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Abstract

Relative income may be a better predictor of health outcomes than absolute income. We examined two measures of relative income—income incongruity and relative household income—in relation to preterm birth in a study of U.S. Black women. Income incongruity is a measure that compares the median household income of an individual's residential area with that of others who have the same level of marital status and education, but who may live in different areas. Relative household income is a measure that compares an individual's household income with the median household income of her residential area. We used data collected biennially (1997–2003) from participants in the Black Women's Health Study: 6,257 singleton births were included in the income incongruity analyses and 5,182 in the relative household income analyses; 15% of the births were preterm. After adjusting for confounders, we found no overall association of income incongruity or relative household income with preterm birth. For relative household income, but not for income incongruity, there was suggestive evidence that neighborhood composition modified the association with preterm birth: higher relative household income was associated with higher risk of preterm birth in neighborhoods with a high percentage of Black residents, and higher relative household income was associated with lower risk in neighborhoods with a low percentage of Black residents.

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Keywords

African Americans; premature birth; relative income; neighborhood; USA; women

INTRODUCTION

Preterm birth is the leading cause of neonatal mortality in the United States and Blacks are twice as likely as Whites to have a preterm birth (Ananth, Misra, Demissie, & Smulian, 2001; Berkowitz, Blackmore-Prince, Lapinski, & Savitz, 1998; Green, Damus, Simpson, Iams, Reece, Hobel et al., 2005; Martin, Hamilton, Sutton, Ventura, Menacker, & Munson, 2005). The racial disparity has not been fully explained by individual-level factors such as history of preterm birth or lack of prenatal care (Ananth et al., 2001; Berkowitz et al., 1998; Green et al., 2005). In recent years, researchers have begun to examine the effects of neighborhood socioeconomic status on adverse birth outcomes (Ahern, Pickett, Selvin, & Abrams, 2003; Culhane & Elo, 2005; Farley, Mason, Rice, Habel, Scribner, & Cohen, 2006; Kaufman, Dole, Savitz, & Herring, 2003; Luo, Wilkins, & Kramer, 2006; Pickett, Ahern, Selvin, & Abrams, 2002; Pickett & Pearl, 2001).

Economically deprived areas are more likely to be inhabited by Blacks than Whites, even when both groups have similar income and education (Krieger, Williams, & Moss, 1997; Massey, Condran, & Denton, 1987). Economically disadvantaged communities are not as well-equipped with amenities for good health (e.g. primary care, supermarkets, and public transportation) as economically advantaged areas (Kawachi & Kennedy, 1997; Lynch, Smith, Kaplan, & House, 2000; Marmot, 2002; Massey et al., 1987; Subramanian & Kawachi, 2004; Williams & Collins, 2001). Although the socioeconomic status of the individual or the individual's neighborhood may affect health, it has been argued that absolute income may not be as influential as relative income and social status on morbidity (Marmot, Smith, Stansfeld, Patel, North, Head et al., 1991; Singh-Manoux, Adler, & Marmot, 2003) and mortality (Wilkinson, 1997a, b).

Income incongruity is a measure of relative income originally developed by Collins and colleagues (Collins, Herman, & David, 1997). Positive income incongruity exists when the median household income of a person's residential area is greater than that for other individuals in the entire study population who share the person's level of marital status and education, and negative income incongruity exists when the median household income of a person's residential area is lower than expected according to the person's level of marital status and education (Collins et al., 1997; Pickett, Collins, Masi, & Wilkinson, 2005). This variable has been used as a marker for relative income in studies that did not have income data at the individual level. Two studies, which exclusively enrolled Black women, have examined positive income incongruity in relation to preterm birth within levels of census tract racial composition (Pickett et al., 2005; Vinikoor, Kaufman, Maclehose, & Laraia, 2008). While no association was observed among Black women who lived in census tracts of mixed racial composition, positive income incongruity was associated with a reduced risk of preterm birth among Black women who resided in predominantly Black census tracts (Pickett et al., 2005; Vinikoor et al., 2008). Their finding supports studies that found beneficial effects of racial residential segregation on health (Fang, Madhavan, Bosworth, & Alderman, 1998; Halpern, 1993) but contrasts with others that reported detrimental effects on health (Osypuk & Acevedo-Garcia, 2008; Williams & Collins, 2001). Another study assessed positive and negative income incongruity among Black and White women and found that positive income incongruity, but not negative income incongruity, was associated with a lower risk of very low birth weight in both ethnic groups (Collins et al., 1997). The analyses were not stratified by neighborhood racial composition.

