LOW BIRTH WEIGHT, PARENTAL INVESTMENT, AND EARLY EDUCATIONAL OUTCOMES

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ABSTRACT

Low birth weight status is associated with long-term social, economic, and health disadvantages. Recent research suggests that birth weight disparities in parental investment may link low birth weight status with short- and long-term social inequality. However, it remains unclear if birth weight itself is important or if birth weight disparities in parental investment can be explained by differences in the characteristics of women and families who give birth to low birth weight babies. Using data from the *Early Childhood Longitudinal Study–Birth Cohort* and twin fixed-effect models, results indicate that within families, normal-birth-weight children do not receive greater parental investment than their low-birth-weight siblings. However, in the population at large, low-birth-weight children are found to receive fewer parental investments than normal-birth-weight children across levels of socioeconomic status. We find that birth weight disparities in parental investment are partially explained by qualitative differences in the women and families who give birth to low-birth-weight children. Overall, results point to large birth weight disparities in math and reading ability prior to formal schooling and further indicate that, contrary to previous research, parental investment is not a primary mechanism connecting birth weight with early educational inequality.

Introduction

Poor child health can dramatically influence educational attainment and life chances. Compared to normal-birth-weight (NBW) children, children who are born low birth weight (LBW) are more likely to drop out of school (Dalton Conley and Bennett 2000), have lower lifetime earnings (Case, Fertig, and Paxson 2005), have worse adult health (Blackwell, Hayward, and Crimmins 2001), and generally experience a lower quality of life across a variety of social, health, and economic measures (Haas 2006; Palloni 2006). The negative effects of LBW status are well documented. Explanations for *how* LBW status is linked with social disadvantage, however, remain elusive.

Much has been written about the relationship between parental investment and subsequent child health. However, to date, relatively few studies have investigated parental investment as a *response* to child health endowments. Although poor child health is ostensibly a product of socioeconomic disadvantage, it may be the case that birth weight status additionally limits the accumulation of resources early in childhood, and is therefore an important mechanism linking birth weight with short- and long-term disadvantage. Recent research investigating the correlation between birth weight and parental investment finds evidence of such health selection effects. For example, using panel data from the NLSY to investigate disparities in parental investment within families, Datar, Kilburn, and Loughran (2010) find that "normal-birthweight children are 5%–11% more likely to receive early childhood parental investments than their low-birth-weight *siblings*" (p.145). Significant results aside, it remains unclear if poor child health status selects children out of receiving a normal level of parental investment, or if the observed negative relationship between child health and parental investment can be explained by the probability of low birth weight children being born to families with fewer resources to invest.

This study adds to the literature on health disparities and social inequality by broadly investigating the relationship between birth weight and parental investment. In doing so, we ask three questions. First, do parents reinforce the observed health selection disadvantage of LBW status by investing relatively fewer resources in LBW children? Second, can disparities in parental investment across birth weight status be explained by variations in SES and racial/ethnic status? Third, does variation in parental investment mediate birth weight disparities in math and reading scores prior to formal schooling? To explore these questions we use regression and twin-fixed effect models to analyze a sample of 6,800 children from the Early Childhood Longitudinal Study–Birth Cohort. We find evidence of health selection effects in parental investment across the population at large, but find no evidence of health selection effects when comparing measures of parental investment within families. Preliminary results indicate that characteristics of the women and families who give birth to LBW babies and LBW babies themselves contribute to birth weight disparities in parental investment. Overall, results point to large birth weight disparities in math and reading ability prior to formal schooling. However, parental investment is not found to be a primary mechanism connecting birth weight with early educational inequality.

Analytic strategy

To examine these research questions, we use data from the Early Childhood Longitudinal Study – Birth Cohort (ECLS-B). The ECLS-B is a nationally representative panel survey of children born in 2001.

