

The Differential Effect of Traditional Risk Factors on Infant Birthweight among Blacks and Whites in Chicago

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Abstract: We analyzed 103,072 White and Black births in Chicago from the 1982 and 1983 Illinois vital records, using 1980 median family income of mother's census tract as an ecologic variable. Thirty-one percent of Blacks and 4 percent of Whites resided in census tracts with median family incomes \leq \$10,000/year. Only 2 percent of Black mothers, compared to 16 percent of White mothers, lived in areas where the median family income was greater than \$25,000/year. Among Blacks with incomes \leq \$10,000/year, maternal age, education, and marital status had minimal predictive power on the incidence of low birthweight (LBW) infants. Among

high-risk mothers in the poorest areas the proportion of LBW infants in Blacks and Whites was less divergent than in higher income areas. Independent of residential area, low-risk Whites had half the occurrence of LBW infants as Blacks. We conclude that the extremes of residential environments show dramatic racial disparity in prevalence, yet the few low-risk Blacks still do less well than low-risk Whites. Traditional risk factors do not completely explain racial differences in neonatal outcome. (*Am J Public Health* 1990; 80:679-681.)

Introduction

Despite the dramatic improvements in perinatal care during the past 30 years, Black infants are twice as likely as White infants to die during their first month of life.¹⁻³ This is primarily related to the high incidence of low birthweight (<2500 grams) infants among Black mothers.⁴⁻⁶ Cities such as Washington, DC, Detroit, and Chicago with large Black subpopulations have the highest neonatal mortality rates (NMR) in the country and are in part responsible for the United States' relatively poor international ranking in neonatal survival.⁷ The mechanisms underlying this well-documented phenomenon are not well understood.

Low maternal socioeconomic status (SES) worsens pregnancy outcome.^{8,9} Black mothers are more likely to be young, unmarried, poorly educated, and receiving welfare support.⁸ However, Spurlock, *et al.*,¹⁰ found that poor and non-poor Black infants in Kentucky had no significant difference in birthweight distribution. There is limited available information on mothers of high SES, especially among ethnic groups with widespread poverty. Shiono, *et al.*,⁵ reported that in a middle class community Black mothers still had a high incidence of LBW infants. Similarly, Kleinman and Kessel¹¹ found that the ratio of low birthweight for Blacks versus Whites was actually higher among college educated mothers than for women who did not complete high school. Another recent study indicated that a 5 percent racial difference in low birthweight persisted independent of maternal residence.¹² Few studies have addressed the possibility that mature, educated, Black mothers who reside in high income communities might be less likely to deliver low birthweight infants.

For these reasons, we utilized Illinois vital records and US census income data to determine the extent to which disparities in traditional risk factors affect racial differences in pregnancy outcome in Chicago. We particularly wanted to learn if low maternal risk status reduces the number of low birthweight Black infants.

Methods

We analyzed all Black and White births in Chicago using a data set created by appending survival data from infant birth-death tapes as previously described¹³ and income characteristics of mother's census tract (from 1980 census tapes) to records in the 1982 and 1983 birth files. Because of their strong association with neonatal outcome maternal age, education, and marital status were used as proxies of individual risk status. Median family income of mother's census tract residence was used as the primary proxy for environmental deterioration. Percent of families within each census tract living below the poverty level was used as an additional ecologic variable.

Among Blacks and Whites we calculated the proportion (per 100 live births) of LBW infants by census tract income, maternal age, and education for the entire study population. We stratified the study population by median family income of mother's census tract to examine the Black-White differential in residential environments. Within each grouped income area, we calculated the frequency of individual and ecologic risk variables. To explore the independent association of residential environment and pregnancy outcome, we determined the relation of maternal age, education, marital status, parity, and history of prior infant death to Black and White infant birth weight.

Relative risk with 95% confidence intervals are presented. Confidence limits were estimated by the Taylor Series method.¹⁴

Results

There were 51,827 Black and 51,245 White births in Chicago during 1982 and 1983. Black neonatal mortality was twice as high as that of Whites (16/1,000 vs 7/1,000) and the LBW proportions were twice as high in Blacks (14 percent vs. 6 percent). Only 2 percent of Black mothers, compared to 16 percent of White mothers, resided in census tracts in which the median family income was greater than \$25,000/year. Conversely, 31 percent of Blacks lived in census tracts in which the average household income was less than \$10,000/year; only 4 percent of White mothers resided in such impoverished neighborhoods (Figure 1).