In the present report from the Black Women's Health Study, we had information on individual-level household income as well as area-level household income. We derived another measure of relative income, "relative household income," which defines an individual's household income relative to the household incomes of others in her residential area (Subramanian & Kawachi, 2004; Wilkinson, 1997a). To our knowledge, no previous studies have examined the association of relative household income in relation to preterm birth. We examined relative household income (derived from an *observed* household income) and income incongruity (derived from an *expected* household income according to marital status and educational level) as potential risk factors for spontaneous and medically indicated preterm birth. We also examined whether racial composition of the residential area modified the effects of these relative income measures on risk of preterm birth.

METHODS

Data sources

The Black Women's Health Study (BWHS) is an ongoing prospective follow-up study of Black women residing throughout the United States (Rosenberg, Adams-Campbell, & Palmer, 1995). In 1995, the study enrolled 59,000 women aged 21 to 69 years who completed health questionnaires mailed to subscribers of *Essence*, a general interest magazine marketed to Black women. The enrolled population also included family and friends of early participants and members of selected Black professional organizations. Participants have been followed through biennial questionnaires that collect information on demographic, reproductive, and medical factors. The study has maintained an average follow-up rate of 80% since baseline (Rosenberg, Palmer, Wise, Horton, & Corwin, 2002; Rosenberg, Wise, & Palmer, 2005).

The 1995 residential addresses were linked to the 2000 U.S. Census block group data by a company that has been reported to geocode accurately (Krieger, Waterman, Lemieux, Zierler, & Hogan, 2001). Census block groups are geographic areas typically of homogenous demographic composition that contain an average of 1,500 people (US Census Bureau, 2002).

Income incongruity

Income incongruity compares a participant's block group income with the average block group income of others in the study population with the same marital status and level of education (Collins et al., 1997; Pickett et al., 2005). To create this variable, we extracted information on median household income from census block group data and information on marital status (married or living as married, and unmarried) and years of education (≤ 12, 13–15, and ≥ 16 years) from the follow-up questionnaires. Each woman was classified as having positive income incongruity if the median household income of the block group in which she lived was at least one standard deviation higher (or lower to define negative income incongruity) than the average block group median household income of mothers with the same level of education and marital status in our study population (Collins et al., 1997; Pickett et al., 2005). A participant with no income incongruity lived in a block group with a median household income that was within one standard deviation of the average block group median household income for study participants with comparable marital status and educational level.

Relative household income

Relative household income compares the participant's household income to the median household income of the block group in which she lives. Household income was assessed in categorical form in the BWHS. We collapsed the census variable, median household income, into the following six categories of U.S. dollars: $\leq$ 15,000; 15,001–25,000; 25,001–35,000; 35,001–50,000; 50,001–100,000; and > 100,000, and coded them from 1 to 6. This ordinal

variable for block group median household income was then subtracted from the individual-level household income variable, for which the same categories had also been coded from 1 to 6. We categorized women as having "higher relative household income" if their individual-level household income was at least one category higher than their block group's median household income. We categorized women as having "lower relative household income" if their individual-level household income was at least one category lower than the median household income category of their block group, while "similar household income" indicated no difference in categories of individual-level and neighborhood-level household income.

