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Race, Ethnicity, Concentrated Poverty, and Low Birth Weight Disparities

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Abstract

This study examines the extent to which the relationship between area socioeconomic position (SEP) and low birth weight (LBW) varies by race and ethnicity. A cross-sectional, secondary data analysis was performed with 1992-1994 Vital Statistics and 1990 U.S. Census data for selected metropolitan areas. Low birth weight (< 2500 grams) rates were calculated for non-Hispanic Black, Latino, and non-Hispanic White live singleton births. Concentrated poverty was defined as poor persons living in neighborhoods with 40% or more poverty in metropolitan areas. The results showed that the relationship between concentrated poverty and LBW varied by race and ethnicity. Concentrated poverty was significant for Latinos, even when controlling for maternal health and MSA-level factors. By contrast, maternal health characteristics, such as pre-term birth, teen birth and tobacco use, explained much of the variance in African-American and White LBW. These findings extend the discussion about race, class, and health disparities to include Latinos and shows how the relationship between SEP and LBW can vary within an ethnic group.

Keywords

concentrated poverty; health disparities; low birth weight

Introduction

African-Americans and Latinos have elevated risks for chronic disease and death, and these risks are particularly acute among their youngest members. Low birth weight (LBW) is recognized as one of the primary factors contributing to racial/ethnic disparities as the African-American LBW rate has been at least twice the corresponding rate for Whites for decades (United States Department of Health and Human Services, 2000). Low birth weight

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infants who survive the neonatal (first 28 days) and post-neonatal (28-365 days) periods can have problems that extend into adulthood. For instance, LBW children are more susceptible to cerebral palsy, deafness, blindness, and other serious illnesses (Paneth, 1995). Furthermore, LBW children are more likely to perform poorly on developmental assessments than are normal birth weight children, to need special education, to repeat a grade at some point in their schooling, and to have attention deficit disorder (Lewit, Baker, Corman, & Shiono, 1995; McCormick, Gortmaker, & Sobol, 1990; Paneth, 1995).

Background and Significance

It has been acknowledged that a reduction in LBW births will only come by addressing the biological risk factors (i.e., low maternal weight gain, low pre-pregnancy weight, maternal illness, short gestation, and fetal infections), the individual-level risk factors (i.e., inadequate prenatal care, maternal social class, race, and maternal age), and the lifestyle risk behaviors (i.e., poor nutrition, alcohol, and drug and tobacco use by pregnant mothers) (Chomitz, Cheung, & Lieberman, 1995; Collins & Shay, 1996; Geronimus, 1996; O'Campo, Xue, Wang, & Caughy, 1997; Paneth, 1995). Recent studies have begun to consider community-level factors that impact individual and lifestyle factors associated with LBW. Findings from this line of research have demonstrated positive associations between per capita income in neighborhoods and the risk of LBW, residential segregation and infant, post-neonatal, and adult mortality, and neighborhood income and post-neonatal mortality (Collins & Williams, 1999; Collins & David, 1997; LaVeist, 1989; 1992; O'Campo, Xue, Wang, & Caughy, 1997). These findings are important; however, epidemiologic studies must also consider other area-based socioeconomic measures (i. e., percentage below poverty) in order to examine the impact of neighborhood socioeconomic position (SEP) on LBW in particular and on health disparities in general (Krieger, Chen, Waterman, Rehkopf, & Subramanian, 2003; Krieger et al., 2003; Krieger, Williams, & Moss, 1997). Research associated with The Public Health Disparities Geocoding Project show that the "percentage of persons below poverty" is a robust measure of area-based SEP (Krieger, Chen, Waterman, Rehkopf, & Subramanian, 2003; Krieger et al., 2002; 2003). Some recent research, examining the relationship between race, class, and health outcomes, has begun to focus on concentrated poverty because African-American and Latino families are more likely to live in areas where a substantial segment of the population have incomes below the poverty level than do White families. Jargowsky (1997) found that African-American and Latino concentrated poverty increased between 1970 and 1990 by 70 and 158%, respectively, suggesting that the social, economic, and health conditions have declined for racial/ethnic minorities who are poor. A small body of research has produced results linking concentrated poverty to health problems. Waitzman and Smith (1998) found that residence in areas where the neighborhood poverty rate equals from 20 to 40% was associated with an elevated risk of adult mortality. Sims and colleagues (2007) demonstrated that concentrated poverty has implications for the health of children, with results indicating that residence in high-poverty areas (areas where the neighborhood poverty rate equals 40% or more) was associated with infant mortality rates among racial and ethnic groups. In short, this line of research establishes that harsh economic environments can contribute to unfavorable health conditions brought on by environmental stressors and the lack of access to quality healthcare (Geronimus, 2000).

