

# Racial Disparities in Birth Outcomes Increase with Maternal Age: Recent Data from North Carolina

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## Abstract

**Background:** Racial disparities in birth outcomes persist in North Carolina and the United States. We examined patterns of birth outcomes and women's health measures in North Carolina by race and age to portray the largest disparities. We wanted to see if our data were consistent with the "weathering hypothesis," which holds that the health of African American women may begin to deteriorate in early adulthood, with negative effects on birth outcomes.

**Methods:** We conducted a descriptive analysis of 1999-2003 North Carolina live birth and infant death records and 2001-2003 Behavioral Risk Factor Surveillance System survey data. Birth outcome measures examined were low birth weight, very low birth weight, infant mortality, neonatal mortality, and postneonatal mortality. Women's health measures examined were obesity, self-reported health status, high blood pressure, high cholesterol, current smoking, and smoking during pregnancy. Rates for whites and African Americans were compared for each of three age groups.

**Results:** Racial disparities in birth outcomes increase with increasing maternal age. African American teens often experience better birth outcomes than older African American women. Racial disparities in measures of women's health also increase with increasing age.

**Conclusions:** Health problems among older African American women of reproductive age may contribute substantially to racial disparities in birth outcomes. Improving the health of older African American women may be an effective strategy to reduce the overall racial disparities in birth outcomes.

## Introduction

There are longstanding disparities in birth outcomes between whites and African Americans in North Carolina and the United States. For infant mortality and low birth weight, African Americans have rates at least two times those for whites, and the gap has been increasing over time. Arline Geronimus has proposed a "weathering hypothesis" to help explain this pattern.<sup>1,2</sup> The weathering hypothesis proposes that the health of African American women may begin to deteriorate in early adulthood as a physical consequence of cumulative socioeconomic disadvantage. As a result, the racial differential in infant mortality, for example, is larger at older maternal ages than at younger ages. A conclusion from this is that improvements in health among adult African American women would help reduce their infant mortality rate. This report examines recent North Carolina data to see if these data are consistent with this hypothesis.

Many studies suggest that women's preconceptional health is an important determinant of birth outcomes. Chronic health conditions, substance abuse, and other health problems cannot all be fixed after a woman becomes pregnant. In this study, we look at patterns of women's health measures and birth outcome measures by maternal race and age. Since we present only parallel, descriptive data, this study cannot demonstrate that women's health problems cause poor birth outcomes. However, a number of previous studies suggest that this is the case. For example, other researchers have found that maternal chronic hypertension,<sup>3,4</sup> obesity,<sup>5,6,7</sup> smoking,<sup>8,9,10</sup> and high cholesterol<sup>11</sup> are associated with subsequent adverse birth outcomes. One study suggests that the excess incidence of maternal chronic hypertension among African American women, including hypertension preceding pregnancy, contributes to the racial disparity in pregnancy outcomes.<sup>3</sup> Since smoking cessation interventions during pregnancy have had limited success,<sup>9</sup> efforts should be made to reduce smoking among all women of reproductive age as a

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strategy for improving birth outcomes. Postpartum maternal smoking strongly increases the risk of Sudden Infant Death Syndrome (SIDS) and is associated with other infant health problems.<sup>12</sup>

## Methods

We examine several 1999-2003 birth outcome measures for non-Hispanic African Americans and whites for the maternal age groups 15-19, 20-34, and 35 years and older: percentage low birth weight (less than 2,500 grams), percentage very low birth weight (less than 1,500 grams), infant deaths (first year of life) per 1,000 live births, neonatal deaths (first 27 days) per 1,000 live births, and postneonatal deaths (28-364 days of age) per 1,000 live births. These measures pertain to the entire five years of birth and infant death data combined, 1999 through 2003 inclusive. The percentage low birth weight and the infant mortality rate are standard overall measures of birth outcome, though the causes of low-weight births and infant deaths are heterogeneous. The vast majority of very low-birth-weight births and neonatal deaths are preterm deliveries, while more than half of postneonatal deaths result from SIDS, birth defects, and injuries/accidents.