Preterm birth

On follow-up questionnaires from 1997 through 2003, participants reported whether they had a singleton birth that was three or more weeks early, which the BWHS defines as a preterm birth. Participants also reported the reason for the preterm birth. We separately assessed spontaneous preterm births (premature labor for no known reason or early rupture of membranes) and medically indicated preterm births (cesarean section or medical induction) because they may have different etiologies (Berkowitz et al., 1998; Pickett, Abrams, & Selvin, 2000). The BWHS carried out two validation studies of self-reported preterm birth (defined as 3 or more weeks early). In a study that compared the self-report of 25 BWHS participants with medical record data, preterm birth was confirmed for 23 (92%), and the reason for the preterm birth was confirmed for 20 of the 23 cases (87%). In a study that compared the self-reports of 23 BWHS participants from Massachusetts who delivered singletons during 1995–2003 with birth registry data from the Massachusetts Department of Public Health, preterm birth was confirmed for 21 out of 23 (91%), and spontaneous preterm birth was confirmed for 11 of 12 participants (92%). The proportion of preterm birth in the present analysis, 15.0%, is similar to the proportion among Black women in national data (based on the <37 weeks gestation definition) in 2001, 15.6% (Vahratian, Buekens, & Alexander, 2006).

Additional covariates

Maternal age at pregnancy was categorized into fine age groups (<30, 30–34, 35–39, and ≥ 40) to minimize residual confounding from age. Because the minimum age at baseline was 21 and few women were less than age 25 years at the index birth, we did not divide the <30 category further. We also considered the following variables for inclusion in statistical models: years of education (≤ 12, 13–15, 16, ≥ 17), marital status during pregnancy (married or living as married, divorced/separated/widowed, single), prepregnancy body mass index (BMI) (kg/m^2) (<20, 20–24, 25–29, ≥ 30) (WHO Expert Committee, 1995), smoked cigarettes during pregnancy (no, yes), parity status (nulliparous, parous), participant born preterm (no, yes, unsure), had a previous preterm birth (no, yes), annual household income in US dollars (≤ 35,000, 35,001– 50,000, 50,001–100,000, > 100,000), and number of people supported by the household income (1, 2, 3, 4, ≥ 5). The last two factors listed were assessed on the 2003 questionnaire. The area-level household income variable was not adjusted for number of people in the household and, for consistency, we decided against adjusting for number of people in the household for the individual-level household income variable in our main analysis. The census variable, percent of Black residents, was divided into three categories: low, medium, and high, using cut points based on the 25^{th} and 75^{th} percentiles in our sample: < 14.4%, 14.4 to 82.7%, and > 82.7% Black residents.

Exclusion Criteria

From 1997 to 2003, the period during which information on preterm birth status was collected, 8,697 singleton births were reported by women less than 45 years of age. We restricted our sample to 7,026 first reported pregnancies to prevent correlations arising from two or more births contributed by the same mother. Of these, 567 were excluded because the mothers had

invalid addresses for geocoding (e.g. business addresses or post office boxes). We also excluded 49 preterm births that could not be classified as either spontaneous or medically indicated, leaving 6,410 births.

For the income incongruity analyses, we excluded 153 births because data on the mother's marital status and education were missing, leaving data on 6,257 births (5,312 term births, 499 spontaneous preterm births, and 446 medically indicated preterm births).

For the relative household income analysis, we did not exclude mothers with missing data on maternal education and marital status because these variables were not used to create the relative household income variable. Instead, we excluded 1,228 mothers with missing data on family household income from the sample of 6,410 participants. This left 5,182 births (4,408 term births, 402 spontaneous preterm births, and 372 medically indicated preterm births). The proportion of participants in this sample with ≥ 16 years of education was 57.3%, compared with 55.2% in the full sample. Other characteristics such as median maternal age (32 vs. 32 years), median BMI (25.8 vs. 25.9 kg/m^2), and proportion of personal household income > $50,000 (67.9 vs. 68.7%) were also similar in the two samples.

Statistical analyses

Odds ratios and 95% confidence intervals for income incongruity and relative household income in relation to preterm birth were estimated using generalized estimating equation (GEE) models. GEE models were employed using PROC GENMOD in SAS version 9.1 (SAS Institute Inc, 2003) with an empirical variance estimator, exchangeable working correlation structure, and the "logit link" function. GEE models accounted for the correlation created by two or more women living in the same block group (Horton, 1999). In our study, the median number of women per block group was one (range: one to 12) and the average number of women per block group was 1.19.

