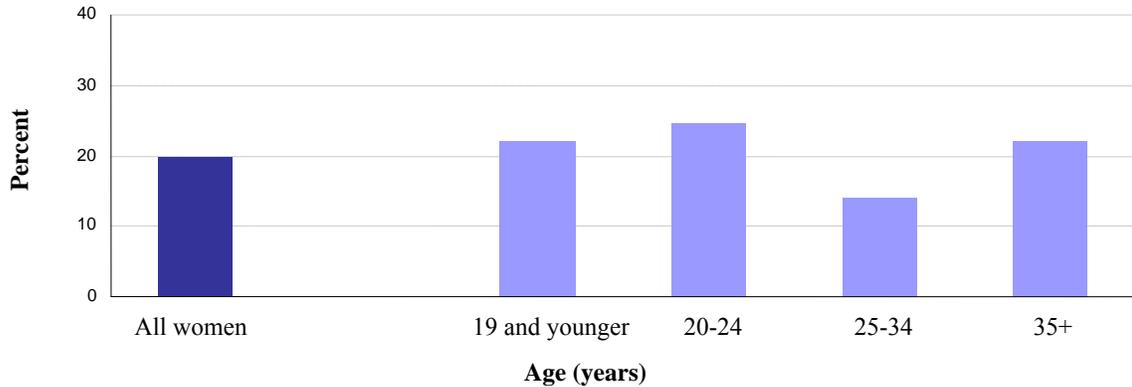
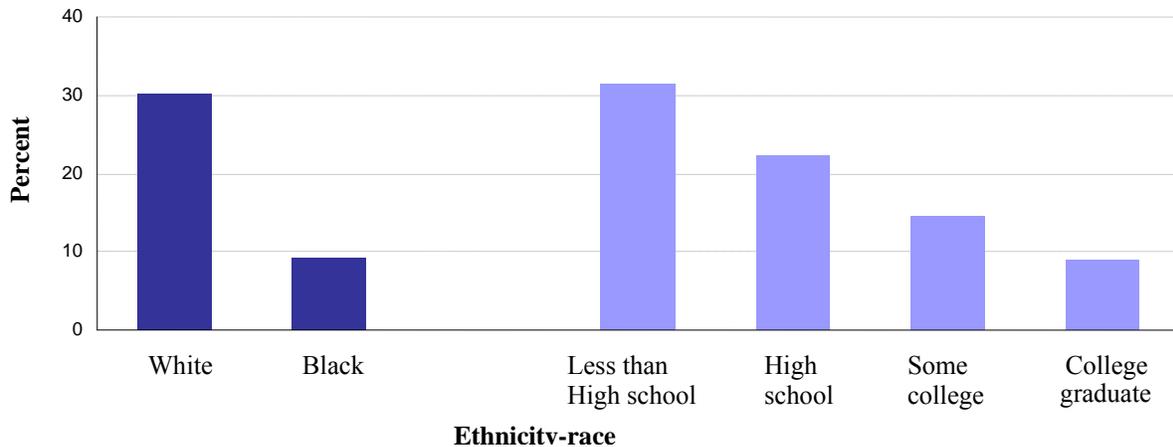


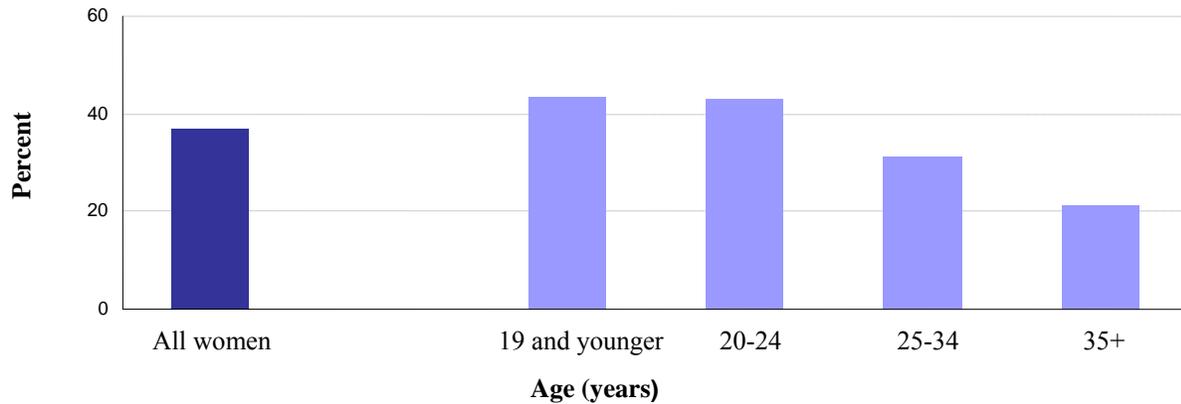
Figure 14: Percent Of Women Who Smoke Cigarettes Currently Classified By Ethnicity-Race And Education