We also present selected 2001-2003 health indicators from the North Carolina Behavioral Risk Factor Surveillance System (BRFSS) for non-Hispanic African American and white women for ages 18-24, 25-34, and 35-44: obesity, self-reported health status, high blood pressure (2001, 2003 only), high cholesterol (2001, 2003 only), and smoking. These measures pertain to the entire three years of BRFSS data combined, except those for blood pressure and cholesterol, which are for two years of data combined (these two questions were not asked on the 2002 BRFSS survey). Previous studies have shown these measures to be associated with adverse birth outcomes. The BRFSS is an ongoing random telephone health survey of adults in North Carolina.

The 15-19 year-old age group was used for the birth and infant death data because this is an age category commonly used for analysis of teen birth statistics; there are very few births to girls under age 15. The BRFSS survey interviews only persons ages 18 and older, and so the 18-24 year-old age group was used to define young adult females.

Several years of vital records and BRFSS data were aggregated to yield large enough numbers for meaningful analyses by race and age. All numerators of the race-age specific birth outcome measures are greater than 30, and most are much larger than 100. All numerators of the race-age specific BRFSS measures for females except one (African American women ages 18-24 with high cholesterol) are 20 or greater. African American/white ratios of the birth outcome and women's health measures were computed for each of the three age groups. Statistical significance of the racial differences was assessed using the chi square test. For the BRFSS measures, statistical significance was calculated using the SUDAAN software, which accounts for the complex sample design of the BRFSS when computing the errors of the estimates. A p value of less than 0.05 indicates a

statistically significant difference at the 95% confidence level.

Birth weight is reported very accurately on birth certificates in North Carolina, and maternal smoking during pregnancy is reported fairly accurately.<sup>13</sup> An infant death was ascertained by an infant death certificate that matched to the live birth certificate. These matched records are needed because maternal race and age are recorded only on the birth certificate. Less than 1% of the 1999-2003 birth records were missing information on maternal race, age, or smoking or on birth weight.

The BRFSS data are self-reported by the respondents over the telephone and, thus, are subject to some bias. However, if the degree of bias does not differ much by race and age, the basic results here will not be affected. Overall in North Carolina, approximately 5% of households do not have a telephone. A higher percentage of African Americans than whites live in poverty; therefore, it is likely that a higher percentage of African Americans do not have a telephone. A result of this would be that health problems among African American women, as measured here, are more understated than for white women, since the poorest women (without telephones) have the most health problems. Therefore the racial differentials in the BRFSS measures in this study may be somewhat understated. Less than 1% of the 2001-2003 BRFSS records for females ages 18-44 were missing information on age, race, health status, blood pressure, or cholesterol. Approximately 10% were missing information on Body Mass Index (BMI), which was used to measure obesity.

On the birth certificate, mother's race and ethnicity are self-reported by the mother around the time of delivery, usually while in the hospital. In the BRFSS, race and ethnicity are self-reported over the telephone by the adult survey respondent. Self-report is the preferred method of collecting data on race and ethnicity.<sup>14</sup> The race reported by the mother on the birth certificate is sometimes reclassified to a standard category according the coding rules of the National Center for Health Statistics.<sup>14</sup> However, this will have little impact on the results of the present study since the data here are limited to non-Hispanic whites and African Americans.

## Results

Table 1 shows the distribution of live births in North Carolina during the period 1999-2003 for non-Hispanic African Americans and whites, by maternal age. Twenty-eight percent of all live births shown in Table 1 were to African Americans, while 44% of the teen births (ages 15-19) were to African Americans. Table 1 reveals that teens comprised 18.7% of African American births, compared to 9.2% of white births.