All multivariable models included maternal age, years of education, marital status, prepregnancy BMI, and smoking during pregnancy. Indicator terms were added to models for observations with missing data. Further adjustment for parity, participant born preterm, previous preterm birth, annual household income, and number of people supported by the household income yielded little change in the effect estimates and were not included in final models.

To investigate potential effect modification, cross-product terms between indicator variables of the exposure and the ordinal percent Black variable were added to statistical models. Wald tests were used to determine statistical significance. Because the BWHS population is mobile (Russell, Palmer, Adams-Campbell, & Rosenberg, 2001), we conducted sensitivity analyses to examine associations among women who had not moved or who had moved but had lived during the entire study period in neighborhoods that had the same category of median household income.

RESULTS

The percentages of mothers with positive and negative income incongruity were 13.6% and 13.9%, respectively, and the percentages with higher and lower relative household income were 63.0% and 14.5%. As shown in table 1, across levels of income incongruity going from positive to negative, maternal household income and level of education decreased while body mass index, cigarette smoking, percent of participants born preterm, having had a previous preterm birth, and parity increased. For census block group characteristics across these levels of income incongruity, the percent of Black residents increased and median household income

decreased. Similar trends in individual-level characteristics were present across levels of relative household income, going from higher to lower.

As shown in table 2, as the percent of Black residents in census block groups increased, there were decreases in the percent of married participants, educational level, and household income. The median household income of block groups decreased as the category of percent Black residents increased.

There were no significant associations between neighborhood racial composition, income incongruity, or relative household income with preterm birth overall or by preterm birth subtype (table 3). There were also no significant associations in sensitivity analyses confined to women whose neighborhood socioeconomic status had not changed. For the income incongruity sensitivity analysis (N=4,945 births), the odds ratio was 0.93 (95% CI: 0.73, 1.18) for the association between positive income incongruity and preterm birth, and 0.99 (95% CI: 0.76, 1.29) for the association between negative income incongruity and preterm birth (data not shown). For the relative household income sensitivity analysis (N=4,231 births), the odds ratio was 1.02 (95% CI: 0.82, 1.27) for the association between higher relative household income and preterm birth, and 1.18 (95% CI: 0.88, 1.57) for the association between lower relative household income and preterm birth (data not shown).

After stratifying by neighborhood racial composition (otherwise referred to as % Black residents in census block groups) (table 4), the adjusted odds ratio for positive income incongruity and preterm birth overall was 1.23 (95% CI: 0.74, 2.05) among women who lived in block groups with a high percentage of Black residents. There was a stronger association of positive income incongruity with spontaneous preterm birth: OR=1.68, 95% CI: 0.93, 3.06. In the sensitivity analysis confined to women whose neighborhood socioeconomic status had not changed, we observed similar results as those from the full analytic population for census block groups with a low or medium percentage of Black residents. However, for those living in block groups with a high percentage of Black residents we found a stronger association between positive income incongruity and spontaneous preterm birth (OR= 2.26, 95% CI: 1.17, 4.37) (data not shown). As in the full sample, there was no relation between negative income incongruity and spontaneous preterm birth among women who lived in block groups with a high percentage of Black residents (OR=1.06, 95% CI: 0.58, 1.92).

