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Neighborhood Economic Disadvantage and Children's Cognitive and Social-Emotional Development: Exploring Head Start Classroom Quality as a Mediating Mechanism

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Abstract

Past research has shown robust relationships between neighborhood socioeconomic disadvantage and children's school achievement and social-emotional outcomes, yet the mechanisms for explaining these relationships are poorly understood. The present study uses data from 1,904 Head Start participants enrolled in the Head Start Impact Study to examine the role that classroom structural and relational quality play in explaining the association between neighborhood poverty and children's developmental gains over the preschool year. Results suggest that neighborhood poverty is directly related to lower levels of classroom quality, and lower gains in early literacy and math scores. Indirect relationships were also found between neighborhood poverty and children's social-emotional outcomes (i.e., approaches to learning and behavior problems) via differences in the physical resources and negative student-teacher relationships within classrooms. These findings highlight the need for policy initiatives to consider community characteristics as potential predictors of disparities in classroom quality and children's cognitive and social-emotional development in Head Start.

Keywords

Head Start; neighborhood poverty; classroom quality; early math; early literacy; approaches to learning; behavior problems

A growing body of research has found important links between neighborhood characteristics and young children's physical, social, and academic development (Brooks-Gunn, Duncan, Klebanov, & Sealand, 1993; Leventhal & Brooks-Gunn, 2000). In particular, neighborhood poverty is associated with young children's lower academic performance and higher

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behavioral and emotional problems, with children from the most economically disadvantaged contexts showing the largest deficits over time (Chase-Lansdale, Gordon, Brooks-Gunn, & Klebanov, 1997; Dupéré, Leventhal, Crosnoe, & Dion, 2010). Although these empirical associations have been identified across multiple studies, relatively little research has explored the specific social, structural, or relational mechanisms that contribute to negative outcomes for low-income children living in poor communities. In particular, very little is known about whether and how the quality of the educational settings embedded within high-poverty neighborhoods may account for some of their effects on low-income children's growth. Educational settings may convey the influence of neighborhood poverty on developmental outcomes because after a child's home, these are the neighborhood settings within which children spend the most time.

The goal of the present study is to explore the role that the quality of early education environments may play in the relationship between young, low-income children's exposure to economic disadvantage in their neighborhoods and several dimensions of their academic, social-emotional, and behavioral functioning. In order to explore these relationships, we focus exclusively on children who attend Head Start classrooms in a diverse set of neighborhoods across the United States. We are particularly interested in the structural and relational quality of the Head Start classrooms that these children attend as key mechanisms in partially explaining the relationship between neighborhood disadvantage and children's outcomes. This study examines these questions using data from the Head Start Impact Study, a nationally representative, randomized controlled trial (RCT) of the effectiveness of Head Start conducted in 2002 and 2003. These data allow us to address conceptual and empirical gaps in the existing neighborhood and preschool literatures while capitalizing on variability in levels of neighborhood poverty across more than 20 U.S. states.

Neighborhoods as Salient Contexts for Children's Development

Several decades of research from sociology, urban studies, education, and psychology suggests that neighborhoods play an important role in shaping the development of children and adolescents. A broad collection of non-experimental studies have linked neighborhood poverty, in particular, with a host of negative outcomes for the children and young adults living in these contexts, including lower academic achievement, increased criminal and violent behavior, and lower future earnings (Leventhal & Brooks-Gunn, 2000). Experimental and quasi-experimental evidence supports these findings, with studies of programs like Moving to Opportunity and Gautreaux showing that moves out of high-poverty neighborhoods and into more economically advantaged communities may benefit children across several domains (Katz, Kling, & Liebman, 2001; Leventhal & Brooks-Gunn, 2003; Rosenbaum, Reynolds, & DeLuca, 2002).

