

PRETERM BIRTH AMONG AFRICAN AMERICAN AND WHITE WOMEN WITH A LIFELONG RESIDENCE IN HIGH-INCOME CHICAGO NEIGHBORHOODS: AN EXPLORATORY STUDY

Objective: To explore the association between race and preterm birth among women with a lifelong residence in high-income neighborhoods.

Methods: Stratified and multivariable logistic regression analyses were performed on the Illinois transgenerational birthfile (infants born 1989–1991 and mothers born 1956–1975) with appended US Census income data. African American ($n=777$) and non-Hispanic White ($n=2,327$) infants born to mothers with a lifelong residence in Chicago census tracts with median family incomes in the top income quartile were studied.

Results: African Americans had a twofold greater preterm (<37 weeks) birth rate than Whites: 11.6% vs 5.2%, relative risk (95% confidence interval) equaled 2.2 (1.7–2.9). The adjusted (controlling for maternal birth weight, age, education, marital status, cigarette smoking, and prenatal care utilization) odds ratio of preterm birth for African Americans (compared to Whites) equaled 1.2 (.4–2.0). African Americans had a sixfold greater very low birth weight rate (<1500 g) than Whites: 3.3% vs .6%; relative risk (95% confidence interval) equaled 5.9 (3.1–11.2). The adjusted odds ratio of very low birth weight for African Americans (compared to Whites) equaled 2.4 (1.1–3.9).

Conclusions: A stark racial disparity in the unadjusted rates of preterm birth and very low birth weight exists among women with a lifelong residence in high-income urban neighborhoods; however, the disparity narrows when traditional, individual-level risk factors are mathematically controlled. (*Ethn Dis.* 2007;17:113–117)

Key Words: High Socioeconomic Status, Prematurity, Race, Very Low Birth Weight

James W. Collins, Jr, MD, MPH; Richard J. David, MD;
Dyan M. Simon, MD; Nikhil G. Prachand, MPH

INTRODUCTION

African American women have more than a twofold greater rate of preterm (<37 weeks) birth than White women.¹ Short gestation is tightly linked with very low birth weight (VLBW, <1500 g), which is a stronger proxy measure of mortality risk and more accurately measured.^{2,3} During the past 50 years, the racial gap in VLBW rates has widened; African Americans now have a threefold greater VLBW rate than Whites.^{1,4} Moreover, despite extensive published literature, the racial disparity in VLBW rates is an epidemiologic enigma; traditional socio-demographic and medical risk factors have a greater effect on the VLBW rates of Whites than of African Americans.^{5–9} In recognition of the public health importance of this phenomenon, *Healthy People 2010* calls for the elimination of racial and ethnic group disparities in infant mortality rates among United States residents.¹⁰

Contextual factors are strongly associated with perinatal outcome.^{11–15} Historically, African Americans and Whites have been exposed to extremes of residential environments, and a disproportionately high percentage of African Americans is directly exposed to urban poverty.¹² Although neighborhood poverty is a risk factor for preterm

birth and VLBW, the racial disparity in both outcomes persists as maternal residential environment improves.^{11–14} Rauh et al found that individual-level variables had minimal effect on the VLBW rate of African American women who lived in high-income New York City neighborhoods.¹⁴

To our knowledge, all population-based studies on pregnancy outcome have used cross-sectional designs in which ecologic risk estimates were based on women's place of residence at or near the time of delivery. The limited available data show that women's pre-pregnancy (fetal, infant, and childhood) experiences are associated with adult reproductive health.^{16,17} The risk of preterm birth among African American and White women with a lifelong residence in nonimpoverished neighborhoods is unknown.

We undertook an analysis of Illinois vital records and US Census income data to determine the extent to which the racial disparity in rates of preterm birth and VLBW exists among women with a lifelong residence in high-income Chicago neighborhoods.