For the relative household income analyses stratified by neighborhood racial composition (% Black residents) (table 5), among participants who resided in block groups with a low percentage of Black residents, we observed a reduced odds ratio for preterm birth overall for women with higher relative income (OR=0.71, 95% CI: 0.50, 1.00) compared with women who were in the same household income category as those of their block groups. There were no associations in the stratum of medium percentage of Black residents. Among women who lived in block groups with a high percentage of Black residents, higher relative household income was associated with an increased odds ratio for preterm birth overall (OR= 1.80, 95% CI: 1.14, 2.82) and spontaneous preterm birth (OR=1.96, 95% CI: 1.07, 3.59). In a sensitivity analysis conducted among women whose neighborhood socioeconomic status had not changed, the adjusted odds ratio for the association between higher relative household income and preterm birth overall among women who lived in block groups with a high percentage of Black residents was 2.72 (95% CI: 1.48, 4.98), and the odds ratio for the association between higher relative income and preterm birth overall among women living in neighborhoods with a low percentage of Black residents was 0.66 (95% CI: 0.45, 0.96), relative to women with similar household income (data not shown).

DISCUSSION

In the present study, we examined two different measures of relative income in relation to preterm birth: one was a comparison between block groups (i.e. mother's block group income compared with the average block group income for women with similar marital status and education, otherwise called income incongruity) and the other was a comparison between mother's household income and the median income of households in her block group (i.e. relative household income). Income incongruity depends on the distribution of the entire study population rather than the internal characteristics of an area in which the participant lives. Relative household income directly compares a woman's income to that of the households in the areas in which she resides. Studying relative household income could improve our understanding of how socioeconomic inequalities *within* residential communities may affect health.

Our results suggest that income incongruity is not associated with preterm birth and that neighborhood racial composition (percent of Black residents) does not modify the relation between income incongruity and preterm birth. While we also found no overall association of relative household income with preterm birth, there was some evidence of a positive association between relative household income and spontaneous preterm birth in analyses stratified by neighborhood racial composition, although neighborhood composition itself was not associated with preterm birth. Odds ratios for both higher and lower relative household incomes in relation to preterm birth were below one in areas with low percentages of Black residents and above one in areas with high percentages of Black residents. The different associations in areas with high and low proportions of Black residents, if real, may be explained by different pathways. One might speculate that in predominantly Black areas, mothers with lower household incomes may have had less financial ability to use available resources important for good health (Massey et al., 1987). The positive association seen among mothers with higher household incomes who lived in predominantly Black areas could be related to the stresses associated with living in economically disadvantaged areas (Morland, Wing, Diez Roux, & Poole, 2002), coupled with feelings of isolation or lack of social support that women with household incomes similar to the median household income in their block groups may not experience. Acute and chronic stress have been associated with an increased risk of spontaneous preterm birth (Committee on Understanding Premature Birth and Assuring Healthy Outcomes & Board on Health Sciences Policy, 2007; Holzman, Jetton, Siler-Khodr, Fisher, & Rip, 2001; McLean & Smith, 2001; Moawad, Goldenberg, Mercer, Meis, Iams, Das et al., 2002). This could explain why the estimated effect of relative household income among those who resided in predominantly Black block groups was stronger for spontaneous preterm birth than for medically indicated preterm birth. Among participants who lived in block groups with a low proportion of Black residents, mothers with higher relative household income had a reduced risk of preterm birth overall. If real, an explanation might be that women with higher household incomes had better financial means to afford good health promoting amenities and services available within these communities. To our knowledge there have been no other studies of relative income in relation to preterm birth.

Our income incongruity results do not confirm previously reported protective effects of positive incongruity in relation to adverse pregnancy outcomes (Collins et al., 1997; Pickett et al., 2005; Vinikoor et al., 2008). Collins et al. (1997) found an inverse association between positive income incongruity and very low birth weight among Blacks (OR= 0.7, 95% CI: 0.5, 0.9) and Whites (OR= 0.6, 95% CI: 0.5, 0.9). They found no association with negative income incongruity and did not stratify by racial composition. Pickett et al. (2005) and Vinikoor et al. (2008) examined positive income incongruity and stratified by two levels of racial density. No association was observed among women who resided in racially mixed census tracts in either study. The odds ratio among women who lived in "predominantly Black" census tracts in the

Pickett study was 0.83 (95% CI: 0.75, 0.92), and the odds ratio in the Vinikoor study was 0.83 (95% CI: 0.74, 0.92) among mothers who lived in census tracts with “high relative density” of African Americans.