In addition to this empirical work, a number of classic theories have helped to explain how and why these associations between neighborhoods and individual development might occur (Brooks-Gunn, Duncan, & Aber, 1997; Jencks & Mayer, 1990; Leventhal & Brooks-Gunn, 2000; Sampson, 2012; Sampson, Morenoff, & Gannon-Rowley, 2002; Shinn & Toohey, 2003). For the most part, these theories have hypothesized two primary pathways that explain the transfer of neighborhood processes to the individual level. First, *structural*

theories focus on the institutions and physical resources available within communities that may directly support (or impede) individuals' development. For example, families living in neighborhoods with a high density of museums, libraries, schools, and other educational institutions may be better able to provide their children with cognitively stimulating learning experiences that promote academic achievement compared with those living in areas devoid of such resources (Leventhal & Brooks-Gunn, 2000). Second, *relational* theories highlight the role that social processes, norms, interactions, and behaviors play in linking neighborhood poverty with individual outcomes. Social disorganization theory, for example, suggests that lower levels of positive social exchange and cohesion between neighbors may mediate the relationship between neighborhood socioeconomic disadvantage and individual behavior (Shaw & McKay, 1942).

Although theories supporting these neighborhood characteristics as mechanisms for influencing young children's development are well developed, there has been very little work that has tested these suggested relationships empirically (Leventhal & Brooks-Gunn, 2000). Extant literature most often relies on simple counts of the number of institutions present in a neighborhood and individual reports of broader social relationships, rather than direct, contextual-level observations of the quality of structural and relational supports. The present study aims to understand the early childhood classroom setting as one possible conduit for community structural and relational resources to reach low-income children and their families. We build off of recent work by Dupéré and colleagues (2010) that has found distinct, positive links between neighborhood advantage, quality of childcare, and individual academic achievement in several ways. First, we deepen the conceptualization and measurement of classroom quality and child outcomes through focusing on three distinct, directly observed dimensions of classroom quality, as well as representations of both cognitive and social-emotional skills. Second, unlike previous work that has examined relationships between neighborhood, classroom, and child-level phenomena independently, we use a structural equation modeling approach to capture these processes in a single, cohesive model. Third, we focus specifically on the critical early childhood support of preschool education in a group of particularly vulnerable low-income children attending Head Start. Given the well-established benefits of quality preschool education for later development and unique focus of Head Start on a "whole-child" approach, this is an especially policy-relevant setting to examine.

Head Start Classroom Quality as a Mediating Setting

There is substantial evidence that high-quality early care and education can help to support young children's cognitive and social-emotional development (Howes, Phillips, & Whitebook, 1992; Mashburn et al., 2008; Pianta, Barnett, Burchinal, & Thornburg, 2009; Peisner-Feinberg et al., 2001; Votruba-Drzal, Levine Coley, & Chase-Lansdale, 2004; Yoshikawa et al., 2013; Zaslow, Tout, Halle, Whittaker, & Lavelle, 2010; Zill et al., 2001). Conversely, additional work has shown a direct, negative relationship between children's behavioral outcomes and the number of hours that they spend in low quality programs (McCartney et al., 2010). Indeed, Burchinal, Vandergrift, Pianta, and Mashburn (2010) find that the benefits of increments in quality for improving positive child outcomes do not accrue until quality reaches a moderate level.

In the present study, we define classroom quality in terms of two distinct but complementary components that directly parallel the neighborhood theoretical literature outlined above. *Structural quality* describes the physical space and materials present and used to support children's learning in the classroom. *Relational quality* refers to the interactions, relationships, and day-to-day exchanges between teachers and children. Relational quality can be further categorized into high levels of emotionally *positive* (e.g., supportive, warm, caring) student-teacher interactions, and low levels of *negative* (e.g., harsh, punitive, dismissive) interactions. The result is three distinct yet interrelated dimensions of classroom quality: structure, positive teacher-child interactions, and negative teacher-child interactions. Although both structural and relational quality have been linked to child outcomes broadly defined, there is some evidence to suggest that different components of quality may be linked more closely with particular child outcomes than others (Mashburn et al., 2008). In particular, recent evidence suggests that structural and instructional quality are more strongly associated with cognitive or academic outcomes, whereas positive relational quality is more important for children's social-emotional and behavioral development (Burchinal et al., 2010; Mashburn et al., 2008).

