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Race and ethnic differences in determinants of preterm birth in the USA: broadening the social context

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Abstract

Preterm births occur in 9.7% of all US singleton births. The rate for blacks is double that of whites and the rate is 25% higher for Hispanics than for whites. While a number of individual correlates with preterm birth have been identified, race and ethnic differences have not been fully explained. Influenced by a growing body of literature documenting a relationship among health, individual income, and neighborhood disadvantage, researchers interested in explaining racial differences in preterm birth are designing studies that extend beyond the individual. No studies of adverse birth outcomes have considered contextual effects beyond the neighborhood level. Only a handful of studies, comparing blacks and whites, have evaluated the influence of neighborhood disadvantage on preterm birth.

This study examines how preterm birth among blacks, whites and Hispanics is influenced by social context, broadly defined to include measures of neighborhood disadvantage and cumulative exposure to state-level income inequality, controlling for individual risk factors. Neighborhood disadvantage is determined by Census tract data. Cumulative exposure to income inequality is measured by the fraction of the mother's life since age 14 spent residing in states with a state-level Gini coefficient above the median. The results for neighborhood disadvantage are highly sensitive across race/ethnicities to the measure used. We find evidence that neighborhood poverty rates and housing vacancy rates increased the rate of very preterm birth and decreased the rate of moderately preterm birth for blacks. The rate of very preterm increased with the fraction of female-headed households for Hispanics and decreased with the fraction of people employed in professional occupations for whites. We find direct effects of cumulative exposure to income inequality only for Hispanics. However, we do find indirect effects of context broadly defined on behaviors that increased the risk of preterm birth.

Keywords: Preterm; Social context; Income inequality; Racial differences

Introduction

Preterm births, defined as deliveries of less than 37 completed weeks of gestation, occurred in more than 9.7% of all US singleton births during 1996. The rate for non-Hispanic blacks was 16%, for non-Hispanic whites was 8%, and for Hispanics was 10% (CDC, 1999). The causes of preterm birth are thought to be multifactorial (Von Der Pool, 1998). Roughly 20% of preterm deliveries in the US result from medical intervention, 40% result from idiopathic preterm labor (IPL), and 40% result from premature rupture of the membranes (PROM) (Mattison, Damus, Fiore, Pertrini, & Alter, 2001; Lockwood & Kuczynski, 2001). The physiological pathways that result in IPL and PROM are not well

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understood. Maternal risk factors associated with preterm births include the number of pregnancies, short interpregnancy interval (Basso, Olsen, Knudsen, & Christensen, 1998), maternal age (Anath, Misra, Demissie, & Smulian, 2001), maternal smoking (Walsh, 1994), use of marijuana and cocaine (Kliegman, Madura, Kiwi, Eisenberg, & Yamashita, 1994), intrauterine infections, bacterial vaginosis, some extrauterine infections (Goldenberg & Culhane, 2003), hypertension (Samadi, & Mayberry, 1998), and occurrence of a previous preterm birth (Mattison et al., 2001). The prevention of preterm births has been associated with the availability of and access to prenatal care (Vintzileos, Ananth, Smulian, Scorza, & Knuppel, 2002).

While a number of individual correlates with preterm birth have been identified, race and ethnic differences in preterm birth rates have not been fully explained. Influenced by a growing body of literature that documents a relationship among health, individual poverty, and neighborhood segregation (by class or race), researchers interested in explaining racial differences in preterm birth are designing studies that extend beyond the individual. Pickett, Ahern, Selvin, and Abrams (2002) found that Census tract measures of disadvantage, including proportion of unemployed males, median household income and the change over the sample period in the fraction of the population that is black were significant predictors of preterm birth for blacks. For whites, only the change in male unemployment over the sample period was significant. Other evidence is mixed. Dole et al. (2003) found that perceived neighborhood safety was not a significant predictor of preterm birth, controlling for pregnancy anxiety, negative life events and perceived discrimination.

Neighborhood disadvantage may increase psychosocial stress and directly influence the occurrence of preterm birth through neuroendocrine and immune pathways that affect susceptibility to infection and hypertension (Wadhwa, Dunkel-Schetter, Chiez-DeMet, Porto, & Sandman, 1996; Culhane et al., 2001; Culhane, Rauh, McCollum, Elo, & Hogan, 2002). Other effects of neighborhoods may be indirect through their influence on maternal behaviors, such as drug use and short interpregnancy interval, and on access to prenatal care (Hogan & Ferre, 2001; Buekens & Klebanoff, 2001). But the potential influence of social context on preterm birth may not end at the neighborhood boundary. Income inequality, especially as it cumulates over time, can increase psychosocial stress, particularly for those who are relatively deprived. States with greater income inequality may be less willing to provide social services such as income maintenance and health care for poor women, which can also increase the risk of preterm birth. However, there has not been a study to date that evaluated whether or not there is a broader social context operating through cumulative exposure to income inequality for preterm birth, or any other adverse birth outcome.

This study evaluates the quantitative importance of social context, broadly defined, in explaining differences among blacks, whites and Hispanics in moderately preterm (gestation between 33 and 36 weeks), very preterm (gestation less than 33 weeks) and full-term births. We estimate a multilevel, multinomial logit model of the risk of very preterm and moderately preterm birth relative to term birth controlling for neighborhood contextual variables. We broaden the scope for social context to include a measure of cumulative exposure to income inequality.

Background

Explaining racial and ethnic differences in preterm birth rates remains a high priority. Studies over the last 15 years have focused on elucidating individual risk factors associated with adverse birth outcomes and assessing their importance across racial and ethnic subgroups. But these results have generally been unsuccessful in explaining the large racial and ethnic disparities in preterm births and other adverse birth outcomes. Because of the lack of progress in explaining these differences, researchers have reconceptualized the problem and have begun to explore psychological and biological mechanisms within a social context. By introducing social context, it may be possible to account for differences in exposure to psychological and physical stressors. These differences can arise from both the place in which people live and their relative social position.

In the early 1990s, the Centers for Disease Control (CDC) hypothesized that chronic stress was a major contributor to preterm births in blacks. Since then there has been progress in identifying the physiological pathways between chronic stress and preterm birth. Researchers have investigated the relationship between preterm birth, maternal stress and hormones that control the onset of labor, especially corticotropin and catecholamines. The neuroendocrine system is viewed as a possible mediating pathway between psychosocial factors and preterm birth (McCubbin et al., 1996; Wadhwa et al., 1996; Sandman, Wadhwa, Chiez-DeMet, Dunkel-Schetter, & Porto, 1997). Chronic stress and stress hormones also affect immune functions, influencing a mother's susceptibility to disease. In addition, there is a large body of research that links stress and increased risk for cardiovascular disorders, including hypertension (Wadhwa, Culhane, Rauh, & Barve, 2001). This link is key because chronic hypertension, pregnancy-induced hypertension and pregnancy-aggravated hypertension are associated with a greater risk for preterm delivery (Samadi & Mayberry, 1998).