Our study has a number of strengths. We assessed spontaneous preterm birth and medically indicated preterm birth separately as well as combined. Our income incongruity variable, which is based on three categories of education in contrast to the two levels used in previous studies, allowed for a more detailed assessment of income incongruity. We assessed a new measure of relative income, relative household income. Effect estimates were examined not only among women who resided in predominantly Black areas but also among women who lived in areas with a low proportion of Black residents. We adjusted for multiple confounders including some not controlled in previous studies, such as prepregnancy body mass index and cigarette smoking.

Our study has several limitations. Preterm birth was self-reported and not based on clinical assessment. However, validation studies showed an acceptable level of accuracy in reporting, and the prevalence of preterm birth was comparable to the prevalence based on national data (Vahratian et al., 2006). Maternal household income was assessed on the 2003 questionnaire only and was used as an estimate of maternal household income around the time of pregnancy, which could have been up to six years earlier. In addition, 19% of the mothers had missing information on household income and could not be included in the relative household income analyses. However, maternal characteristics for participants in this analytic sample were similar to those in the full sample of participants with data on household income. Since the BWHS is a mobile population and census data were linked to 1995 residential addresses, there would have been misclassification in the measures of neighborhood income if a mother lived in a census block group in 1995 that was economically different from that at the time of her pregnancy. However, associations from sensitivity analyses carried out among women whose neighborhood socioeconomic status had not changed during the study period were similar or stronger than those in the overall analysis, suggesting that such misclassification is not an explanation for our findings.

The BWHS is a convenience sample of U.S. Black women and participants in the BWHS may have differed in some respects from other Black women who did not participate. Almost all BWHS participants (97%) have obtained at least a high school degree and 83% of U.S. Black women nationally of similar ages have acquired the same level of education (US Bureau of the Census, August 1996). Therefore, assuming internal validity, the results on the effects of relative income may be applicable to many Black women nationally, except for perhaps the 17% who have not completed high school.

In conclusion, while absolute income is significantly associated with risk of preterm birth in the United States, particularly at the area-level (Ahern et al., 2003; Farley et al., 2006; Kaufman et al., 2003; Pickett et al., 2002), it is unclear whether relative income is also a strong determinant. The evidence from studies to date is mixed and conclusions about an effect of relative income would be premature. We did not confirm previous findings of inverse associations of income incongruity with preterm birth among Black women overall (Collins et al., 1997) or among Black women who lived in neighborhoods with a high percentage of Black residents (Pickett et al., 2005; Vinikoor et al., 2008). However, we did find associations between relative household income and preterm birth with within levels of neighborhood racial composition. These findings suggest that context may be an important determinant of whether relative income influences risk of preterm birth. Further studies might consider focusing on potential modifiers, such as neighborhood racial composition, of an association between relative income and birth outcomes.

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Table 1

Distribution of maternal and block group characteristics according to levels of income incongruity and relative household income, Black Women's Health Study, 1995–2003

Maternal and block group characteristics	Income incongruity (n= 6,257)			Relative household income (n= 5,182)		
	Positive (n= 850)	No (n= 4,537)	Negative (n= 870)	Higher (n= 3,263)	Similar (n= 1,167)	Lower (n= 752)
Maternal characteristics						
Age, years, mean (SD)	32.7(4.5)	31.6(4.5)	31.1(4.6)	32.1(4.3)	32.1(4.6)	31.0(4.8)
Married or living as married, %	70.0	67.5	66.3	75.0	66.3	42.5
Education ≥16 years, %	59.7	55.0	50.0	64.4	53.5	32.6
Household income > $50,000, %	80.6	68.2	54.5	85.0	61.6	3.1
No. people supported by income, mean (SD)	3.7(1.1)	3.6(1.3)	3.7(1.3)	3.7(1.2)	3.6(1.3)	3.3(1.4)
Body mass index, kg/m^2, mean (SD)	26.2(5.6)	27.3(6.2)	28.1(7.0)	27.1(6.1)	27.3(6.3)	28.0(7.1)
Parous, %	42.5	41.7	51.8	39.5	43.8	48.7
Smoked during pregnancy, %	5.8	7.6	11.4	5.7	7.7	14.7
Participant born preterm, %	9.0	10.4	11.8	9.8	10.3	12.6
History of preterm birth, %	6.0	6.9	9.0	6.5	5.5	9.2
Block group characteristics						
% Black residents, mean (SD)	30 (33)	48 (33)	65 (30)	50 (34)	43 (35)	47 (35)
Median household income, $, mean (SD)	80,609 (17,461)	42,392 (11,349)	18,961 (5,514)	39,856 (17,484)	55,338 (22,227)	50,106 (22,188)