The current study considers the ways that the economic resources of neighborhoods may be associated with the structural and relational quality of the Head Start classrooms embedded in these settings. Although historically Head Start programs have targeted some of the poorest counties in the United States (Ludwig & Miller, 2007), they currently exist within a broad range of neighborhood contexts to better reach all low-income children. The level of economic disadvantage in the neighborhoods surrounding Head Start classrooms may be associated with the quality of those classrooms in several ways. First, Head Start awards federal funds to local public or private organizations within the communities that they serve (U.S. Department of Health and Human Services, Administration for Children and Families, Office of Head Start, n.d.). Consequently, Head Start programs are often under-resourced as a result of being located in economically disadvantaged communities that have a smaller tax base (for public programs) or serving parents who cannot afford to pay high fees (for private programs). This lower availability of fiscal resources likely has direct and negative impacts on the structural quality of these classrooms through reductions in material resources, as well as on relational quality, due to lower availability of funding to support teachers' continued professional development.

Second, salaries for Head Start teachers vary dramatically across not only states, but also across neighborhoods (Barnett, Carolan, Fitzgerald, & Squires, 2012; Phillips, Voran, Kisker, Howes, & Whitebook, 1994). For example, a Head Start teacher in the Bronx makes an average of $17,041 per year, whereas a Head Start teacher a few miles away in Manhattan makes an average of $38,152 per year (TeachersSalary.net, n.d.). This large disparity likely makes it difficult to attract the most highly qualified and experienced teachers to classrooms serving economically disadvantaged populations, leading to lower classroom quality (Phillips et al., 1994). The "flight" of talented teachers to teach older children in public school systems where they are paid on a (higher) public school salary scale may be even more apparent in poorer neighborhoods than better-off neighborhoods. Finally, like all families living in a high-poverty context, the teachers and staff of Head Start

classrooms in economically disadvantaged neighborhoods are also subject to stress related to living in or commuting to a high-poverty (and often high-crime, low-resourced) setting. Such stress may lead to lower relational quality in their classrooms by impairing their ability to provide a warm, supportive, and well-structured environment (Friedman-Krauss, Raver, Morris, & Jones, 2014; Jennings & Greenberg, 2009).

The Present Study

The present study seeks to understand the relationships between Head Start neighborhood economic disadvantage, Head Start classroom structural and relational quality, and Head Start enrollees' cognitive (i.e., early literacy and math) and social-emotional (i.e., approaches to learning and behavior problems) development over the course of one preschool year. This study tests the hypothesis that three dimensions of Head Start classroom quality may serve as partial mediators of the relationships between neighborhood disadvantage and low-income children's development outcomes. In particular, the associations between neighborhood poverty and classroom structural quality are hypothesized to be especially important for children's cognitive growth, whereas the associations between neighborhood poverty and relational quality—represented in this study by separate measures of positive and negative teacher-child interactions—may be more important for dimensions of children's social-emotional development. Understanding these relationships can inform current policy efforts aimed at improving the quality of preschools serving low-income children as a mechanism for promoting healthy child development.