Our analysis takes place in two stages. First, in order to observe a general pattern of parental investment across birth weight status we regress measures of parental investment on birth weight controlling for relevant child and mother background factors:

$$Y_{if} = \alpha + \beta_1 BW_{if} + \gamma_1 X_{if} + \varepsilon_{if} + \varepsilon_f$$

In equation 1, Y_{if} represents the parental investment received by the *i*th child in family *f*, BW_{if} is an indicator of whether or not a child was born low birth weight (1=yes, 0=no), and X_{if} is a vector of observed family and individual demographic background factors[1]. The error term has two components in

[1] BW is used as an example in this equation. In our analyses we subdivide low-birth-weight in MLBW and VLBW.

this model: a random unobserved error term that is child specific ε_{if}, and a family-specific error term that is shared amongst siblings ε_f. Without the ability to account for unobserved differences within and across families, significant differences in parental investment across birth weight in OLS regressions may be explained by qualitative differences between the mothers of moderate and very low birth weight babies and the mothers of normal birth weight babies.

In order to discount unobserved differences between mothers explaining the variation in parental investment, we make use of sibling fixed-effect models to compare differences in parental investment within families. Employing sibling fixed-effect models removes the family-specific error component bias present in OLS regressions by comparing siblings:

$$Y_{1f} - Y_{2f} = \beta_1(BW_{1f} - BW_{2f}) + \gamma_1(X_{1f} - X_{2f}) + \varepsilon_{1f} - \varepsilon_{2f}$$

Comparing sibling 1 (Y_{1f}) to sibling 2 (Y_{2f}), equation 2 provides an estimate of parental investment β_1 based on sibling differences in birth weight that is unbiased by the unobserved family components present in the error term. It should be noted, however, that while family-fixed effect models effectively remove biases from shared family components, they do not eliminate unobserved bias at the individual level. In order to reduce the possibility of unobserved factors influencing the correlation between parental investment and birth weight, we include a set of mother and child characteristics that are likely correlated with both factors including family SES at wave 1, race, family structure, age of assessment, and gender.

In order to determine if differences in parental investment can be explained by variation in parenting practices within socioeconomic status and race/ethnicity, we reexamine equation 1 across a series of samples that are stratified by race/ethnicity and SES. Finally, we test the efficacy of parental investment as a mediator in the relationship between birth weight and math and reading scores prior to formal schooling.

Results

Table 2 (not shown) presents OLS and twin fixed-effects regression coefficients for seven measures of parental investment. In support of the cumulative advantage hypothesis, OLS models indicate that in the population at large, LBW children experience significantly less parental support, interaction, and cognitive stimulation, are less likely to be breastfed, and have a lower quality HOME environment than their NBW counterparts. However, the twin fixed-effect models presented in Model 2 indicate that, within families, parental investment does not vary across birth weight. The lack of significant differences in the fixed-effect analyses suggests that differences in parental investment across birth weight present in the OLS regressions are the not the result of mothers discriminately investing in response to birth weight, but rather reflect qualitative unobserved differences between the mothers of LBW babies and those of NBW babies.

Birth weight, however, is not randomly assigned. LBW babies are more likely to be born to women with low SES or who are a racial/ethnic minority. Accordingly, variation in parental investment across birth weight in the OLS models could be explained by differences in parenting practices across socioeconomic status and race/ethnicity. The general lack of significance in the interactions presented in Table 3 (not shown) indicates that variation in parental investment cannot be attributed to broad differences in parenting across social groups[2]. Instead, the lower levels of parental investment received by LBW children are reflective of unobserved differences in the families of LBW children across social groups.

Conclusion

Low birth weight children receive fewer parental investments than their normal birth weight counterparts and a provocative explanation for this pattern is that parents invest less in their low birth weight offspring. But we note that there are important limitations to the sibling models on which this claim rests. Our twin models reduce these biases and provide a stronger estimate of the effect of differential investment. We find no evidence that, when parents have twins, they invest less in the lower birth weight child. Compared

[2] Only 10% (10/98) of 98 possible interactions are significant.

to normal birth weight children, these findings indicate that the lives of children with LBW are qualitatively disadvantaged. In general, our results suggest that variation in parental investment across birth weight is not a product of discriminative investing in response to biological endowments, but rather that the lower level of investment received by low-birth-weight children is a result being born into families that have fewer resources to invest. However, equating for differences in parental investment across health status does little to alter birth weight disparities in math and reading skills. Counter to findings by Datar, Kilburn, and Loughran (2010), we conclude that variation in the level of parental investment experienced across birth weight is not a primary mechanism connecting poor child health with later life inequality.

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