The risk of LBW infants among Blacks remained essentially twice as high as that of Whites across all maternal income, education, and age groups. Although the higher

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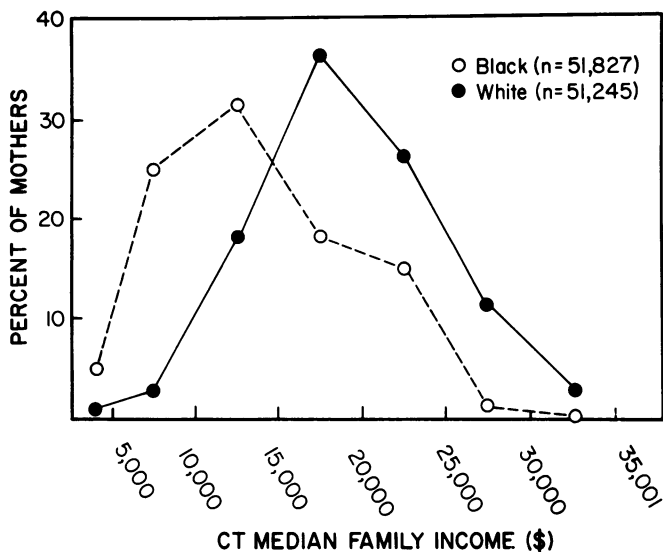


FIGURE 1—Census Tract Median Family Income Distribution of Black and White Mothers

Black risk appeared to be eliminated at very high incomes, the confidence intervals were broad because of the small number of Blacks (N = 200, or 0.4 percent) residing in census tracts with median family income over \$40,000/year (Table 1).

Table 2 illustrates the racial distribution of risk factors by census tract income. White mothers were often Hispanic in low-income areas. Among mothers who resided in very low-income census tracts (\leq \$10,000/year) Blacks were almost 3.5-times as likely as Whites to reside in a census tract where more than one-half of the census tract cohabitants lived below the federally mandated poverty level (RR = 3.47, 95% CI 3.07, 3.92).

The differential effect of race on the LBW rates in low-income areas is apparent with maternal age. Among Black mothers who resided in higher income communities, the high proportion of LBW was minimally reduced and remained twice that of Whites independent of maternal education, age, and marital status (Table 3).

TABLE 1—Proportion of Low Birthweight (<2500 grams) and Relative Risk in Black and White Infants according to Income, Maternal Education, and Age

Variables	% LBW		Black Relative Risk (95% CI)
	Black	White	
Income (per year)			
≤\$10,000	15	8	1.92 (1.64, 2.26)
\$10,001–\$20,000	14	6	2.12 (2.01, 2.24)
\$20,001–\$30,000	12	6	2.16 (1.99, 2.39)
\$30,001–\$40,000	10	5	2.26 (1.39, 3.54)
>\$40,000	4	4	.98 (.13, 7.29)
Maternal Education (years)			
<12	16	7	2.40 (2.26, 2.55)
12	14	7	2.13 (1.93, 2.42)
13–15	12	5	2.14 (1.93, 2.42)
16	10	5	2.13 (1.76, 2.57)
≥17	9	5	1.87 (1.38, 2.53)
Maternal Age (years)			
≤19	14	8	1.44 (1.37, 1.55)
20–35	14	6	2.41 (2.30, 2.52)
>35	14	8	1.98 (1.64, 2.39)

TABLE 2—Distribution of Individual and Environmental Risk Factors by Census Tract Average Annual Income and Race

Variables	≤\$10,000		\$10,001–\$20,000		\$20,001–\$30,000	
	Black	White	Black	White	Black	White
Age (years)						
% ≤19	34	19	27	3	22	8
Education (years)						
% <12	54	55	38	60	23	21
Marital Status						
% Unmarried	82	36	71	88	59	12
Maternal Ethnic Origin						
% Hispanic	<1	25	<1	23	<1	2
Poverty Level*	43	13	1	0	0	0

*Incidence rate of residing in a census tract in which more than 50% of families have annual incomes below the federally mandated poverty level.

Discussion

We found that high-risk Whites and Blacks had less divergent LBW rates in the poorest areas than in higher income areas while low-risk Whites had half the occurrence of LBW infants as Blacks regardless of the income of the area in which they lived. In Chicago, the percentages of Black and White mothers at the extremes of residential environment are dramatically different. Contrary to Spurlock, *et al.*,¹⁰ who reported that poor and non-poor Black infants in Kentucky had no difference in the incidence of LBW, we found that among all mothers, Black and White, low income is associated with a greater risk of low birthweight.

A wider Black-White gap at the upper end of the socioeconomic spectrum has been described in earlier studies such as that by Kleinman and Kessel,¹¹ but this could have been an artifact of the differences in the economic value of education (the usual proxy for income) between Blacks and Whites in the US. For example, the income disparity between college educated Blacks and Whites is greater than it is for those who did not finish high school.¹⁵ Notwithstanding the limitations of the available grouped income data, our results confirm the results of Kleinman and Kessel and highlight the difficulty in defining a truly low-risk group of Black mothers using traditional risk factors.