Table 2 shows differences in selected birth outcomes by maternal race and age. The general pattern is that the percentages and rates of adverse birth outcomes for African Americans increase with increasing maternal age, and the racial disparities increase with increasing maternal age. Most of the racial differences shown in Table 2 are statistically significant at  $p < 0.0001$ . The two measures that are most associated with preterm delivery, the percentage very low birth weight and the neonatal death rate,

have the largest racial disparities at the older ages. The teen postneonatal death rates are the same for African Americans and whites (3.8), but for mothers ages 20 and older, the rates for African Americans are more than two times the rates for whites.

Table 3 shows differences in selected women's health indicators by maternal race and age. We include several chronic disease indicators and two measures of smoking, a behavioral risk. The general pattern here is similar to that for the birth outcomes: the

measures for African American women increase with increasing age, and the racial disparities in these indicators increase with increasing age. All of the racial differences at age 35-44 except one are statistically significant at  $p < 0.05$ . For four of the measures—percent with fair or poor health, percent with high cholesterol, percent who currently smoke, and percent of mothers who smoked during pregnancy—African American 18-24 year-olds have lower rates than white 18-24 year-olds (two of these are statistically significant). But the African American rates

increase substantially with age, so that by ages 35-44 African American women have higher rates than white women for all but one of these four measures.

## Discussion

A much higher percentage of births occur to teens among African Americans than among whites (19% vs. 9%). Also, African American teens often experience better birth outcomes than older African American women. Though perhaps controversial, Geronimus raises the question of whether African American communities adjust their fertility-timing norms and expectations to emphasize childbearing at the ages when women are the healthiest or may have the greatest social support available.<sup>1</sup>

The BRFSS data presented here show that selected health indicators for African American women worsen substantially with age, and racial disparities in measures of women's health increase with age. Geronimus found sharp increases with age in the African American/white ratios of hypertension and high blood lead level prevalence among women.<sup>1</sup> These results suggest the

**Table 1.**  
**North Carolina Resident Live Births by Maternal Race and Age, 1999-2003**

Age Group	African American		White	
	Number	Column %	Number	Column %
15-19	26,065	18.7	32,659	9.2
20-34	101,249	72.8	276,536	77.6
35+	11,783	8.5	47,259	13.2

**Table 2.**  
**Selected Birth Outcome Measures by Maternal Race and Age for North Carolina Residents, 1999-2003**

	Age 15-19	Age 20-34	Age 35+
<b>Percent low birth weight (&lt;2,500 grams)</b>			
African American	14.4	13.5	16.7
White	9.5	7.1	8.3
Ratio: A.A./White	1.52	1.90	2.01
p value for racial difference	< 0.0001	< 0.0001	< 0.0001
<b>Percent very low birth weight (&lt; 1,500 grams)</b>			
African American	3.2	3.5	4.4
White	1.8	1.3	1.6
Ratio: A.A./White	1.78	2.69	2.75
p value for racial difference	< 0.0001	< 0.0001	< 0.0001
<b>Infant deaths per 1,000 births</b>			
African American	14.3	15.0	15.3
White	10.7	5.8	5.5
Ratio: A.A./White	1.34	2.59	2.78
p value for racial difference	< 0.0001	< 0.0001	< 0.0001
<b>Neonatal deaths per 1,000 births</b>			
African American	10.5	10.7	12.1
White	7.0	4.1	4.0
Ratio: A.A./White	1.50	2.61	3.03
p value for racial difference	< 0.0001	< 0.0001	< 0.0001
<b>Postneonatal deaths per 1,000 births</b>			
African American	3.8	4.2	3.1
White	3.8	1.7	1.5
Ratio: A.A./White	1.00	2.47	2.07
p value for racial difference	.708	<.0001	<.0001

**Table 3.**  
**Selected Women's Health Indicators by Race and Age for North Carolina Female Adults, 2001-2003 Behavioral Risk Factor Surveillance System (BRFSS) Data**