Infections: Sexually transmitted infections are risk factors for adverse perinatal outcomes such as miscarriage, ectopic pregnancy, stillbirth, preterm delivery, birth defects, newborn illness and death. In Mississippi, among all women with live births, 37.1% reported having a vaginal infection during pregnancy. This response was more likely among nonwhite women, unmarried women, women who received income from aid, or had Medicaid as payer for prenatal care and/or delivery. College graduates were less likely to report a vaginal infection than women of

lower educational levels. Self-reported vaginal infection appeared to increase with decreasing age (but differences were not statistically significant between ages 19 years or younger vs. ages 20-24, or ages 25-34 years vs. 35 years or more).

Figure 15: Percent Of Women Who Reported Having A Vaginal Infection During Pregnancy Classified By Age



Source: MS PRAMS Surveillance Report, 2003

Adequacy of Prenatal Care: The Kotelchuck Index classifies the prenatal care received by the mother into one of four categories (Inadequate, Intermediate, Adequate, and Adequate Plus) by combining information about the timing of prenatal care, the number of prenatal care visits and gestational age of the fetus. For example, Adequate Plus is defined as prenatal care begun by the 4th month and 110% or more of the recommended number of prenatal visits were received.

In Mississippi, The infant mortality rate for infants born to mothers who received “adequate plus” prenatal care is more than double that for infants born to mothers who received “adequate” prenatal care. This would seem to indicate that these fetuses were identified as higher risk leading to those mothers being scheduled for more prenatal care. Another theory is that doctors have increased their ability to sustain these fetuses through pregnancy. However, once born, these infants are unable to sustain themselves. In other words, an event that would historically have been classified as a fetal death is now being classified as an infant death, giving rise to the rate of infant mortality.

Maternal Co-Morbidities: Chronic hypertension and diabetes are co-morbidities that can result in adverse perinatal outcomes, such as premature birth, fetal growth retardation, and perinatal

mortality. Zhang & Cox (2005) examined the 1999-2003 Mississippi birth cohort linked with infant death files. They found that 2.5% of Mississippi mothers delivering a live birth during the period reported having diabetes. Chronic hypertension was reported by 1.5% of Mississippi mothers giving birth between 1999 and 2003. Black mothers reported chronic hypertension more frequently compared to white mothers.

A similar study of the Mississippi 1999-2003 birth cohort linked with infant death files (Graham & Zhang, 2006), found that maternal chronic conditions were significant factors associated with negative birth outcomes in Mississippi. The study determined that infant mortality, LBW and PTB were more prevalent among nonwhite women, very young women (≤ 15 years), and women with certain chronic medical conditions.

V. Recommendations

Based on the preceding analyses, a modified Social Cognitive Theory Concepts Model was developed for reducing Mississippi infant mortality (Appendix D). Recommendations include placing emphasis on prevention of neonatal deaths, especially among nonwhite women of childbearing age. A combination of focused health education and expanded health services are key to effecting more positive birth and infant outcomes in Mississippi.

Task 1: Family Planning Services—Reducing unintended pregnancies and increasing access to prenatal healthcare services between pregnancies are two major areas that must be targeted to decrease infant mortality. Data provided by the 2003 Pregnancy Risk Assessment Monitoring System (PRAMS) demonstrates that out of 1,453 mothers surveyed, 57.8% of the mothers' pregnancies were unintended. From this percentage, 72.7% were Black.