Purpose of the Study

This current study examines the extent to which the relationship between area SEP and birth weight varies by race and ethnicity. Vital Statistics and U. S. Census data from selected metropolitan areas were used to estimate race/ethnicity-specific models of LBW. The analyses contribute to health disparities research in two ways. First, this study uses concentrated poverty as a proxy for area SEP. This SEP measure (proportion of families residing in areas where over 40% of the population has incomes below the poverty threshold) allows investigators to give some attention to the areas where many African-Americans and Latinos live and the challenges associated with living in areas with few, if any, economic, political, or social resources. Second, this study extends the discussion about race, class, and health disparities to include Latinos and shows how the relationship between area SEP and LBW varies within an ethnic group. This line of research paves the way for a more informed understanding of how community deprivation impacts the life chances and quality of life for the most vulnerable segment of any population.

Methodology

Sample and Setting

Data were drawn from the 1990 U.S. census block-group files (United States Bureau of the Census, 1990). Block groups (the smallest geographic unit for which socioeconomic data are tabulated) averaged 1,000 residents in 1990 and represented neighborhoods for which concentrated poverty was computed for selected metropolitan statistical areas (MSAs). An MSA is a free-standing metropolitan area with a population size of at least 100,000. After calculating the percentage of concentrated poverty at the block group level, these values were aggregated to the MSA level (the unit of analysis). Birth weight and maternal health data were drawn from the 1992, 1993, and 1994 natality data files of the Vital Statistics (Vital Statistics of the United States, Multiple Volumes, 1992-94), and were also analyzed at the MSA level. The association of LBW with concentrated poverty was analyzed for non-Hispanic African-Americans, Latinos, and non-Hispanic Whites. The Census and Vital Statistics data were linked by common MSA codes found in each data file. Among the 100 largest U.S. MSAs, the greatest number of MSAs for which LBW and poverty concentration could be analyzed was chosen for each race/ethnic group: 87 MSAs for African-Americans and Whites, and 77 MSAs for Latinos.

Variables of Interest

The dependent variable was the 1992-1994 *average LBW rate* (a continuous variable), defined as singleton infants born weighing less than 2,500 grams or 5.5 pounds per 100 live births. Low birth weight rates were averaged over three years to decrease the instability that may be caused by rates for racial/ethnic groups in smaller MSAs (LaVeist, 1992). The primary independent variable of interest was *concentrated poverty*. This measure was derived by computing the percentage of racial/ethnic families in MSAs who lived in high poverty neighborhoods (blocks in which 40% or more of its residents had household incomes below the poverty line). The poverty threshold for a family of four in 1990 (1989 dollars) was $12,647 (United States Bureau of the Census, 1990).

Low birth weight has been shown to be associated with a number of factors; therefore, other important risk factors were included from the birth certificates in the Vital Statistics data files. *Inadequate prenatal care rate* was measured by the number of mothers who did not initiate care during the first trimester of pregnancy. The *pre-term birth rate* represented the number of infants that were born prior to 36 weeks per 100 live births. The teen birth rate was represented the number of births that were to unwed mothers from 15 to 19 years of age per 100 live births. Tobacco use equals the number of pregnant women who used tobacco per 100 live births. *Region* was represented in the analysis by four dummy variables (South was the reference group). Each variable was race/ethnic-group specific and was calculated at the MSA level, and was averaged for the 1992, 1993, and 1994 periods.