Our data suggest that residential environment is an important risk factor that researchers need to take into account when examining the relation between race and neonatal outcome. Residing in a very low-income urban neighborhood is such a strong proxy of low birthweight for Blacks that traditional indicators of favorable outcome (education, age, marital status) fail to identify clearly a low risk subgroup. The intense concentration of extreme poverty combined with the related issues of disintegrating social networks, substance abuse, poor nutrition, smoking, and inadequate prenatal care may produce such a powerful negative force that isolated changes in the classical risk factors do not dramatically reduce the high percentage of low birthweight infants.

Racial differences in intrauterine growth rates exist.^{16,17} However, when Wilcox and Russell controlled for Black-White disparities in birthweight distribution, the excess in mortality among Black infants was not eliminated.¹⁷ The study found that a high incidence of small births among Blacks accounted for the majority of Black-White differences in survival.

The mechanisms of racial disparity in health in this

TABLE 3—Proportion of Low Birthweight (<2500 grams) infants by Census Tract Average Annual Income and Race

Variables	<\$10,000			\$10,001–\$20,000			\$20,001–\$30,000		
	Black (N = 15,889)	White (N = 1,851)	Black RR (95% CI)	Black (N = 27,754)	White (N = 27,867)	Black RR (95% CI)	Black (N = 8,936)	White (N = 20,199)	Black RR (95% CI)
	%LBW								
Maternal Age (years)									
≤19	14	13	1.02 (.78, 1.35)	14	8	1.72 (1.53, 1.93)	13	5	2.70 (2.15, 3.40)
20–35	16	7	2.40 (1.97, 2.93)	14	6	2.24 (2.10, 2.39)	12	6	2.20 (2.02, 2.41)
Maternal Education (years)									
≤12	16	9	1.85 (1.56, 2.21)	15	7	2.08 (1.97, 2.21)	14	6	2.21 (2.01, 2.43)
>12	12	5	2.43 (1.54, 3.82)	11	5	2.08 (1.80, 2.40)	11	5	2.14 (1.87, 2.46)
Marital Status									
Unmarried	16	11	1.20 (.96, 1.44)	15	9	1.76 (1.51, 2.05)	14	8	1.75 (1.51, 2.05)
Married	14	6	2.29 (1.80, 2.40)	11	6	2.00 (1.84, 2.18)	10	5	1.87 (1.67, 2.09)
Parity*									
Primiparity	13	8	1.64 (1.27, 2.12)	9	7	1.27 (1.14, 1.41)	12	6	1.99 (1.75, 2.74)
Low parity	14	6	2.44 (1.83, 3.25)	14	6	2.28 (2.11, 2.47)	13	5	2.62 (2.35, 2.93)
High parity	18	9	2.08 (1.53, 2.84)	18	8	2.39 (2.17, 2.64)	15	6	2.31 (1.94, 2.20)
Prior Infant Death									
Yes	22	9	6.37 (1.62, 25.10)	22	8	2.31 (1.82, 2.95)	25	5	3.94 (2.47, 6.89)
No	15	8	1.78 (1.52, 2.09)	14	6	2.15 (2.04, 2.27)	13	4	3.40 (3.11, 3.73)

*Parity was defined as high in third or higher numbered births to women under 25 years of age and fourth or higher numbered births to women 25 to 29 years of age. All other multiparous births were considered to represent low parity.¹¹

society are complex and deep-rooted.^{8,18} We suspect that the persistently high rate of low birthweight infants among Blacks reflects generations of poverty.¹⁹ While the vital records-based studies can identify factors that affect perinatal outcome, there is a need for studies in greater depth. A limitation of the present study is that even with household income data for each birth we could not truly have “controlled” for Black-White economic differences since income cannot be equated with purchasing power.²⁰ Moreover, despite treating census tract income as an indicator of the environment within which people live, the lack of homogeneity among mothers of the same grouped income area limits the generalizability of the study.²¹ A multidisciplinary approach is needed to better elucidate and remove causes of Black-White differences in neonatal outcome.

In summary, the extremes of residential environment show dramatic racial disparity in prevalence, yet traditional risk factors fail to explain why non-poor Blacks remain at high risk for poor pregnancy outcome. Given that a large percentage of Blacks in this country live at or below the poverty level we need to eliminate economic disparities between the races in addition to providing planned intervention if we hope to see the health gap closed. We suspect that it may require more than one generation of non-poverty and adequate services to see an impact upon infant birthweight.¹⁹

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