Task 2: Perinatal High Risk Management (PHRM)—A team approach to case management of high risk mothers and neonates should be available throughout the state. Increased funding and staffing of the PHRM program would ensure that more high risk mothers and infants are being served.

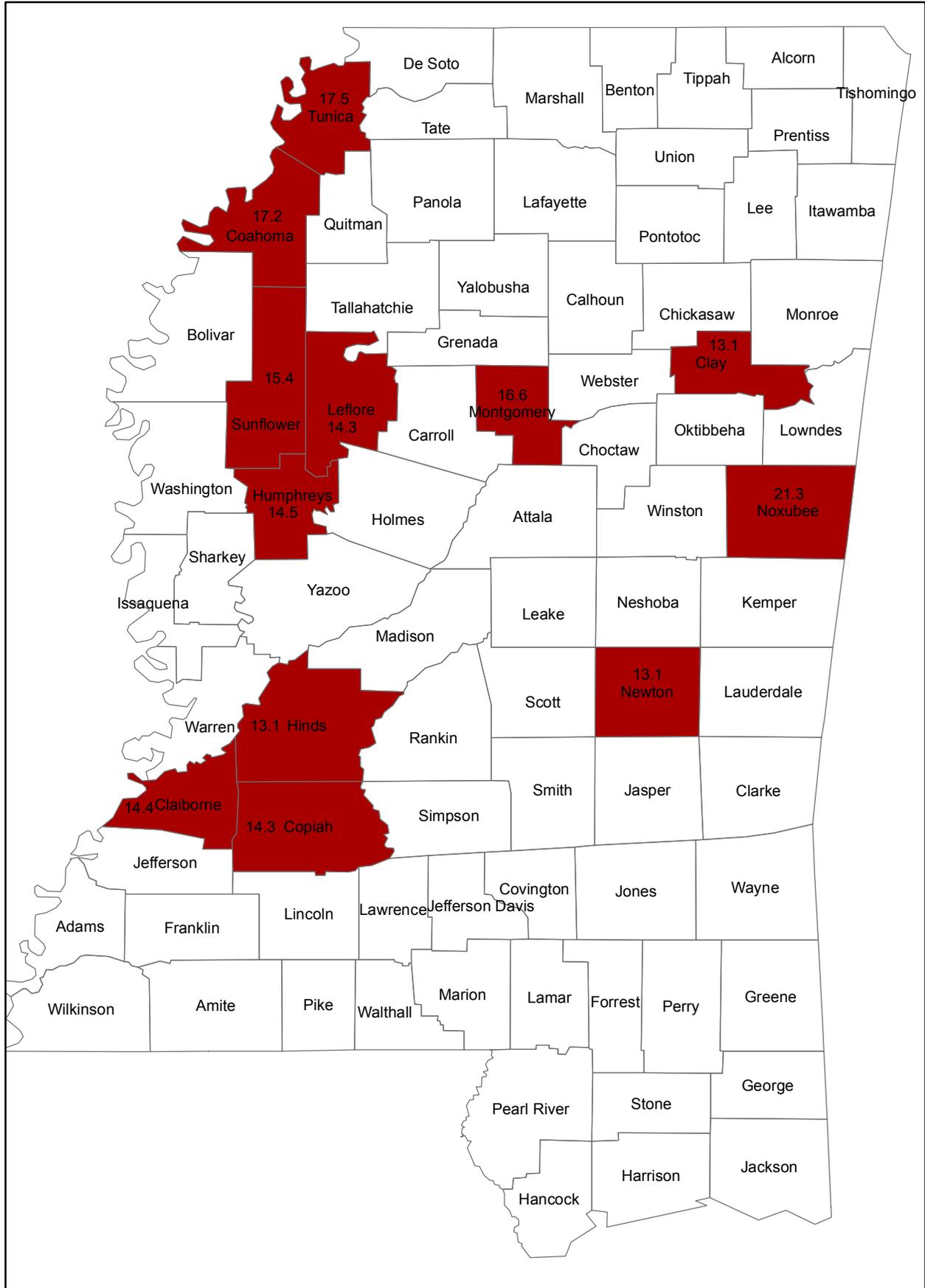
Task 3: Health Education and Outreach—According to results from the 2003 PRAMS, categories grouped by educational level show that mothers with higher education practiced better health management before, during, and after their pregnancy. In Mississippi, educational campaigns targeting maternal health and control of hypertension, diabetes, obesity, use of tobacco and alcohol, and nutrition should result in a decrease in LBW infants. Presently, the MDH has an active Community Health Worker (CHW) program utilizing community-based public health workers who canvass communities locating and linking women to the healthcare system. Although still in its pilot stages in two areas of the state, the program has proven useful in improving utilization of prenatal care for underserved women. Additional funding resources are needed to expand the program to a statewide focus. Additional health education programs should include maternal and infant health, prenatal and infant care, SIDS reduction methods, and folic acid campaigns.