Statistical analysis

The tables included report the results from four sets of analyses. The first table presents a description of the sample by concentrated poverty, birth weight status, and maternal health characteristics. Disparities between racial/ethnic groups based on these characteristics were assessed using student's *t* test statistics. The second table presents a series of equations specifying the extent to which the relationships between concentrated poverty and LBW rates varied by race/ethnicity. The first equation estimates the correlation between concentrated poverty and LBW rate. Equations 2 and 3 introduce the maternal health characteristics and region variables, respectively. The third set of analyses examines the extent to which concentrated poverty was associated with minority versus White LBW disparities. The final set of analyses investigates the relationship between concentrated poverty and LBW disparities for Latino sub-ethnic groups. All analyses were performed using SPSS 11.5 for Windows (Sims & Rainge, 2002).

Results

The results in Table 1 show African-Americans to be the group with the largest proportion of its population living in extremely poor areas. More that 25% of the African-American population lived in areas where 40% or more of the residents had incomes below the poverty threshold. This level (27.6%) is six and nearly two times greater that the corresponding levels for Whites (4.5%) and Latinos (16%), respectively. The average proportion of African-American mothers having LBW infants (16.7%) doubled the level for Whites (7.4%), and nearly doubled the level for Latinos (8.4%). Risk factors for LBW also varied across groups. The proportion of African-American mothers who did not initiate prenatal care during the first trimester (11.7%) tripled, and nearly doubled the corresponding proportions for Whites (3.4%) and Latinos (5.9%), respectively. African-Americans also had the highest percentage of pre-term and unwed teen births. Whites were the group with the largest percentage of smokers. The proportion of White smokers was significantly greater than African-American and Latino smokers (see Table 1).

Table 2 reports group-specific regression estimates of LBW on concentrated poverty, maternal health, and region considerations for African-Americn, Latino, and White mothers across selected MSAs in the United States. The results in the bivariate analysis (equation 1 in each model) indicate that concentrated poverty has a positive relationship with LBW

levels ($p < .001$) in the Latino model. For Latinos, areas with large segments of the population living below the poverty threshold also have high LBW rates. In the African-American and White models, concentrated poverty does not have a statistically significant relationship with LBW levels (see Table 2).

The second and third equations in the Latino model indicate that the relationship between concentrated poverty and LBW rates changes considerably once other variables are introduced. The addition of maternal health in equation 2, and region variables in equation 3, leads to a 48% and 25% reduction, respectively, in the size of the concentrated poverty coefficient. Despite changes in magnitude, the concentrated poverty indicator remains statistically significant in the full model (equation 3), suggesting that concentrated poverty has a relationship with LBW regardless of maternal health and regional considerations. It is also important to note that concentrated poverty is associated with the Latino-White LBW rate disparity. Regression lines summarizing the association between concentrated poverty and minority-White LBW rate disparities in Figure 1 show that an increase in concentrated poverty among Latinos is associated with an increase in the LBW rate disparity between Latinos and Whites (see Figure 1).

The results in Table 2 also indicate that the maternal health of a population is related to the LBW levels among it. Pre-term birth has a positive association with LBW levels across all three groups. The teen birth coefficient is positive and statistically significant in the White model, suggesting that high birth rates among White unwed teens are associated with high LBW rates among this group. Tobacco use is positively correlated with LBW rates in equation 2 in the African-American and Latino models. A rise in the number of African-American and Latino smokers is related to an increase their respective LBW rates. This relationship between the number of smokers and LBW rates among African-Americans appears to be explained by MSA region because the coefficient is not significant in equation 3 in the African-American model.

The third equations in each of the models in Table 2 demonstrate that metropolitan region is related to the LBW rates. African-American individuals who live in the Northeast and the Midwest have higher LBW rates than African-Americans living in the South, all else being equal. Among Whites, only individuals in the Northeast region are found to have higher LBW rates than do White southerners. The relationship between region and LBW rates for Latinos is a bit more complex, as the relationship patterns vary by region. Latinos in the Northeast have higher LBW rates than Southern Latinos. Midwest Latinos, by contrast, have lower LBW rates than their Southern counterparts.

