



Early physical health conditions and school readiness skills in a prospective birth cohort of U.S. children



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ABSTRACT

Rationale: Extant research identifies associations between early physical health disparities and impaired functioning in adulthood, but limited research examines the emergence of these associations in the early years of children's lives.

Objective: This study draws on data from the Early Childhood Longitudinal Study Birth Cohort (ECLS-B; $N = 5900$) to assess whether a host of early health indicators measured from birth to age five are associated with children's cognitive and behavioral skills at age five.

Results: After adjusting for child and family characteristics, results revealed that children's neonatal risks (prematurity or low birth weight) and reports of poor health and hospitalizations were associated with lower cognitive skills, and neonatal risks and poor health predicted lower behavioral functioning at age five. Some of the association between neonatal risks and school readiness skills were indirect, functioning through children's poor health and hospitalization. Analyses further found that associations between early physical health and children's school readiness skills were consistent across subgroups defined by family income and child race/ethnicity, suggesting generalizability of results.

Conclusions: Findings emphasize the need for more interdisciplinary research, practice, and policy related to optimizing child well-being across domains of physical health and development in the early years of life.

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1. Introduction

Mounting research suggests that early physical health status may forecast children's long-term functioning throughout childhood and into adulthood. A major proponent of the fetal origins hypothesis, Barker (1995) argued that a child's experiences in utero, such as inadequate fetal nutrition, could alter fetal growth processes and negatively affect long-term health. Studies testing this theory have found that children who experienced neonatal risks, such as low birth weight and premature birth, were more likely than their counterparts to suffer health complications throughout adulthood, such as cardiovascular and respiratory disease (Almond and Currie, 2011; Barker, 1995; Barker et al., 2005). Neonatal risks have also been associated with long-term functioning in other arenas, predicting lower educational attainment, social status, and economic productivity across the lifecourse (Case et al., 2004;

Knudsen et al., 2006; Lê et al., 2013; Ziol-Guest et al., 2012). These findings are in line with a primary tenet of the fetal origins hypothesis suggesting that early "programming" in utero may remain dormant through the early part of an individual's life (Almond and Currie, 2011).

An opposing hypothesis is that neonatal health insults will have more immediate consequences for human development. Indeed, researchers have found that neonatal risks predispose children to additional childhood health problems such as ear infections, respiratory infections, and hospitalizations, as well as asthma diagnosis and special health care needs (Hack et al., 2005; Lepomnyaschy and Reichman, 2006; Stein et al., 2006). Moreover, neonatal risks may impair other arenas of early development. Studies have identified associations between neonatal risks and lower cognitive skills assessed across the first five years of life (Delobel-Ayoub et al., 2009; Morse et al., 2009). These studies attribute deficits in cognitive functioning to reduced brain size and immature neurophysiology (Reichman, 2005). Together, this research suggests that early health conditions may mediate associations between neonatal risks and children's development,

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although this hypothesis has not been directly tested in the literature.

Nonetheless, it is important to note that many early health conditions emerge in children without neonatal risks, and an emerging body of literature has found specific early health indicators to be associated with children's development. Of these indicators, asthma is the most common chronic condition of childhood (Currie, 2005) and has been linked with lower cognitive functioning (Halterman et al., 2001; Liberty et al., 2010) as well as behavior problems among children aged four to nine (Weil et al., 1999). Acute health conditions such as respiratory and ear infections similarly have predicted lower cognitive functioning in kindergarten (Roberts et al., 2000). Parental reports of children's poor general health have also been associated with lower cognitive skills and psychological adjustment between kindergarten and first grade (Crosnoe, 2006; Janus and Duku, 2007; Spernak et al., 2006). Research suggests that these health conditions may limit children's access to early learning opportunities or require treatment that interferes with the ability to learn or socialize with peers (Currie, 2005), thus inhibiting the development of nascent cognitive, self-regulatory, and behavioral skills.

On the whole, evidence links a variety of individual health indicators to young children's cognitive functioning and, less consistently, to behavioral functioning, but this literature suffers from numerous limitations. One concern is the use of small, epidemiological samples drawn from restricted economic strata, racial/ethnic subgroups, or urban centers (Halterman et al., 2001; Roberts et al., 2000; Weil et al., 1999). The use of such samples inhibits the generalizability of results to a broader sample of children. A second limitation is that, with few exceptions (e.g., Crosnoe, 2006; Spernak et al., 2006), prior studies have taken a piecemeal approach to studying children's health, by neither accounting for the multi-faceted nature of health (Martinez, 2002; National Research Council/Institute of Medicine) nor assessing the dynamic nature of health conditions over an extended period of time. For example, much of the literature linking specific early health conditions to children's developmental competencies have not adjusted for children's neonatal risks (e.g., Crosnoe, 2006; Halterman et al., 2001; Roberts et al., 2000; Spernak et al., 2006), potentially overestimating the role of such conditions. Relatedly, studies on neonatal risks have rarely attended to other aspects of children's health (e.g., Morse et al., 2009), thus overlooking the possibility that other health conditions may be a conduit through which neonatal risks are associated with later development.