Task 4: WIC—Increased access to and utilization of Nutritional Services for Women, Infants, and Children would improve maternal and infant health, reducing prevalence of LBW and failure to thrive among infants.

Task 5: Healthcare Services—Improving access to medical services for women of childbearing age, especially those with chronic medical conditions, would improve overall maternal health and better prepare mothers for pregnancy. Early identification and management of chronic medical conditions improves outcomes for both mothers and infants. Likewise, ensuring access to routine, comprehensive health services for infants would also enhance early identification of problems.

VI. APPENDICES

Top Ten Infant Mortality Rates By County 1996-2005 (10 Year Average)



Appendix C: Infant mortality rates and numbers of deaths by county, Mississippi, 1996-2005

	Infant mortality rate 1996-2005	Rate in top 10?	Difference from state rate	Stat. signif. higher than state rate	Infant mortality rate 1996-2000	Infant mortality rate 2001-2005	% Change in death rate 01-05 vs. 96-00
All MS	10.5	n/a	n/a	n/a	10.5	10.5	0.0%
County							
Adams	12.3		1.8		13.7	10.6	-22.6%
Alcorn	7.8		-2.7		5.9	9.5	61.0%
Amite	7.5		-3.0		6.1	8.8	44.3%
Attala	11.1		0.6		10.7	11.5	7.5%
Benton	16.1		5.6		18.1	14.1	-22.1%
Bolivar	12.5		2.0		12.3	12.9	4.9%
Calhoun	7.9		-2.6		3.9	11.8	202.6%
Carroll	8.6		-1.9		5.8	11.3	94.8%
Chickasaw	8.8		-1.7		8.8	8.8	0.0%
Choctaw	10.1		-0.4		11.8	8.1	-31.4%
Claiborne	14.4	7	3.9		10.0	19.5	95.0%
Clarke	5.5		-5.0		5.0	6.1	22.0%
Clay	13.1	tied 10	2.6		9.9	16.7	68.7%
Coahoma	17.2	3	6.7	Yes	13.8	21.2	53.6%
Copiah	14.3	tied 8	3.8	Yes	17.7	11.0	-37.9%
Covington	10.7		0.2		9.4	12.0	27.7%
Desoto	7.9		-2.6		9.9	6.3	-36.4%
Forrest	9.7		-0.8		6.6	12.8	93.9%
Franklin	7.9		-2.6		6.7	9.3	38.8%
George	9.4		-1.1		11.6	7.1	-38.8%
Greene	6.6		-3.9		7.7	5.4	-29.9%
Grenada	11.7		1.2		10.1	13.4	32.7%
Hancock	8.2		-2.3		8.8	7.7	-12.5%
Harrison	9.4		-1.1		9.3	9.4	1.1%
Hinds	13.1	tied 10	2.6	Yes	13.0	13.3	2.3%
Holmes	12.4		1.9		15.9	8.5	-46.5%
Humphreys	14.5	6	4.0		10.1	18.9	87.1%
Issaquena	10.3		-0.2		9.3	11.5	23.7%
Itawamba	10.4		-0.1		10.0	10.8	8.0%
Jackson	8.3		-2.2		8.7	7.9	-9.2%
Jasper	9.7		-0.8		9.7	9.8	1.0%
Jefferson	13.4		2.9		16.1	10.7	-33.5%
Jeff Davis	10.4		-0.1		10.8	9.8	-9.3%
Jones	10.7		0.2		11.9	9.5	-20.2%
Kemper	13.6		3.1		10.4	16.9	62.5%
Lafayette	10.1		-0.4		8.6	11.4	32.6%
Lamar	8.4		-2.1		7.9	8.8	11.4%
Lauderdale	12.5		2.0		12.8	12.2	-4.7%
Lawrence	9.0		-1.5		6.7	11.2	67.2%
Leake	10.3		-0.2		7.2	13.1	81.9%
Lee	10.7		0.2		11.2	10.3	-8.0%
Leflore	14.3	tied 8	3.8	Yes	12.0	16.8	40.0%