The Latino model of LBW produces strong findings, however further investigation is warranted because the “Latino” classification is an aggregate of sub-ethnic groups into one category. Therefore, it is unclear which sub-ethnic group exerted the strongest effect on poverty concentration and the Latino LBW rate and the Latino-White disparity. To this end, the Latino population was disaggregated into major sub-ethnic groups (Puerto Ricans, Mexican, and Cuban Americans) to assess how they separately influenced the overall Latino-White LBW disparity. This disparity increased as the size of the Puerto Rican

population increased in MSAs, while the Latino-White LBW disparity declined the greatest, as the size of the Cuban population increased (see Figure 2).

Discussion

Low birth weight is a serious public health concern for any community or society because it is a leading cause of infant death. It is also important to note that LBW rates are important indicators of community well-being because many of the factors associated with LBW can be linked to socioeconomic deprivation. This study attempts to explicate the relationship between area SEP and birth outcomes by investigating the degree to which the correlation between concentrated poverty and LBW rates varies by race and/or ethnicity. Such analyses represent an important step towards the development of community health outcome models that reflect the dynamics associated with racial or ethnic group membership in a society stratified by race and ethnicity.

These results indicate that the correlation between concentrated poverty and LBW rates vary by race and ethnicity. The Latino model is the only one for which concentrated poverty had a statistically significant relationship with LBW. For Latinos, increasing LBW rates are associated with a greater concentration of poor Latinos in high-poverty neighborhoods in large urban areas. The analysis of sub-ethnic groups within the Latino population suggests that country of origin may be an important factor that is associated with the relationship between area SEP and birth outcomes. The disaggregated findings that are presented in Figure 2 illustrate that the Latino-White LBW disparity vary by country of origin. The LBW disparity between Latinos and Whites increased as the percent of Puerto Ricans increased, suggesting that the economic deprivation associated with Puerto Rican areas can be linked to poor health outcomes including LBW rates. The results for Cuban areas revealed a different pattern. The Latino-White LBW disparity decreased as the Cuban population increased in MSAs. Cubans are among the most affluent Latino groups and the socioeconomic position of the areas in which they live provide them access to resources that protect them from LBW and other poor health outcomes. Future analysis needs to explore the differences in LBW between major Latino ethnic groups.

The results for African-Americans are less strong than they are for Latinos. The concentrated poverty coefficients in the African-American models are not statistically significant, plus the African-American-White LBW disparity does not change substantially with increases in the proportion of African-Americans in very poor areas across MSAs. Area SEP appears to have less of an impact on the African-Americans. However, it would be premature to discount the impact of poverty on African-American birth outcomes because a substantial segment of the African-American population (27.6%) resides in very poor areas. Furthermore, recent area-level studies using race-specific models to examine group differences in outcomes such as violence, have noted that area socioeconomic measures like poverty to be unstable in African-American models (Bruce, 2004b; Sims, Sims, & Bruce, 2007). The null findings in our analysis might be due to model misspecification (Bruce, 2004a). Therefore, research investigating the relationship between area SEP and birth outcomes using alternative methodological frameworks, and cutting-edge statistical techniques is warranted.

Another methodological limitation worth noting is that individuals in the Vital Statistics were not directly linked to neighborhoods characterized by poverty concentration, because census data were aggregated at the neighborhood and the MSA levels. Since Vital Statistics data were also available at the MSA level, associations between ecological and health variables were likewise made at the MSA level. This means that individual-level inferences cannot be drawn from these data. Epidemiologic studies that employ multilevel methods are able to make such inferences by linking individual-level outcome variables with individual and group-level predictor variables, which enables them to avoid committing an ecological fallacy (i.e., drawing inferences at the individual level with group-level data) (Diez-Roux et al., 1997; O'Campo, Xue, Wang, & Caughy, 1997).

This study nonetheless contributes to epidemiologic studies of ecology (i.e., physical environment variables) and health in that it examines the relationship between severe poverty and LBW rates and disparities. Previous studies of ecology and infant health have only considered residential segregation (Poledak, 1991), census tract poverty rate, or neighborhood income as proxies for neighborhood conditions (Collins & David, 1997; Sims & Rainge, 2002). This study considers the isolation of poor minorities in severely poor neighborhoods and the challenge they face in coping with their poverty and the poverty of those around them (Jargowsky, 1997). This study also contributes to epidemiologic research in that it goes beyond the conventional African-American-White comparison of health conditions to include the Latino population. Latinos are among the fastest-growing groups in American society and a segment of this population will undoubtedly encounter harsh economic as well as health conditions. These trends, plus the strong findings from this study, encourage investigators to incorporate Latinos in future studies focusing on race and health outcomes.

