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Birth weight, cognitive development, and life chances: A comparison of siblings from childhood into early adulthood [☆]

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ABSTRACT

Using data from the National Longitudinal Survey of Youth Child Sample (CNLSY79), we sought to elaborate the complex interplay between childhood health and educational development over the early life course. Our approach made use of sibling comparisons to estimate the relationship between birth weight, cognitive development, and timely high school completion in models that spanned childhood, adolescence, and into early adulthood. Our findings indicated that lower birth weight, even after adjusting for fixed-family characteristics and aspects of the home environment that varied between siblings, was associated with decreased cognitive skills at age 5 and marginally significantly slower growth rates into adolescence. In addition, low birth weight increased the risk of not graduating by age 19, although this relationship reflected differences in cognitive development. Additional moderation analyses provided no evidence that birth weight effects are exacerbated by social conditions. Overall, the pattern of findings painted a complex picture of disadvantage, beginning in the womb and presumably via educational attainment, extending over the life course.

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1. Introduction

There is growing interest among social scientists in the role childhood health plays in social stratification processes over the life course (Strully and Conley, 2004; Link and Phelan, 1995). One reason for this attention is an increasing recognition that early life social and physical conditions decrease educational attainments (Conley et al., 2003) which results in health and mortality differentials in the later years (Hayward and Gorman, 2004). Research explicitly linking health to achievement and developmental processes across childhood, adolescence, and into adulthood is relatively rare, however (e.g., Hayward et al., 2000). Prior examples in the literature linking childhood health to socioeconomic attainment processes have been based on cross-sectional analysis (e.g., Gorman, 2002a,b), growth models of cognitive development (e.g., Goosby and Cheadle, 2009; Boardman et al., 2002), or models of attainment which sometimes make use of prior achievement scores (e.g., Haas and Fosse, 2008). These studies, however, do not incorporate explicit models of development and attainment into a single framework.

Although childhood health as measured by birth weight has been linked to achievement (Goosby and Cheadle, 2009; Boardman et al., 2002) and timely high school completion (Conley and Bennett, 2001, 2000; Haas and Fosse, 2008), not all studies support these findings (e.g., Gorman, 2002a,b), indicating that important questions about the nature and magni-

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tude of birth weight effects remain. Moreover, a unified model assessing whether the impact of birth weight on attainment operates directly through cognitive development or whether effects are independent has, to our knowledge, yet to be undertaken. Thus, the extent and nature of birth weight influences on cognitive development and indicators of attainment, like high school completion, have yet to be fully demonstrated. This study attempts to provide such a model by incorporating longitudinal growth models of youth cognitive developmental trajectories as birth weight mediators into models of high school completion.

Using sibling data from the Children of the National Longitudinal Survey of Youth (CNLSY79) we address the following questions: (1) Is birth weight related to cognitive development in childhood and (2) are there birth weight differences in cognitive growth into adolescence? (3) Is birth weight associated with timely high school completion and (4) is the relationship between birth weight and high school completion accounted for by cognitive development? Previous research indicates that birth weight and social conditions, such as income and family context, are correlated with each other and with subsequent achievement into adulthood. Birth weight effect estimates will be biased when factors which cause low birth weight, decrease cognitive performance, and lower educational attainment are omitted from statistical models. Because controlling for these common causes is difficult, it is unclear whether birth weight or social conditions are the real causes of differences in outcomes (see, for example, Conley et al., 2003; Royer, 2006; Behrman and Rosenzweig, 2004). Accordingly, we make use of sibling-comparison models to adjust for temporally invariant omitted factors (e.g., Guo and VanWey, 1999), along with measures of the family context that vary between siblings, leading to our final question: (5) Do birth weight associations persist when controlling for confounding factors that are constant within-families or vary between siblings in the same families?

2. Background

2.1. Birth weight, child development, and educational attainment

Although there is evidence that birth weight is associated with a range of developmental outcomes (see Hack et al., 1995 for a review), the mechanisms by which birth weight results in decreased achievement and life chances are not entirely clear. Children born premature and LBW (hereafter LBW; births < 2500 g) can have immature lungs leading to birth asphyxia¹ and other complications (e.g., severe periventricular hemorrhage) which can, in turn, result in severe trauma for the smallest babies (Hack et al., 1995). The “fetal origins” or “Barker hypothesis,” which has been advocated as an explanation for a number of adult-onset chronic diseases, suggests that the factors causing LBW may also increase risk for developmental impediments (see Barker, 1995; Barker et al., 1993; Godfrey and Barker, 2001). Specifically, children born LBW, are at risk for numerous health and developmental problems including growth retardation, physical illness through adulthood, and mental health problems (Breslau, 1995; Hack et al., 1995; McCormick et al., 1992). Moreover, LBW children are at risk for lower reading and math score growth (Goosby and Cheadle, 2009; Boardman et al., 2002), lower IQ scores (Hack et al., 2002), school problems (McCormick et al., 1990; Klebanov et al., 1994a,b), grade failure and placement in special classes (Klebanov et al., 1994a,b), and decreased likelihood of timely high school completion (Conley et al., 2003).

Social factors appear to play an important role in infant health (e.g., Hughes and Simpson, 1995; Paneth, 1995) indicating that some developmental birth weight consequences result from social factors which are not always adequately measured and accounted for in statistical analyses. Moreover, children from different social classes and racial/ethnic backgrounds are not at equal risk for LBW with those facing the most detrimental social conditions also being more likely to be born prematurely and/or of lower birth weight (Paneth, 1995; Cramer, 1995; Sastry and Hussey, 2003). Gaps in birth weight among social, economic, racial/ethnic groups, and geographic areas have not substantially lessened in recent years despite increased medical care expenditures (Pearl et al., 2001; Hahn et al., 1995; Pappas et al., 1993; Gortmaker and Wise, 1997), and may in fact have increased as a result of welfare reform (Kaestner and Lee, 2003).

Children who grow up experiencing economic disadvantage are at increased risk for slower cognitive development resulting from resource deficits and less favorable home environments, poor school environments, and physical health problems (Duncan and Brooks-Gunn, 1997). Although not all studies find that birth weight is related to slower intellectual development, particularly Gorman (2002a,b) who used a methodologically strong twin design in an adolescent sample, research generally supports the conclusion that birth weight negatively influences development – both cognitive development and later educational attainment. Furthermore, LBW in the US is an important social problem which does not appear to be lessening with time.

2.2. The role of family context

Parents with fewer economic resources are often less likely to effectively parent and invest in children’s developmental and academic well-being (McLoyd, 1998). These family circumstances may be due to higher levels of stress and increased risk for mental and physical health problems among the poor, which in turn, contributes to both employment declines

¹ Birth asphyxia can occur for a number of other reasons, including maternal low blood oxygen due to respiratory or heart problems, low blood pressure, poor placental function, and other complications.

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