Appendix C continued

	Infant mortality rate 1996-2005	Rate in top 10?	Difference from state rate	Stat. signif. higher than state rate	Infant mortality rate 1996-2000	Infant mortality rate 2001-2005	% Change in death rate 01-05 vs. 96-00
All MS	10.5	n/a	n/a	n/a	10.5	10.5	0.0%
County							
Lincoln	8.9		-1.6		9.9	7.9	-20.2%
Lowndes	11.7		1.2		12.1	11.2	-7.4%
Madison	9.8		-0.7		9.6	10.0	4.2%
Marion	7.9		-2.6		6.8	8.9	30.9%
Marshall	10.3		-0.2		7.6	13.3	75.0%
Monroe	10.5		0.0		14.0	7.0	-50.0%
Montgomery	16.6	4	6.1		26.8	5.0	-81.3%
Neshoba	9.8		-0.7		10.0	9.6	-4.0%
Newton	13.1	tied 10	2.6		14.3	11.8	-17.5%
Noxubee	21.3	1	10.8	Yes	24.9	17.2	-30.9%
Oktibbeha	8.0		-2.5		8.1	7.8	-3.7%
Panola	11.9		1.4		16.5	7.4	-55.2%
Pearl River	6.3		-4.2		5.9	6.6	11.9%
Perry	5.1		-5.4		6.3	3.6	-42.9%
Pike	7.0		-3.5		7.3	6.7	-8.2%
Pontotoc	6.0		-4.5		7.1	5.0	-29.6%
Prentiss	11.1		0.6		9.5	12.9	35.8%
Quitman	10.7		0.2		8.0	14.1	76.3%
Rankin	8.1		-2.4		7.1	9.0	26.8%
Scott	12.9		2.4		9.6	15.9	65.6%
Sharkey	3.6		-6.9		3.4	3.9	14.7%
Simpson	12.5		2.0		11.6	13.5	16.4%
Smith	11.2		0.7		7.9	14.3	81.0%
Stone	11.3		0.8		10.2	12.4	21.6%
Sunflower	15.4	5	4.9	Yes	14.0	17.0	21.4%
Tallahatchie	11.3		0.8		11.2	11.5	2.7%
Tate	11.1		0.6		12.4	9.8	-21.0%
Tippah	9.9		-0.6		11.3	8.6	-23.9%
Tishomingo	7.4		-3.1		5.2	9.8	88.5%
Tunica	17.5	2	7.0	Yes	19.4	16.0	-17.5%
Union	7.9		-2.6		7.5	8.4	12.0%
Walthall	11.5		1.0		11.7	11.3	-3.4%
Warren	9.9		-0.6		12.3	7.2	-41.5%
Washington	12.1		1.6		12.3	11.8	-4.1%
Wayne	10.2		-0.3		12.1	8.2	-32.2%
Webster	7.1		-3.4		6.9	7.3	5.8%
Wilkinson	7.5		-3.0		7.8	7.2	-7.7%
Winston	9.0		-1.5		6.7	11.3	68.7%
Yalobusha	7.9		-2.6		6.5	9.3	43.1%
Yazoo	10.9		0.4		10.0	11.8	18.0%

* Rates in shaded cells represent values calculated with less than 20 events. These rates may not be reliable.