Conclusions

This study reveals that future epidemiologic studies of ecology and health might want to develop models that integrate characteristics of disadvantaged communities (i.e., poverty concentration, as well as housing dilapidation, neighborhood wealth, local service delivery, etc.) with maternal health factors (i.e., pre-term births, teen births, tobacco use). This would help in directing urban and health policy towards understanding potential pathways of eliminating birth outcome disparities. This research offers a step in the direction to understanding how racial/ethnic group membership, community disadvantage, and maternal health factors are related to LBW. The findings show that poverty concentration is directly associated with the poor health of poor Latinos in particular. In general, poor families in the U.S. are becoming more residentially segregated in poor, urban neighborhoods, and that means that their economic conditions are worsening as well (Vaughan, 2002). In addition, recent declines in government funding for Medicaid insurance for the poor ensures that more children will fall into poverty and experience poorer health over time. This reduction in funding will also ensure that the polarization of health status will continue to widen between the haves and the have-nots (who are mostly highly segregated, poor minorities) (Massey, 1996). In the end, the medical community must pay close attention to how societal racism and structural factors beyond the individual level (e.g., neighborhood segregation, racial bias in medical care, and stressors associated with discrimination), impact health disparities. This

is important in order to move us closer to eliminating infant-health disparities in particular, and overall health disparities in general (Smedley, Stith, Nelson, & Institute of Medicine [U.S.] Committee on Understanding and Eliminating Racial and Ethnic Disparities in Health Care, 2003; Williams, 1999).

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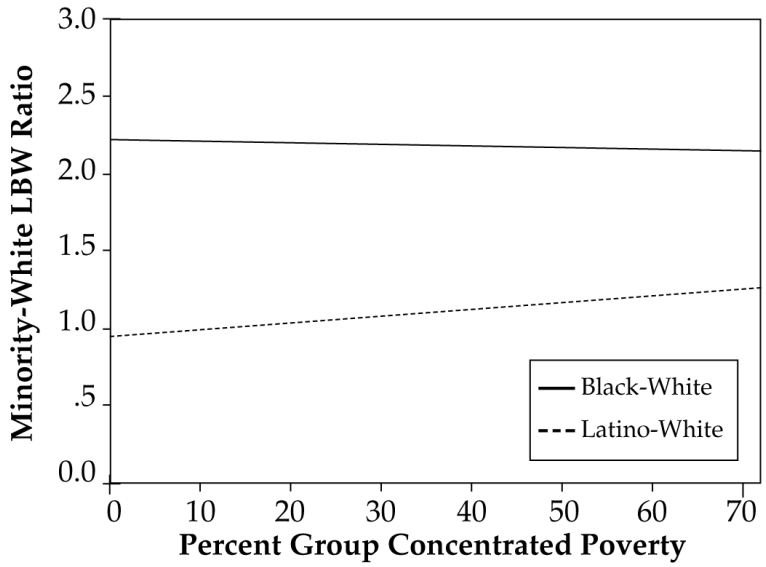

Figure 1. Association of Minority-White LBW with concentrated poverty
Source: 1990 U.S. Census data and 1992–1994 Vital Statistics

