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Original article

The relationship between low birthweight and childhood health: disparities by race, ethnicity, and national origin

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ABSTRACT

Purpose: Racial/ethnic disparities in rates of low birthweight (LBW) are well established, as are racial/ethnic differences in health outcomes over the life course. Yet, there is little empirical work examining whether the consequences of LBW for subsequent child health vary by race, ethnicity, and national origin.
Methods: Using data from the 1998–2016 National Health Interview Survey, we examined whether racial, ethnic, and national differences existed in the association between LBW and subsequent health outcomes, namely being diagnosed with a developmental disability, asthma diagnosis, and poorer general health.
Results: Children born with LBW consistently had poorer health relative to children born with normal birthweight. There was no systematic evidence that the linkages between LBW and subsequent health were weaker for one racial/ethnic/national origin group relative to others.
Conclusions: LBW was associated with subsequent poorer health. There was no systematic evidence that the link between LBW and subsequent child health were weaker for one racial/ethnic/national origin group relative to others. Together, these findings highlight the importance of reducing race/ethnic disparities in rates of LBW as a way of eradicating inequalities in childhood health.

Introduction

Birthweight is one of the most powerful predictors of health later in life [1]. Low birthweight (LBW) is associated with higher risk of infant mortality and subsequent morbidity [2–4]. A large body of work shows links between LBW and all-cause mortality, developmental disabilities, and diminished respiratory functioning later in life in developing and developed countries [5–15]. LBW serves as a marker for poor infant health and as a global summary measure of public health problems, including long-term maternal malnutrition and poor prenatal care [16,17]. Less than 2500 grams is the universal cutoff point to define LBW [18,19].

Despite significant improvements in infant health, racial and ethnic disparities in LBW have persisted in developed countries [16,17]. South Asian and black women in the United States and the United Kingdom are twice as likely as non-Hispanic (NH) white women to give birth to a LBW infant [16,17,20]. By contrast, Hispanic women in the United States have rates of LBW only slightly higher than those of NH white women despite their socioeconomic disadvantage [16,17]. Racial/ethnic disparities in rates of LBW persist even after adjusting for group differences in sociodemographic characteristics and health care access [16,17].

Although race/ethnic disparities in rates of LBW and rates of poor child health are well established, we do not know whether and by how much the health consequences of LBW differ by race/ethnicity. To date, only two studies have examined race/ethnic differences in the health consequences of LBW [2,14]. They find limited evidence of race/ethnic differentials in the association between LBW and the risk of developing a developmental disability in childhood. As these studies focus solely on developmental disabilities, we do not know whether this pattern is also observed for other important child health outcomes. Examining racial/ethnic differences in the link between LBW and global health measures may be important because racial/ethnic differences in diagnosis rates may be partly obfuscated by group differences in access to medical care [20]. Furthermore, due to data constraints, these studies compare the consequences of LBW for NH whites, NH blacks, Hispanics, and NH Others [2,6]. The NH Others category

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includes several distinct groups with considerable heterogeneity in distribution of birthweight, generating the need for us to disaggregate them into finer grained categories [21,22]. Notably, examining the health consequences of LBW for children born to NH Asians may be especially important given that (1) rates of LBW are higher among some Asian groups (i.e., South Asian) [23,24]; (2) the relationship between LBW and neonatal mortality is weaker for Asians than non-Asians [25,26]; and (3) some have called into question the validity of LBW as an indicator for the health status of some NH Asian groups [25,27–30].

Using data from the 1998–2016 National Health Interview Survey (NHIS), we assessed whether the links between LBW and subsequent child health—developmental disability, asthma diagnosis, and parent rated general health—varied by race/ethnicity.

Materials and methods

Our data came from the Sample Child Core Questionnaires of the Integrated Public Use Microdata files of the 1998–2016 NHIS. The NHIS is a large, nationally representative cross-sectional survey collecting information on health outcomes and health determinants in the United States [31]. It was first fielded in 1957. Starting in 1997, NHIS randomly selected a child in the household and asked a "knowledgeable adult" additional questions about the health of these children. Starting in 1998, NHIS collected information about the relationship between the knowledgeable adult and the sampled child.