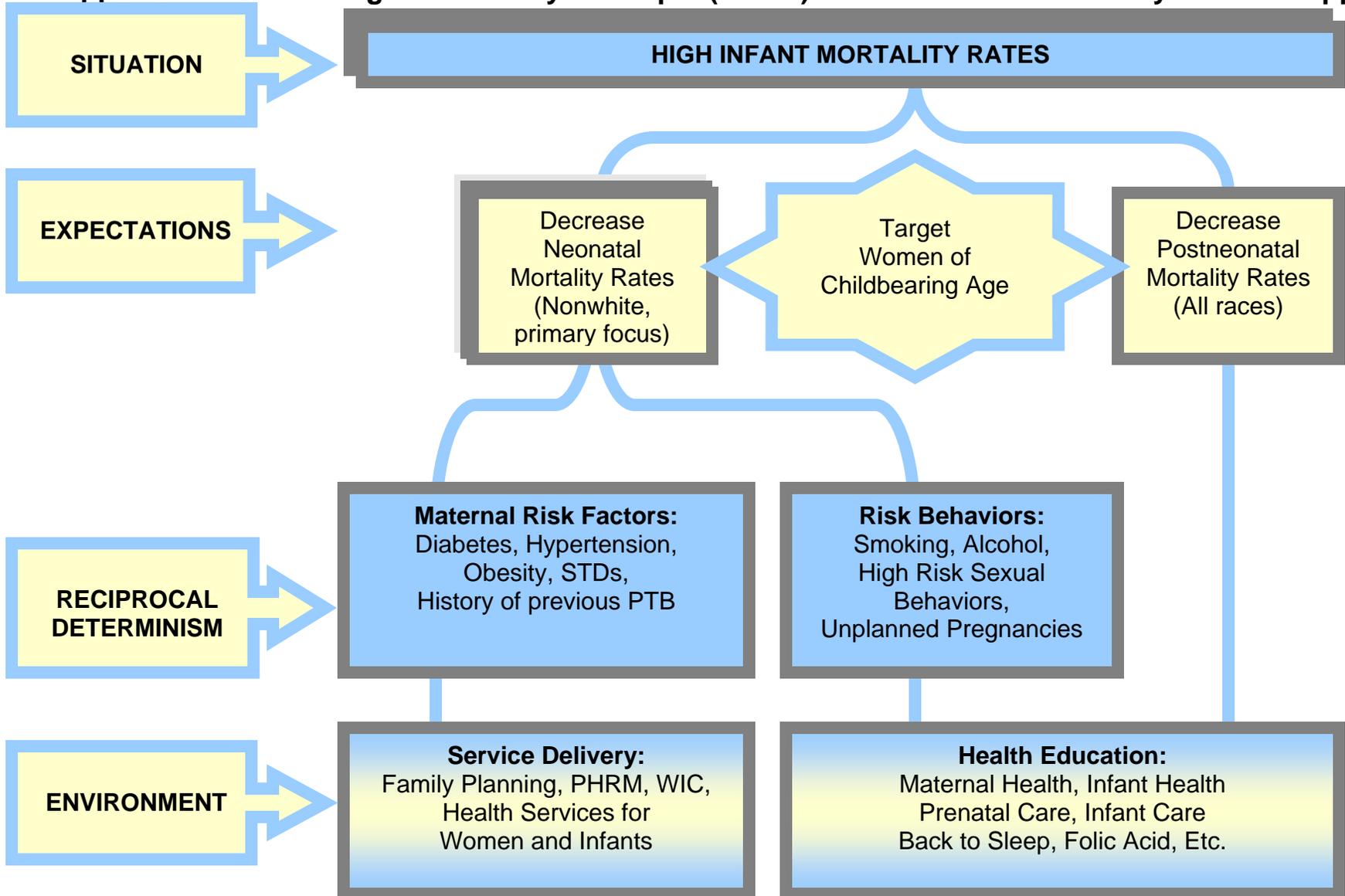
Appendix D: Infant Mortality Rates by Other Factors, Mississippi 1996-2005