METHODS

Study Population

A detailed description of the Illinois transgenerational dataset has been previously published.⁴ Briefly, the birth certificate data tapes for 1989–1991 from the Illinois Department of Public Health were linked to those of their mothers who were born in Illinois between 1956 and 1976. Approximately 328,000 potentially matchable infants

From the Department of Pediatrics, Children's Memorial Hospital, Feinberg School of Medicine, Northwestern University (JC, DS, NP); Department of Pediatrics, John Stroger Hospital of Cook County, University of Illinois Medical School (RD), Chicago, Illinois.

Address correspondence and reprint requests to James W. Collins Jr, MD, MPH; Division of Neonatology; Children's Memorial Hospital; 2300 Children's Plaza, #45; Chicago, IL 60614; 773-880-4142; 773-880-3061 (fax); jcollins@northwestern.edu

were in the 1989–1991 cohort. On the basis of each mother's maiden name (first and last) and exact date of birth, we successfully linked 267,303 (79%) maternal birth records to infant records. Failure to match usually arose from minor spelling errors in the mother and infant records. After the linkage of maternal and infant birth certificates was complete, all identifying information on the individual mothers and their infants was removed, producing an anonymous transgenerational dataset for analysis. In both generations, African American and White race were defined by mother's race and origin (non-Hispanic) listed on the birth certificate. White and African American mothers in the transgenerational birthfile had a slightly better sociodemographic profile than mothers of the 1991 population of Illinois births.⁴

For the 1989–1991 Chicago birth cohort, we appended 1990 US Census income information to each birth record; it was used to estimate maternal residential environment during adulthood and pregnancy. For the 1956–1975 Chicago birth cohort, we appended 1960 US Census income to each birth record; it was used to estimate maternal residential environment during early life (fetal, infancy, and childhood). Only women ($N=72,707$) who resided in Chicago at the time of their own birth and at the time they delivered a singleton infant were eligible for study inclusion.

Residential Environment

Census tract median family income was used to define neighborhood income status. This continuous measure was divided into empiric fourths of the total distribution. Neighborhoods in ≥ 75 th quartile were empirically defined as high income. Only African American and White women ($N=3104$) who resided in high-income Chicago neighborhoods at the time of their own birth and at the time they delivered a singleton infant were studied.

Pregnancy Outcome and Race

We calculated race-specific rates of preterm (<37 weeks) birth and VLBW infants. Next, we determined the distribution of traditional maternal socio-demographic (age, level of education attainment, marital status, and cigarette smoking) and medical (birth weight, adequacy of prenatal utilization) risk factors among African American and White women. The adequacy of prenatal care received by each mother during the pregnancy was categorized according to the Adequacy of Prenatal Care Utilization Index (APCUI).¹⁸ Care was designated on the basis of adequacy of initiation and adequacy of received services as one of the following:

- *inadequate*: prenatal care began after the 4th month or $<50\%$ of recommended visits received,
- *intermediate*: prenatal care began by the 4th month and $50\%–79\%$ of recommended visits received,
- *adequate*: prenatal care began by the 4th month and 80% to 109% of recommended visits received, and
- *adequate plus*: prenatal care began by the 4th month and $\geq 110\%$ of recommended visits received. This represents a category of high-risk women who received more prenatal care than the number of visits recommended by the American College of Obstetricians and Gynecologists. This two-factor index assessed prenatal care utilization, not its quality.

Lastly, we performed multivariate logistic regression analyses to calculate the adjusted odds ratio (OR) of preterm birth and VLBW for African Americans (compared to Whites).