This study addresses several critical gaps in the existing literature on neighborhoods, preschool quality, and child development. First, we evaluate the well-known but infrequently tested hypothesis that characteristics of the institutions embedded in local communities serve as critical mechanisms for the influence of broader neighborhood characteristics on specific child outcomes. Second, we draw from a strong body of literature to test three specific aspects of Head Start classroom quality—structural, positive teacher-child interactions, and negative teacher-child interactions—as being differentially important for various dimensions of low-income children's development. Third, we draw from past research showing the particular importance of neighborhood and classroom processes for low-income children's development and focus explicitly on a sample of children attending Head Start. This study brings several empirical innovations to these questions, as well. Our use of the nationally-representative Head Start Impact Study (from which we use data on 993 Head Start classrooms located in 335 unique census tract neighborhoods across 22 states) provides both substantial variation in the depth of neighborhood economic disadvantage and improved generalizability to diverse geographical contexts compared to past neighborhood research conducted primarily in single, urban areas. In addition, our use of structural equation modeling allows us to test and account for multiple mediating mechanisms and child outcomes in a single, cohesive model while also addressing methodological issues of traditional multi-level modeling (Preacher, Zyphur, & Zhang, 2010). Finally, our inclusion of pre-test measures of our child outcomes as covariates in this model helps us to account for unobserved time-invariant characteristics that may introduce bias to observational estimates.

Method

Sample

The analytic sample for the present study consists of 1,904 Head Start participants from the treatment group of the national Head Start Impact Study. These children attended Head Start in a total of 993 classrooms within 335 census tracts, across 22 states. Participants ranged from two through five years old upon entry into Head Start, with the average child being just over 3.5 years old. The sample consists of roughly equal numbers of boys and girls (49% boys), and is ethnically diverse with approximately 37% Hispanic children, 34% black children, 27% non-Hispanic white children, 2% Asian children, and 1% Native American children. The average income-to-needs ratio (created using 2002 U.S. Census poverty thresholds based on income and family size) was 0.86 (*SD* = 0.57), which as expected given Head Start eligibility criteria places the majority of the sample below the federal poverty line of 1.00. In addition, approximately 37% of mothers of sample children did not graduate from high school, 34% achieved a high school degree or equivalent, 26% received some post-secondary training, and 4% had a bachelor's degree or higher. See Table 1 for additional descriptive statistics.

Procedure

Recruitment and random assignment—The Head Start Impact Study (HSIS) was a nationally representative, randomized controlled trial of the effectiveness of Head Start funded by the Department of Health and Human Services. Children who applied to one of 378 Head Start centers under 84 grantees that had been sampled to be representative of Head Start nationally were eligible to participate in HSIS. Random sampling of children who applied to these Head Start centers was used to determine which children would participate in HSIS. In total, 4,440 children who were first time applicants to Head Start were randomly assigned off waitlists to either receive an invitation to participate in Head Start services or to be in the control group. A total of 2,644 children were randomized to receive Head Start services (U.S. Department of Health and Human Services, Administration for Children and Families, 2010a), of which 1,904 are included in the present set of analyses. The remaining 740 children were excluded from analyses because they did not take up treatment (i.e., did not attend a Head Start center) or were missing data on geographical location or spring outcome scores. On average, these 740 excluded children were significantly older, $t(2321) = 2.72$, $p < .01$, and wealthier (based on income-to-needs scores), $t(2018) = 2.22$, $p < .05$, showed significantly higher baseline PPVT scores, $t(2112) = 2.95$, $p < .01$, and behavior problems, $t(2178) = 1.93$, $p < .10$, and were situated in classrooms with significantly lower material and spatial quality, $t(1937) = 4.74$, $p < .01$. No significant differences were found between included and excluded children on gender, race/ethnicity, maternal education, baseline math scores, baseline approaches to learning, positive and negative teacher-student interactions in the classroom, or neighborhood poverty.

Data collection—Data collection began in the fall of 2002 when the children entered Head Start for the first time and continued throughout the school year. During the fall of 2002 and spring of 2003, trained data collectors visited the children at school and administered the cognitive outcome tests. During the spring, data collectors also completed

direct assessments of classroom quality. Parents completed questionnaires about their child and their family during the fall of 2002 and the spring of 2003. Parents also rated their children's behavior problems and approaches to learning at these two time points (U.S. Department of Health and Human Services, Administration for Children and Families, 2010a).