		Infant Mortality Rate									
		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Race White	Mother's Age										
	< 17	8.4	6.2	7.2	9.1	9.5	6.5	11.1	9.7	9.5	12.3
	18-24	9.4	7.6	6.9	7.3	8.4	7.3	8.0	8.2	6.5	8.5
	25-34	4.8	5.7	5.2	4.7	4.8	6.1	5.3	5.2	5.6	5.0
	35+	7.6	11.8	8.0	10.1	6.3	8.9	5.2	8.1	4.5	3.9
	Unknown										
	Prev. SGA infant										
	Yes	38.8	27.6	24.1	24.8	34.2	19.1	39.0	20.6	26.5	19.0
	No	7.6	6.9	6.2	6.5	6.4	6.8	6.5	6.7	5.9	6.5
	Gest. Age										
	< 37 weeks	33.3	29.8	22.1	26.8	25.4	28.2	28.8	22.2	20.3	18.4
	37+ weeks	2.9	3.3	3.4	3.0	3.3	2.7	2.5	3.5	2.9	3.6
	Unknown										
	Birthweight										
	< 1,500 g	270.2	219.2	195.7	196.2	188.1	196.7	246.1	210.7	159.4	171.8
	1,500-2,499 g	21.9	19.6	15.9	16.2	21.3	25.9	17.2	16.2	15.9	21.4
	2,500+ g	2.6	3.0	3.1	2.8	2.9	2.8	2.2	3.0	2.7	3.1
	Unknown										
	Kotelchuck Index										
	Missing info.										
	Inadequate	11.5	7.8	8.0	9.2	7.4	13.3	7.2	10.4	9.4	9.8
	Intermediate	5.6	4.7	4.9	5.5	5.9	2.4	6.8	4.2	6.3	7.9
	Adequate	3.2	3.9	4.8	3.8	3.1	3.1	3.7	3.9	2.5	3.3
	Adequate Plus	11.7	10.7	7.6	8.5	10.3	10.8	8.8	8.6	8.8	8.4
Total	7.9	7.1	6.4	6.7	6.7	6.9	6.9	6.8	6.1	6.6	

		Infant Mortality Rate									
		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Race Nonwhite	Mother's Age										
	< 17	14.3	20.5	16.6	21.5	15.1	18.1	16.7	17.5	13.7	23.0
	18-24	13.2	13.6	14.8	12.7	15.4	14.2	16.1	15.4	13.8	16.4
	25-34	13.2	13.9	13.0	13.9	14.0	13.2	11.1	14.4	14.6	15.7
	35+	20.7	13.0	15.0	13.6	17.4	18.0	13.4	16.0	12.5	20.9
	Unknown										
	Prev. SGA infant										
	Yes	23.4	39.0	42.3	26.5	31.4	63.9	52.4	55.9	57.4	36.0
	No	14.3	14.1	14.0	13.9	14.9	14.1	13.9	14.7	13.6	16.8
	Gest. Age										
	< 37 weeks	44.9	45.1	47.0	45.0	47.6	46.7	46.6	43.1	45.2	48.5
	37+ weeks	4.9	5.8	4.7	4.7	4.9	4.4	3.7	6.1	3.7	4.7
	Unknown										
	Birthweight										
	< 1,500 g	272.6	273.2	282.5	286.0	282.2	312.7	273.6	252.7	288.3	298.4
	1,500-2,499 g	22.8	20.6	21.9	14.9	15.6	18.0	17.3	21.1	15.1	20.7
	2,500+ g	4.3	5.2	4.5	4.5	4.9	3.6	4.0	4.9	3.5	4.3
	Unknown										
	Kotelchuck Index										
	Missing info.										
Inadequate	15.1	17.7	16.6	17.0	19.3	14.2	14.7	19.7	14.8	20.0	
Intermediate	14.8	7.1	12.5	11.3	8.9	10.8	12.1	10.6	8.7	15.4	
Adequate	6.9	9.5	8.3	9.1	8.1	8.4	7.9	8.1	8.7	8.5	
Adequate Plus	19.6	18.4	19.1	15.6	19.4	19.0	17.2	18.2	16.7	19.0	
Total	14.4	14.6	14.5	14.1	15.1	14.7	14.5	15.4	14.2	17.0	

