Relevant social and spatial contexts for elementary school children: An examination of multiple scales

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ABSTRACT

This study examined direct area-level effects of 4 common child well-being outcomes across multiple scales of residential and school neighborhoods to identify relevant contexts for measuring neighborhood effects on elementary school children. Results from growth curve models indicate that neighborhoods operationalized as residential and school census tracts exerted similar effect sizes while neighborhoods operationalized as school attendance zones showed attenuated effects. These results suggest that it may be reasonable to interchange residential and school census tracts when examining contextual effects on child well-being. In addition, results suggest that school attendance zones represent conservative, theoretically sound neighborhoods for elementary school children.

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1. Introduction

A recurring issue in the neighborhood effects literature is the definition and operationalization of a "neighborhood" or relevant geographic areas. Neighborhoods can be defined in many ways, but researchers agree that the definition and scale of a neighborhood should be based on theory and evidence specific to the outcome(s) under study and the hypothesized pathways through which neighborhoods exert influence (Diez Roux and Mair, 2010; Flowerdew et al., 2008; Root, 2012; Sharkey and Faber, 2014). However, neighborhood analyses often takes place in the presence of data constraints and as a result, researchers often use administrative units such as census tracts to define neighborhood boundaries. Yet, the use of administrative boundaries may not be arbitrary for children as they have limited mobility and independence, and are often constrained to the spaces surrounding them (Leventhal and Brooks-Gunn, 2003; Northridge et al., 2003; Sharkey and Faber, 2014).

The residential census tract is the most frequently used definition of "neighborhood" in neighborhood effect studies during childhood. Considered as a whole, the body of research conducted at the level of the residential census tract demonstrates that characteristics of the neighborhood's population, e.g., poverty,

appear to be consistently linked with children's academic or developmental trajectories (Leventhal and Brooks-Gunn, 2000; Sastry and Pebley, 2010; Sharkey and Faber, 2014). Yet, residential neighborhoods are only a subset of the potentially relevant contextual influences on children. As such, recent research urges neighborhood and health scholars to define neighborhoods as contexts that are relevant to the social and spatial environments in which children regularly engage (Sharkey and Faber, 2014). Given that youth spend a large portion of their day in school, school neighborhoods serve as a natural starting point for redefining relevant contexts. Yet, the role of school neighborhoods have largely been ignored in this literature except for a few city-specific studies that have examined the effects of school neighborhoods on youth health and well-being using school attendance boundaries, cluster analysis, school census tracts, and school-centric buffers (Bernelius and Kauppinen, 2012; Forsyth et al., 2012; Schwartz, 2010; Whipple et al., 2010; Zhang et al., 2006).

In light of children's limited mobility and daily exposure to both home and school neighborhood environments, school census tracts and school attendance zones may represent valid contexts that exert influence on health, well-being, and development during elementary school. However, which "scale" is most appropriate for defining relevant social and spatial contexts? That is, is a school attendance zone a more salient neighborhood than that of the census tract where the school is located, or vice-versa? Using simulated cities, Spielman et al. (2013) found that neighborhood effects were strongly influenced by the definition of neighborhood

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– neighborhoods that were "too small" overestimated neighborhood effects on behaviors whereas neighborhoods that were "too big" underestimated neighborhood effects. Thus, researchers often conduct parallel analyses at different scales and compare neighborhood effect estimates (Flowerdew et al., 2008; Galster, 2008; Root, 2012). The challenge, then, is to find a balance between the modifiable areal unit problem (correlations between outcomes and context are often stronger at smaller spatial scales) or spatial diffusion (characteristics tend to cluster spatially and become more heterogeneous in larger areas) and theoretical rationale about *why* and *how* neighborhoods exert influence within each scale.

Neighborhoods provide the physical spaces in which youth access resources and opportunities, but also the social spaces in which interactions with peers, family, and other adults occur (Leventhal et al., 2009). As such, researchers have identified several broad underlying mechanisms – institutional resources, collective socialization, collective efficacy, social capital, and social organization – through which neighborhoods may influence health, well-being, and development (Jencks and Mayer, 1990; Leventhal and Brooks-Gunn, 2000; Sampson et al., 2002). Although each theoretical perspective conceptualizes the mechanisms differently, each argues that neighborhoods are both a physical and social space in which interactions with parents, other adults (e.g., teachers, coaches, librarians, neighbors), and peers foster healthy development. As such, the definition and scale of neighborhood should be based on the underlying theoretical mechanisms linking exposure to outcome. For instance, mechanisms that focus on institutions, such as the research on school quality, suggest the context most salient for analysis may be the school attendance zone where resources, e.g., the tax base related to school funding, are drawn from (Sharkey and Faber, 2014).