Statistics

For each two-by-two analysis, we calculated relative risk (RR) and 95% confidence intervals (CI), using White infants born to women with a lifelong residence in high-income neighbor-

hoods as the reference group.¹⁹ In the logistic models, the adjusted OR of preterm birth and VLBW were determined by taking the antilogarithm of the β -coefficients and the confidence intervals from the standard errors of those coefficients.²⁰

RESULTS

In our study population, the preterm birth rate for African Americans ($n=777$) was 11.6% compared to 5.2% for Whites ($n=2,327$), RR 2.2 (1.7–2.9). African Americans also had a six-fold greater VLBW rate than Whites: 3.3% vs .6%, RR 5.9 (3.1–11.2). Nearly 30% (26/90) of African American preterm births were VLBW; 15% (14/92) of White preterm births were VLBW. As expected, all of the VLBW infants were preterm. As a first step toward exploring the potential confounding effect of social and medical factors, we determined the distribution of selected sociodemographic and medical variables according to maternal race (Table 1). African American (compared to White) mothers had a greater prevalence of low birth weight, young age, low level education attainment, unmarried marital status, and inadequate prenatal care utilization. White mothers were more likely to smoke cigarettes.

Because the African American and White populations differed, we performed multivariate logistic regression analyses. The adjusted (controlling for maternal birth weight, age, education, marital status, cigarette smoking, and prenatal care utilization) OR of preterm birth for African Americans (compared to Whites) equaled 1.2 (.4–2.0). The adjusted OR of VLBW for African-Americans (compared to Whites) equaled 2.4 (1.1–3.9).

DISCUSSION

To our knowledge, the present population-based study is the first to

Table. Distribution of selected risk factors according to race (1989–1991, 1956–1975, Illinois)

	African-Americans	White	RR (95% CI)
Total births	n=777	n=2327	(African Americans compared to Whites)
	n (%)		
Maternal low-birth weight (<2500 g)			
Yes	84 (11)	15 (5)	2.2 (1.7–2.9)
No	693 (89)	2212 (95)	reference
Maternal age (years)			
<20	240 (31)	137 (6)	5.2 (4.3–6.4)
20–35	537 (69)	2190 (94)	reference
Maternal education (years)			
<12	272 (35)	186 (8)	2.4 (2.1–2.8)
12	234 (21)	892 (38)	1.7 (1.6–1.7)
13–15	212 (27)	607 (26)	1.6 (1.5–1.8)
≥16	57 (8)	634 (27)	reference
Marital status			
Unmarried	638 (82)	330 (14)	5.8 (5.2–6.4)
Married	139 (18)	1996 (86)	reference
Prenatal care			
Inadequate	244 (32)	169 (7)	4.3 (3.7–5.1)
Intermediate	154 (20)	408 (18)	1.6 (1.4–1.9)
Adequate	217 (28)	1213 (52)	reference
Adequate +plus	159 (21)	526 (23)	1.4 (1.2–1.6)
Cigarette smoke			
Yes	76 (10)	318 (14)	.7 (.5–.9)
No	697 (90)	1986 (86)	reference

RR=relative risk; CI=confidence interval.

explore the pregnancy outcome of African American and White women with a lifelong residence in high-income neighborhoods. We found that African American (compared to White) women have twofold and sixfold greater rates of preterm birth and VLBW, respectively. With the exception of cigarette smoking, African American women have a greater prevalence of high-risk socio-demographic and medical characteristics than White women. Most striking, the racial disparity in preterm birth and VLBW narrows when these differences are mathematically controlled. Further research is warranted to determine the relationship between race and preterm birth among women with a lifelong residence in high-income neighborhoods.

To the extent that life-course factors associated with direct exposure to

neighborhood poverty singularly contribute to the racial disparity in preterm birth, one would expect the gap to narrow among women who never resided in impoverished neighborhoods. Our exploratory data show that African American women unexposed to the health-eroding consequences of early-life and cumulative exposures to neighborhood poverty still have a twofold greater preterm birth rate than their White peers. However, when differences in adult sociodemographic and medical risk status are taken into account, the races actually possess equivalent preterm delivery risk. This finding is in stark contrast to prior studies in which ecologic risk was solely defined at the time of delivery and the racial gap persistent or widened when traditional sociodemographic and prenatal care variables were controlled.^{11–14} More

We found that African American (compared to White) women have twofold and sixfold greater rates of preterm birth and VLBW, respectively.

in-depth investigations are warranted to determine the effect of individual-level and contextual variables on the preterm birth rates of African American women with a lifelong residence in high-income neighborhoods.