		Infant Mortality Rate									
		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Both Race Total	Mother's Age										
	< 17	12.6	16.1	13.6	17.6	13.3	14.2	14.7	14.8	12.2	19.2
	18-24	11.4	10.9	11.2	10.2	12.1	11.0	12.2	12.0	10.3	12.6
	25-34	7.9	8.6	8.0	8.0	8.2	8.6	7.4	8.6	8.9	9.1
	35+	12.9	12.3	10.7	11.5	10.4	12.2	8.3	11.1	7.5	9.9
	Unknown										
	Prev. SGA infant										
	Yes	29.2	34.9	35.1	25.8	32.7	42.1	45.9	41.7	41.3	27.7
	No	10.8	10.2	9.8	10.0	10.3	10.2	9.9	10.3	9.4	11.2
	Gest. Age										
	< 37 weeks	40.4	39.0	36.6	37.6	38.1	38.3	38.6	33.5	33.7	34.9
	37+ weeks	3.8	4.4	4.0	3.8	4.0	3.4	3.0	4.6	3.3	4.1
	Unknown										
	Birthweight										
	< 1,500 g	271.8	254.2	254.7	254.9	251.3	273.2	264.2	238.8	241.6	261.1
	1,500-2,499 g	22.4	20.2	19.5	15.4	18.0	21.2	17.2	19.0	15.4	21.0
	2,500+ g	3.4	4.0	3.7	3.6	3.8	3.2	3.0	3.8	3.1	3.6
	Unknown										
	Kotelchuck Index										
Missing info.											
Inadequate	14.1	15.1	14.2	14.6	15.6	13.9	12.3	16.8	12.9	16.4	
Intermediate	10.1	5.8	8.3	8.3	7.3	6.4	9.3	7.2	7.4	11.3	
Adequate	4.7	6.1	6.1	5.9	5.0	5.2	5.3	5.5	4.9	5.4	
Adequate Plus	15.3	14.3	12.9	11.8	14.3	14.6	12.6	13.1	12.5	13.3	
Total	11.0	10.6	10.2	10.2	10.6	10.5	10.3	10.7	9.7	11.4	

Appendix E: Social Cognitive Theory Concepts (Model): Decrease Infant Mortality in Mississippi



APPENDIX F: Glossary of Terms

1. *Fetal Death*: death prior to the complete expulsion or extraction from its mother of a product of human conception, irrespective of the duration of pregnancy; the death is indicated by the fact that after such expulsion or extraction the fetus does not breathe or show any other evidence of life such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles.
2. *Gestational diabetes*: Diabetes mellitus onset during pregnancy as diagnosed by an elevated glucose challenge test and at least 2 abnormal values on the glucose tolerance test.
3. *Gestational hypertension*: Hypertension onset during pregnancy as diagnosed by a blood pressure >140/90 on at least 2 occasions greater than 6 hours apart without evidence of chronic hypertension.
4. *Infant mortality*: is the death of an infant during the first year of life.
5. *Live birth*: the complete expulsion or extraction from its mother of a product of human conception, irrespective of the duration of pregnancy, which, after such expulsion or extraction, breathes or shows any other evidence of life such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles, whether or not the umbilical cord has been cut or the placenta is attached.
6. *Low birth weight (LBW)*: Newborns weighing <2,500 grams, either because they are premature (<37 weeks gestational age) or growth-retarded (birth weight <10th percentile for gestational age).
7. *Preterm Delivery*: Delivery before the 37th week of gestation.
8. *Very low birth weight (VLBW)*: Newborns weighing <1500 grams.

Appendix G: References

Centers for Disease Control and Prevention. (2002). Healthy People 2010. Available online at www.healthpeople.gov .

Centers for Disease Control and Prevention. (2004). PeriStats. Available online at www.marchofdimes.com/peristats .

Graham, J. & Zhang, L. (2006) The association between chronic disease and negative birth outcomes: Findings from a birth cohort study. *Public Health Nursing (Submitted & In review)*.

Mississippi Department of Health. (2003). Mississippi PRAMS Surveillance Report.

United Health Foundation. (2005). Available online at www.unitedhealthfoundation.org .

Zhang, L. & Cox, R. (2007) Maternal diabetes and chronic hypertension as risk factors for unfavorable birth outcomes: A statewide, population-based study. *In process*.