To address these limitations, this study examined a large, nationally representative sample of children followed prospectively from infancy through school entry to test associations between five indicators of physical health assessed throughout early childhood (neonatal risks, asthma, acute conditions, hospitalizations, and general health) on children's development at age five, when most were entering kindergarten. We comprehensively assess developmental competencies, and further focus on the crucial transition period of kindergarten entry due to growing scientific consensus over the central role of school readiness skills for children's long-term success. Indeed, policy makers, practitioners, and researchers agree that children who enter kindergarten with key developmental competencies adjust more easily to the tasks of formal schooling, exhibit heightened academic achievement, and obtain greater educational attainment and economic productivity in adulthood (Duncan et al., 2007; Knudsen et al., 2006; Lo Paro and Pianta, 2000; Rimm-Kaufman et al., 2000). These school readiness competencies include cognitive skills, most prominently nascent reading and math skills; learning skills, such as the ability to sustain

attention and engage in learning activities; and behavioral skills, including peer social skills and the ability to constrain inappropriate behaviors (High, 2008; National Education Goals Panel, 1997; Snow, 2006).

In addition to attending to disparities in developmental competencies associated with a broad range of early childhood health conditions, this study also attends to the essential issues of economic and racial/ethnic disparities. Extensive research documents heightened levels of neonatal risks and other early health conditions among poor and racial/ethnic minority children (Braveman and Barclay, 2009; Fiscella et al., 2000). Similarly, research clearly delineates economic and racial/ethnic disparities in children's school readiness skills (Brooks-Gunn et al., 2007). Yet differences within these domains of functioning do not inform us of whether the associations between health and development might differ across subgroups of the population. There is ample reason to hypothesize that this may indeed be the case, although limited prior literature on this topic is mixed (Currie, 2005; Figlio et al., 2013; Reichman, 2005). Economically disadvantaged and racial/ethnic minority families have less consistent access to health care and enriching learning opportunities for children than their advantaged and White counterparts (Newacheck et al., 1996; Weinick and Krauss, 2000), and as a result, may be less able to quickly and fully address childhood health conditions, resulting in more negative repercussions for children's learning. Similarly, with more limited economic and social resources, poor families may experience greater stress and disruption from children's health problems, in turn limiting supports for children's healthy development. To address inconsistencies in prior literature at this intersection, this study examines whether children's physical health interacts with family income or race/ethnicity in order to assess whether links between early childhood health and school readiness skills vary across different subgroups of U.S. children.

2. Methods

2.1. Participants

Data for this study were drawn from the Early Childhood Longitudinal Study Birth Cohort (ECLS-B), a prospective, multi-method study of a birth cohort of children born in 2001 and followed from infancy through school entry (Flanagan and West, 2004). The ECLS-B is nationally representative of the nearly 4 million children who were born in 2001, excluding children born to mothers who were less than 15 years old and children who died before the first interview. In the first wave of the survey approximately 10,700 children (NCES requires that all *N*s be rounded to the nearest 50) and their primary caregivers (98% biological mothers) participated in interviews and child assessments conducted in either English, Spanish, or with a translator. Data collection began in 2001, when focal children averaged 10 months old, with families re-interviewed in 2003–2004 (2 years old), in 2005–2006 (4 years old), and 2006–2007, when children averaged 5 years old and most (77%) were entering kindergarten. Weighted response rates were 74.1% at Wave 1 ($N \approx 10,700$), 93.1% at Wave 2 ($N \approx 9850$), 91.3% at Wave 3 ($N \approx 8900$), and 91.8% at Wave 4 ($N \approx 6950$). Teachers (kindergarten or preschool) were also interviewed in Wave 4 (response rates of 76% for kindergarten teachers and 92% for preschool providers). The analytic sample for the current study was limited to children who remained in the sample through Wave 4 and who were not identified as having any severe disabilities, such as cerebral palsy or Down's Syndrome, yielding an analytic sample of 5900.

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