Prior to random assignment, parents received information about the HSIS, including procedures, potential benefits, and study incentives. Following random assignment, study personnel met with parents in groups and individually to further explain the study. Parents were asked to provide informed consent for the duration of the study, which included allowing their child to participate and be assessed, and permitting the researchers to contact the child's teacher (U.S. Department of Health and Human Services, Administration for Children and Families, 2010b). Parents and Head Start teachers received small cash incentives for their participation in the study (i.e. completion of interviews and questionnaires). Center directors received a cash incentive for classroom observations (U.S. Department of Health and Human Services, Administration for Children and Families, 2010b).

Geocoding—In addition to the use of publicly available HSIS data, the present study utilized an additional set of restricted information that was provided to the Secondary Analysis of Variation in Impacts Center as part of a broader agreement with the Administration for Children and Families. In particular, random assignment center geocodes (i.e., latitude and longitude) were provided for use. Geocodes for each random assignment center were coded and linked to surrounding census tracts using ArcGIS software (Version 10.1; ESRI, 2011).

Measures

Child outcomes—Children's outcomes included measures of cognitive and social-emotional functioning. Children's *cognitive outcomes* were captured using the Peabody Picture Vocabulary Test (PPVT; Dunn, Dunn, & Dunn, 1997), a measure of receptive vocabulary, and the Woodcock-Johnson Applied Problems test (WJAP; Woodcock, McGrew, & Mather, 2001), a measure of early math skills. In the PPVT, the child looks at four pictures and is instructed to point to the picture that best matched the word spoken by the assessor. Item response theory (IRT) was used to develop a shorter version of the PPVT that was used in HSIS, and scores were rescaled to have a mean of 250 and a standard deviation of 50 in the base year. In the WJAP, the assessor presents the child with a problem orally and pictorially that requires the child to count or perform simple calculation in order to solve (U.S. Department of Health and Human Services, Administration for Children and Families, 2010a, 2010b). WJAP scores represent W-ability scores, which were obtained using IRT based on a Rausch model.

Children's *social-emotional functioning* was captured using two parent-reported measures of children's approaches to learning and behavior problems. Children's approaches to learning were assessed using an adapted tool from the Head Start Family and Child Experiences Survey (FACES) study. The scale included seven items rated on a scale of 0 (not true) to 2

(very true), and captured children's curiosity, imagination, openness to new tasks and challenges, and positive attitude toward learning. Items included "Makes friends easily" and "Likes to try new things." Items were summed to create the approaches to learning scale. Higher scores reflect more positive approaches to learning. The same scale was used in the fall and the spring. Although internal consistency for the approaches to learning scale was low (Cronbach's *alpha* = .60 in the fall and .64 in the spring), scores on the scale were comparable to those found in previous studies and were significantly related with other measures of children's social development (U.S. Department of Health and Human Services, 2010b).

Children's behavior problems were captured using a parent-reported scale that was adapted from the FACES study and original work conducted by Rutter, Achenbach, Zill and Peterson, and others (U.S. Department of Health and Human Services et al., Administration for Children & Families, Administration on Children, Youth & Families, Commissioner's Office of Research & Evaluation, 2001). The scale included 14 items rated on the same 0 (not true) to 2 (very true) scale, and captured both internalizing and externalizing problems such as children's aggression, disobedience, hyperactivity, inattention, withdrawal, and depression. Items included "Is unhappy, sad, or depressed" and "Hits and fights with others." Items were summed to form the behavior problems scale, with higher scores reflecting more behavior problems (Cronbach's *alpha* = .72 in the fall and .74 in the spring). The same scale was used in the fall and the spring.