The present paper examines the relationship between residential and school neighborhoods and four commonly used child well-being outcomes (educational achievement and psychosocial adjustment [see Curtis et al. (2013) and Sharkey and Faber (2014)]) in U.S. elementary school children. The intent of this paper is not to delve into the mechanisms underlying the association between neighborhood and child well-being but rather to examine how those associations vary across contexts that are relevant to school-aged children. Specifically, I examine the direct area-level effects on reading and math scores and internalizing and externalizing behaviors across neighborhoods defined by residential census tracts, school census tracts, and school attendance zones characterized by commonly used sociodemographic features. Because school attendance zones encompass both residential and school tracts, I hypothesize that the "neighborhood effects" will be attenuated relative to tract neighborhoods, which are smaller in scale. I also expect to find similar effect sizes across residential and school census tracts because elementary schools draw from the immediate surrounding areas (Whipple et al., 2010), making it likely that residential and school tracts share similar sociodemographic characteristics. To date, no research has used nationally representative data to demonstrate how school neighborhoods are associated with educational achievement and psychosocial adjustment during elementary school.

2. Methods

2.1. Data

The Early Childhood Longitudinal Study – Kindergarten Cohort (ECLS-K), sponsored by the Department of Education (National Center for Education Statistics, 2006), is a nationally representative study that followed a cohort of more than 21,400 children who entered kindergarten during the 1998–1999 school year through 8th grade. Data collection took place during the fall and spring of kindergarten (1998–1999) and 1st grade (1999–2000) and the spring of 3rd (2002), 5th (2004), and 8th (2007) grades. The ECLS-K employed a multistage probability sample design (National Center for Education Statistics, 2006). In the base year the primary sampling units (PSUs) were geographic areas consisting of counties or groups of counties. From these PSUs, approximately 24 children were randomly sampled from each of the 1277 selected schools, both public and private. In order to maximize the amount of longitudinal data, subsamples of children were followed if they changed schools and any child flagged to be followed at one point in time continued to be followed in subsequent data collections. In a longitudinal sample, attrition due to non-response and eligibility change is expected. During the first four waves (kindergarten through 5th grade), the ECLS-K had a 40% attrition rate (National Center for Education Statistics, 2006). However, the ECLS-K included weights to compensate for both sampling strategy and attrition; all analyses in this study are weighted appropriately. Results of weighted analyses are generalizable to the U.S. population of kindergarten children in the 1998–1999 school year and first graders in 1999–2000. Subsequent waves are only representative of the ECLS-K cohort (National Center for Education Statistics, 2006).

The ECLS-K contains longitudinal and geocoded data collected directly from children, parents, teachers, and school administrators, providing comprehensive information on education, development, and home, school, and neighborhood environments. The ECLS-K did not provide census tract geocodes for the 5th grade; thus, 5th grade geographic information was only available for children who did not move in elementary school (83% of the sample). Kindergarten, 1st, and 3rd grade geocodes were linked to the 2000 US Decennial Census; 5th grade geocodes were linked to the 2005–2009 American Community Survey (ACS) 5-year estimates.

2.2. Outcomes

Academic achievement from kindergarten to 5th grade was measured using reading (N=9790) and math (N=9810) scores calculated from item response theory (IRT) procedures. "IRT uses the pattern of right, wrong, and omitted responses to the items actually administered in an assessment and the difficulty, discriminating ability, and 'guess-ability' of each item to place each child on a continuous ability scale" (National Center for Education Statistics, 2006, p. 3–5). Responses across waves were pooled to stabilize longitudinal estimates; the child's response at each wave represents estimates of the number of items the child would have answered correctly at each point in time if they had taken all of the 186 questions in the reading forms and all of the 153 questions in all of the mathematics forms (National Center for Education Statistics, 2006). Scores were standardized with a mean of 50 and a standard deviation of 10 (Table 1).

Internalizing (N=16,080) and externalizing (N=16,160) behaviors were measured using subscales of the Teacher Social Rating Scale for fall and spring kindergarten and spring of 1st, 3rd, and 5th grades. The five to six items of the Externalizing Problem Behaviors scale measured acting out behaviors (e.g., arguing, fighting, showing anger, acting impulsively, disturbing the classroom's ongoing activities). The four items on the Internalizing Problem Behavior measured negative affective states such as anxiety, loneliness, sadness and low self-esteem. The ECLS-K scored each scale as the average of the underlying items. The National Center for Educational Statistics (2006) reports adequate split-half reliability ranges of 0.76–0.89 for the Externalizing and Internalizing Problem Behavior scales. Exploratory and confirmatory factor