Table 2

Distribution of maternal and block group characteristics by block group % of Black residents among 6,410 participants, Black Women's Health Study, 1995–2003

Characteristics	< 14.4% Black (n= 1,602)	14.4 – 82.7% Black (n= 3,206)	> 82.7% Black (n= 1,602)
Maternal characteristics			
Age, years, mean (SD)	32.2 (4.4)	31.6 (4.4)	31.5 (4.6)
Married or living as married, %	77.8	67.1	58.4
Education ≥ 16 years, %	64.9	53.4	46.8
Household income > $50,000, %	77.4	67.0	60.0
No. people supported by income, mean (SD)	3.7(1.2)	3.6 (1.3)	3.5(1.3)
Body mass index, kg/m^2, mean (SD)	26.4(5.7)	27.3(6.3)	27.8(6.6)
Parous, %	39.5	44.6	44.9
Smoked during pregnancy, %	7.2	7.7	9.5
Participant born preterm, %	10.4	9.5	12.4
History of preterm birth, %	5.6	7.2	7.8
Block group characteristics			
Median household income, $, mean (SD)	56,307 (23,062)	41,533 (17,690)	37,629 (16,588)

Table 3

Adjusted [a] odds ratios and 95% confidence intervals of the associations of neighborhood racial composition (% Black residents), income incongruity, and relative household income with preterm birth, Black Women's Health Study, 1995–2003

	All preterm birth				Spontaneous preterm birth			Medically indicated preterm birth		
	No. term	No. preterm	OR	95% CI	No. preterm	OR	95% CI	No. preterm	OR	95% CI
Neighborhood racial composition										
<14.4% Black residents	1359	243	1.08	0.91, 1.28	128	1.08	0.86, 1.35	115	1.08	0.85, 1.37
14.4 – 82.7% Black residents	2734	472	1.00	Referent	245	1.00	Referent	227	1.00	Referent
> 82.7% Black residents	1357	245	1.03	0.87, 1.22	134	1.10	0.88, 1.37	111	0.97	0.76, 1.24
Income incongruity										
Positive incongruity	728	122	0.92	0.75, 1.14	73	1.07	0.81, 1.40	49	0.78	0.57, 1.06
No incongruity	3839	698	1.00	Referent	357	1.00	Referent	341	1.00	Referent
Negative incongruity	745	125	0.92	0.75, 1.12	69	0.99	0.76, 1.30	56	0.84	0.63, 1.13
Relative household income										
Higher income	2786	477	1.01	0.84, 1.22	251	1.01	0.79, 1.30	226	1.00	0.77, 1.31
Similar income	994	173	1.00	Referent	90	1.00	Referent	83	1.00	Referent
Lower income	628	124	1.09	0.84, 1.41	61	1.02	0.72, 1.45	63	1.17	0.82, 1.66

[a] Adjusted for age, education, marital status, body mass index, and smoked cigarettes during pregnancy.