	Age 18-24	Age 25-34	Age 35-44
<b>Percent obese (body mass index 30)</b>			
African American	24.2	32.2	43.9
White	12.4	18.7	19.1
Ratio: A.A./White	1.95	1.72	2.30
p value for racial difference	0.014	0.0001	< 0.0001
<b>Percent who report their health as fair or poor</b>			
African American	4.5	7.7	21.1
White	7.1	6.7	12.2
Ratio: A.A./White	0.63	1.15	1.73
p value for racial difference	0.212	0.617	0.0039
<b>Percent with high blood pressure (2001, 2003)</b>			
African American	11.9	16.5	32.0
White	6.1	5.5	12.7
Ratio: A.A./White	1.95	3.00	2.52
p value for racial difference	0.137	0.0002	< 0.0001
<b>Percent with high cholesterol (2001, 2003)</b>			
African American	5.2	17.0	25.3
White	13.6	17.4	22.9
Ratio: A.A./White	0.38	0.98	1.10
p value for racial difference	0.071	0.929	0.580
<b>Percent who currently smoke</b>			
African American	16.8	15.8	23.1
White	34.1	25.8	32.5
Ratio: A.A./White	0.49	0.61	0.71
p value for racial difference	0.0001	0.0003	0.006
<b>Percent who smoked during pregnancy*</b>			
African American	8.3	11.4	14.5
White	31.1	16.5	11.0
Ratio: A.A./White	0.27	0.69	1.32
p value for racial difference	< 0.0001	< 0.0001	< 0.0001

\*This measure is based on 1999-2003 birth certificate data; age groups are 15-19, 20-34, and 35+.

importance of targeting health interventions to African American women in their 20s and 30s as a means of reducing the overall racial disparity in low birth weight and infant mortality. This is consistent with the overarching Healthy People 2010 goal of reducing health disparities.

A limitation of this study is that it presents only descriptive statistics, without other control variables. Therefore the differences that are attributed here to race and age could be due substantially to other factors (such as education, income, social support, or medical conditions) that are associated with race and age. Also, the similarity in the race/age patterns in the data on women's health and birth outcomes does not prove that women's health problems cause adverse birth outcomes.

stress may have negative effects on health, and stress can affect maternal behaviors such as smoking, nutrition, and substance use.<sup>17</sup> Strategies to improve the health of older women of reproductive age should include measures to provide protective resources for women at earlier ages to prevent health problems when they become older.

As Geronimus states: "While most Americans take for granted their good health during their young and middle adulthood—indeed these ages are referred to as the 'prime' of life and the 20s as the 'prime childbearing ages'—our findings suggest that among African American women in poverty, health deterioration may begin on an accelerated course in the mid-20s, and reproductive disadvantage may intensify."<sup>1</sup>

The observation that racial disparities in neonatal mortality widen with maternal age is consistent with the view of aging as a "weathering" process, which may involve life circumstances that undermine women's health in ways that can affect reproduction.<sup>1</sup> Racism, poverty, crime, and environmental problems disproportionately take their toll on the health of African American women,<sup>15</sup> leading to increasing health disparities as age increases. A recent North Carolina study suggests that unequal treatment based on race has negative effects on adult health, and African Americans are much more likely than whites to experience unequal treatment based on their race.<sup>16</sup> Eighteen percent of African American adults reported having emotional upset and/or physical symptoms due to treatment based on race, compared to 4% of white adults; 7% of African Americans reported experiences worse than other races when seeking health-care, compared to one percent of whites.<sup>16</sup> There is evidence that prolonged, active coping with social injustice may exact a physical price.<sup>1</sup> High levels of

In conclusion, an effective strategy to prevent infant deaths and reduce racial disparities in birth outcomes must include measures to improve women's health before they become mothers and to sustain their health throughout the reproduc-

tive years.<sup>18</sup> Future research on racial disparities in birth outcomes should examine differential exposures to risk and protective factors not only during pregnancy, but over the life course of women.<sup>19</sup> **NCMedJ**

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