Very low birth weight (VLBW) is a more objective measure of preterm birth than gestational age assessment <37 weeks. Moreover, VLBW is pathologic in all populations.^{1–3} Our data show that unmeasured factors, conditions, or experiences of African American women supersede the reproductive health benefit of lifelong residence in high-income neighborhoods. Although the OR of VLBW for African American (compared to White) women dramatically decreases when traditional risks are controlled, African Americans still have a twofold greater adjusted VLBW risk than Whites. This risk contrasts with an adjusted OR of preterm birth for African American (compared to White) women that approximates unity. Given that most preterm births are not VLBW, these observations are consistent with prior studies that showed a weak association between traditional maternal sociodemographic characteristics and VLBW among African Americans.^{5–9} The racial gap in VLBW infants may have decreased further if unmeasured stress, behavioral, and clinical risk factors had been mathematically controlled.

Our finding of a racial disparity in VLBW infants is consistent with the limited literature on the pregnancy outcome of second-generation high-

socioeconomic status (SES) women.²¹ Using questionnaire data from medical school graduates, Foster et al found that second-generation high-SES African American women had a twofold greater preterm birth rate than second-generation high-SES White women.²¹ Chronic exposure to interpersonal racial discrimination is a plausible explanation. An expanding literature provides evidence that African American women's lifetime exposure to interpersonal racial discrimination is a strong independent risk factor for VLBW.²²⁻²⁴ We previously found that the association is strongest among college-educated women,²³ a subgroup most likely to have a lifelong residence in high-income neighborhoods.

Understanding the mechanisms underlying African American women's preterm birth and VLBW risk is the key step in eliminating the racial disparity in infant mortality rates. Maternal age, education, marital status, and adequacy of prenatal care utilization are minimally related to the elevated VLBW risk among urban African Americans.⁵⁻⁸ The present study provides evidence that a full generation of non-improvement may allow targeted social programs, designed to eliminate racial differences in traditional risk factors, to narrow the racial gap in preterm delivery and VLBW infants. We encourage researchers and public policymakers to adopt a life-course conceptual framework when examining racial differences in adverse pregnancy outcome.

Our exploratory study has a number of limitations. First, we empirically defined high-income neighborhood on the basis of census tract median family income >75th percentile. Second, our sample size of African Americans was relatively small. This precluded in-depth subgroup analyses of college-graduated women who receive adequate prenatal care. Third, we used two time periods to define lifelong residence in high-income neighborhoods: at time of mothers own

birth and at time of her delivery of her own infant. Place of residence between these time periods was not measured, but it seems unlikely to be different. Fourth, reflecting the hypersegregation residential pattern of Chicago, African American and White women in our study rarely resided in the same high-income neighborhood.²⁵ As a result, African American and White women were most likely exposed to different contextual risk factors independent of neighborhood poverty.^{15,26} Moreover, reflecting the residential pattern of high-income African American neighborhoods contiguous to impoverished areas, African American women with a lifelong residence in high-income neighborhoods were more likely to have experienced the chronic and acute stressors of neighborhood poverty than their White peers.²⁷ Fifth, racial differences in geographic movement patterns from the city to the suburbs across generations may explain some of our findings. Lastly, vital records contain minimal clinical information such as maternal weight and height. Maternal ponderal index and weight gain during pregnancy might account for our findings.

In summary, our exploratory investigation shows a stark racial disparity in the unadjusted preterm birth rates among women with a lifelong residence in high-income urban neighborhoods; however, traditional individual-level risk factors appear to contribute to the African American women's pregnancy disadvantage.

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AUTHOR CONTRIBUTIONS

Design concept of study: Collins, David, Simon

Acquisition of data: Collins, David, Prachand
Data analysis interpretation: Collins, David, Prachand

Manuscript draft: Collins, Simon
Statistical expertise: David, Prachand

Acquisition of funding: Collins
Administrative, technical, or material assistance: Collins, David, Simon, Prachand
Supervision: Collins