Our sample consisted of 134,848 children between ages of 2 and 17 years who were living with their mothers who identified as NH white, NH black, Hispanic, or NH Asian. To minimize reporting bias, we focused on children whose parents served as the "knowledgeable adult." We excluded children without valid information on key covariates. For our analyses of national origin groups, we also excluded those who were not in the three largest Hispanic and the three largest Asian national origin groups, yielding a sample of 124,320 children.

Key measures

Low birthweight is defined using retrospective reports from the parent (usually the mother). Children born with LBW weighed less than 2500 grams at the time of birth. Those born with normal birthweight (NBW) weighed more. Mothers' recollection of birthweight is subject to extremely low recall bias (2%–10%) many years after birth, and recall bias varies little by maternal education [32,33].

Children's race/ethnicity

We classified children into four groups according to their mother's race: (1) NH white, (2) NH black, (3) Hispanic, and (4) NH Asian.

Children's national origin

We distinguished among children with NH white, NH black, Mexican, Puerto Rican, Cuban, Chinese, Filipino, and Asian Indian mothers.

We described children's health using three dichotomous measures—any developmental disability, asthma diagnosis, and poor general health. They were constructed using reports from a parent. The first two were diagnosed outcomes, and the last one was a global measure. We chose these outcomes because prior studies showed that (1) LBW status increased the risk of having these conditions and (2) the odds of being diagnosed/having these conditions differed by race/ethnicity [2,6,7,34].

Developmental disability distinguished children with a developmental disability from those who did not have such a disability. Children had a developmental disability if they were diagnosed with ADHD, autism, cerebral palsy, intellectual disability, learning disability, or any developmental disability; had profound or several hearing problems or were blind at the interview date; or had seizures, stammered, or stuttered in the past 12 months. The same definition was used by Boyle et al. [8].

Asthma diagnosis distinguished children who had ever been diagnosed with asthma from those who did not receive such a diagnosis.

Parent-rated child's general health distinguished children with poor, fair, or good health from those who reported that they had very good or excellent health. Sensitivity tests revealed that demarcating differences existed between the pattern of race/ethnic variation in child health among those who reported poor/fair/good health and those who reported very good/excellent health, but differences within these two groups were minimal. Parent-rated health status is a robust measure of children's health, yielding results similar to physician-assessed health and more objective health-related outcomes [35].

Potential confounders

The potential confounders were child's age, child's gender, maternal education (less than high school, high school graduate, some college, college graduate), mother's age at birth, mother's marital status (never married, cohabiting, married, separated/divorced/widowed), mother's employment status (yes, no), father's education (less than high school, high school graduate, some college, college graduate), household income (below, 100%–199%, 200+% of the official poverty threshold), insurance coverage (none, private, public), and survey year.

Analytical strategy

We documented racial/ethnic differences in rates of LBW and known correlates of LBW and child health. We conducted χ^2 tests to determine significant differences between groups. Results were deemed statistically significant if $P < .05$. Next, we estimated a series of multivariable logistic regression models predicting the odds of being diagnosed with a developmental disability, ever being diagnosed with asthma, and having poor general health. Results were presented in the form of odds ratios and 95th confidence intervals. All models controlled for children's demographic characteristics, family background, and insurance coverage. All analyses were conducted using the appropriate weighting procedures in Stata SE 15 and following NHIS instructions. We divided the final basic annual weights by the number of years in the pooled data [36]. These adjusted weights were used to account for the complex sample design of the NHIS and to produce nationally representative estimates. We also accounted for clustering within regions.

Results

Figure 1 presented the rates of LBW for children in the four racial/ethnic groups. NH black children were twice as likely as NH whites to have been born with LBW. Hispanic and NH Asian children's rates of LBW fell in between these extremes.

Table 1 compared the family background and sociodemographic characteristics of children who belong to the distinct race/ethnic groups. Most racial/ethnic variations were significantly different ($P < .05$). Our discussion focused on significant differences. Hispanic mothers had the lowest and NH Asian mothers had the highest completed years of schooling. Relative to NH white and NH black

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