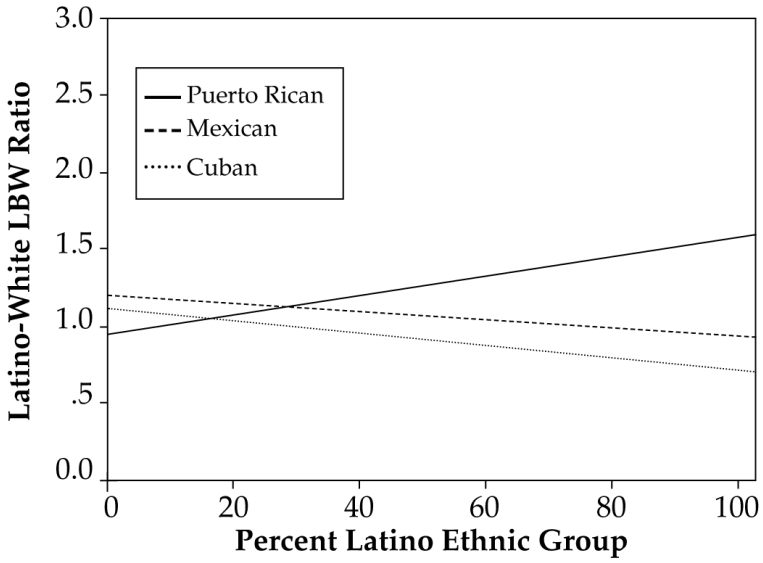

Figure 2. Association of Latino-White LBW with ethnicity
Source: 1990 U.S. Census data and 1992–1994 Vital Statistics

Table 1

Percentages and sample sizes by race/ethnicity in selected MSAs

	African-Americans		Latinos		Whites	
	%	*n*	%	*n*	%	*n*
Concentrated poverty[1]	27.6	321,962	16.0	120,769	4.5	72,023
Low birth weight[2]	16.7	221,934	8.4	108,841	7.4	289,135
Inadequate prenatal care[3]	11.7	171,011	5.9	150,939	3.4	129,175
Pre-term birth[4]	17.7	247,013	10.5	150,921	9.2	358,178
Teen birth rate[5]	22.1	282,408	5.2	230,085	8.3	296,597
Tobacco use[6]	13.4	147,867	3.1	33,043	15.0	524,209
Number of MSAs	87		77		87	

Note: The African-American-White and Latino-White differences are statistically significant below the .001 level.

Source: 1990 U.S. Census STF 3A data, and 1992, 1993 and 1994 Natality files.

[1]Concentrated poverty is measured as the percent of each poor racial/ethnic group that lived in high-poverty neighborhoods (poverty rate is 40% or more) in metropolitan statistical areas in 1990.

[2]Low birth weight (LBW) rate equals births that are < 2500 grams per 100 live births.

[3]Inadequate prenatal care indicates care not initiated in the first trimester.

[4]Pre-term birth or short gestation indicates less than 37 weeks of pregnancy.

[5]Teen birth rate equals the number of births to mothers aged 15 to 19 years old per 100 live births.

[6]Tobacco use denotes the use of tobacco by pregnant women.

Table 2

Un-standardized weighted regression coefficients for the association of African-American, White and Latino low birth weight (LBW) rates with concentrated poverty in selected MSAs: 1990, 1992-1994[1]

	African-Americans			Latinos			Whites		
Concentrated poverty	1.7	−5.1	−6.1	4.6[d]	2.4[c]	1.8[b]	1.6	1.6	1.7
Inadeq. pre-natal care	-	7.5	−8.1	-	−2.0	−1.4	-	2.3	2.6
Pre-term birth	-	.42[d]	.47[d]	-	.32[d]	.21[c]	-	.15[c]	.17[d]
Teen birth rate	-	−1.2	−2.4	-	1.6	3.8	-	8.7[d]	.10[d]
Tobacco use	-	3.5[a]	1.9	-	9.5d	9.4[d]	-	1.3	1.2
South (omitted)									
Northeast	-	-	.93[c]	-	-	.73[c]	-	-	.30[a]
Midwest	-	-	.49	-	-	−.51[a]	-	-	−.16
West	-	-	1.0[b]	-	-	−1.9	-	-	−.18
Intercept	13.2[d]	5.9[d]	4.8[d]	6.0[d]	2.4[c]	3.1[d]	6.1[d]	3.8[d]	3.5[d]
Model statistics									
Adjusted R2	.02	.45	.51	.30	.53	.62	−.004	.44	.48
F	2.4	13.4	10.9	33.6	15.7	14.4	.68	13.9	10.5
p	.12	.00	.00	.00	.00	.00	.41	.00	.00

Source: 1990 U.S. Census STF 3A data, and 1992, 1993 and 1994 Natality files.

[a] $p < .1$;

[b] $p < .05$;

[c] $p < .01$;

[d] $p < .001$

[1] See footnotes in Table 1 for variable definitions.