Table 4

Adjusted [a] odds ratios and 95% confidence intervals of the association of income incongruity with preterm birth, stratified by % of Black residents in census block groups, among 6,257 participants, Black Women's Health Study, 1995–2003

Income incongruity	< 14.4% Black residents (n= 1,567)				14.4 – 82.7% Black residents (n= 3,130)				> 82.7% Black residents (n= 1,560)				*p* value[b]
	No. term	No. preterm	Odds ratio	95% confidence interval	No. term	No. preterm	Odds ratio	95% confidence interval	No. term	No. preterm	Odds ratio	95% confidence interval	
All preterm birth													
Positive incongruity	382	59	0.80	0.58, 1.11	256	42	0.93	0.66, 1.32	90	21	1.23	0.74, 2.05	0.19
No incongruity	886	171	1.00	Referent	2011	354	1.00	Referent	942	173	1.00	Referent	
Negative incongruity	60	9	0.81	0.39, 1.67	400	67	0.92	0.69, 1.23	285	49	1.00	0.71, 1.42	0.62
Spontaneous preterm birth													
Positive incongruity	382	34	0.88	0.58, 1.34	256	24	1.05	0.67, 1.64	90	15	1.68	0.93, 3.06	0.10
No incongruity	886	90	1.00	Referent	2011	178	1.00	Referent	942	89	1.00	Referent	
Negative incongruity	60	3	0.50	0.15, 1.63	400	38	1.06	0.73, 1.54	285	28	1.11	0.71, 1.75	0.37
Medically indicated preterm birth													
Positive incongruity	382	25	0.72	0.45, 1.16	256	18	0.81	0.49, 1.35	90	6	0.74	0.31, 1.76	0.92
No incongruity	886	81	1.00	Referent	2011	176	1.00	Referent	942	84	1.00	Referent	
Negative incongruity	60	6	1.14	0.47, 2.77	400	29	0.79	0.52, 1.20	285	21	0.90	0.54, 1.49	0.83

[a] Adjusted for age, education, marital status, prepregnancy body mass index, and smoked cigarettes during pregnancy.

[b] *p* value for interaction term between positive or negative income incongruity and % Black residents (ordinal).

Table 5

Adjusted [a] odds ratios and 95% confidence intervals of the association of relative household income with preterm birth, stratified by % of Black residents in census block groups, among 5,182 participants, Black Women's Health Study, 1995–2003

Relative household income	< 14.4% Black residents (n= 1,299)				14.4 – 82.7% Black residents (n= 2,592)				> 82.7% Black residents (n= 1,291)				*p* value[b]
	No. term	No. preterm	Odds ratio	95% confidence interval	No. term	No. preterm	Odds ratio	95% confidence interval	No. Term	No. preterm	Odds ratio	95% confidence interval	
All preterm birth													
Higher income	634	104	0.71	0.50, 1.00	1446	237	1.04	0.78, 1.37	706	136	1.80	1.14, 2.82	0.002
Similar income [c]	292	68	1.00	Referent	474	78	1.00	Referent	228	27	1.00	Referent	
Lower income	171	30	0.80	0.48, 1.32	295	62	1.21	0.83, 1.76	162	32	1.61	0.92, 2.82	0.03
Spontaneous preterm birth													
Higher income	634	53	0.69	0.43, 1.09	1446	124	1.02	0.70, 1.48	706	74	1.96	1.07, 3.59	0.01
Similar income	292	35	1.00	Referent	474	41	1.00	Referent	228	14	1.00	Referent	
Lower income	171	14	0.67	0.34, 1.34	295	28	1.09	0.65, 1.82	162	19	1.87	0.90, 3.89	0.03
Medically indicated preterm birth													
Higher income	634	51	0.74	0.46, 1.18	1446	113	1.05	0.71, 1.55	706	62	1.62	0.86, 3.05	0.04
Similar income	292	33	1.00	Referent	474	37	1.00	Referent	228	13	1.00	Referent	
Lower income	171	16	0.98	0.50, 1.93	295	34	1.32	0.80, 2.19	162	13	1.35	0.60, 3.04	0.24

[a] Adjusted for age, education, marital status, body mass index, and smoked cigarettes during pregnancy.

[b] *p* value for interaction term between higher or lower relative household income and % Black residents (ordinal).

[c] Similar income is defined as no difference in category of household income for the participant with that of her block group.