Classroom quality—Head Start classroom quality was measured using the Early Childhood Environment Rating Scale, Revised Edition (ECERS-R; Harms, Clifford, & Cryer, 1998) and the Arnett Caregiver Interaction Scale (CIS; Arnett, 1989). The ECERS-R is an observational tool used to measure overall classroom quality in center-based early childhood programs. Trained data collectors visited each classroom once during the spring of the school year and rated classrooms on 37 items across six domains: adequacy of space and furnishing, personal care routines, language and reasoning, range of activities that are used and available, interactions, and program structure. The items and subscales assess the quality of the classroom space, materials, and experiences including language interactions between teachers and children. Each item was rated on seven point Likert scale using the following anchor points: inadequate (1), minimal (3), good (5), and excellent (7). The CIS was completed by the same trained data collector at the same time as the ECERS-R. The CIS is a direct observation measure that is used to assess the quality of interactions between the lead teacher and children. Twenty-six items were rated on a four point Likert scale from "Not at all true" (1) to "Very much true" (4) and assess quality across four domains: greater teacher sensitivity, responsiveness, encouragement of children's independence, and lower levels of punitiveness and detachment. Items were reverse coded when necessary so that higher scores reflect higher quality.

Exploratory and confirmatory factor analysis (each using a randomly split half of the sample) was used to combine items from both the ECERS-R and CIS to provide overall representations of structural and relational quality (Connors, Friedman-Krauss, Morris, & Jones, 2015). Three factors emerged from this process, which were labeled materials and space for learning (*alpha* = 0.93), positive teacher-child interactions (*alpha* = 0.93), and

negative teacher-child interactions (*alpha* = 0.85). Model fit for this three-factor solution was adequate (*RMSEA* = 0.063; *CFI* = 0.817; *SRMR* = 0.067). Materials and space for learning, which captures classrooms' structural quality, includes 26 items from the ECERS-R such as, "Furniture for routine care, play, and learning," "Space for gross motor play," and "Books and pictures." Both positive teacher-child interactions and negative teacher-child interactions capture classrooms' relational quality. Positive teacher-child interactions consists of 19 items from the ECERS-R and CIS such as "Using language to develop reasoning skills" and "Speaks warmly to the children." Negative interactions included 9 items from the CIS such as "Speaks with irritation or hostility to the children" and "Doesn't reprimand the children when they misbehave." To represent each quality dimension, ECERS-R and CIS scores were standardized to a 0–1 scale and averaged across the items that loaded onto each factor. Greater quality is indicated by higher scores on structural quality and positive interactions, and lower scores on negative interactions. Intercorrelations on the three classroom quality dimensions ranged from −.49 to .64 (see Table 2). For additional details on the development of these quality dimensions, please see Connors et al., 2015.

Neighborhood economic disadvantage—Head Start neighborhood economic disadvantage was represented by the percent of households within the random assignment center's Census tract that fell below the federal poverty line in the year 2000 (two years prior to data collection). These data were taken directly from the U.S. Census Bureau (2000). Census tracts were chosen over alternative neighborhood definitions (e.g., block groups, zip codes) because of their prevalence in past seminal work in the neighborhood literature, their correspondence with natural boundaries that demarcate neighborhoods (e.g., highways, train tracks), and their similarity with residents' perceptions of the size of their lived neighborhood (Coulton, Korbin, Chan, & Su, 2001).

Covariates—A set of child- and family-level covariates was also included in analyses, including child gender, child age, child race (an indicator variable for children who were Hispanic and an indicator for children who were black), maternal education (an indicator for less than high school education), and families' income-to-needs ratio (as calculated based on income and family size using the 2002 poverty thresholds from the U.S. Census). These characteristics were reported by the primary caregiver in the fall.

Analytic Plan

To achieve the goals of the present study, we use a multi-level structural equation modeling (MSEM) framework to test the direct and indirect relationships between study variables of interest while accounting for children's nesting within classrooms. Specifically, we included neighborhood economic disadvantage as a predictor, Head Start classroom structural quality, positive teacher-child interactions, and negative teacher-child interactions as mediators, and children's spring early literacy skills, early math skills, approaches to learning, and behavior problems as outcomes in a single model. In predicting all child outcomes, we also include a set of covariates (child age, child gender, child race, maternal education, and family income-to-needs ratios), as well as each outcome's pre-test score from fall of the Head Start year. The inclusion of pre-test outcome scores (known as a "residualized change" approach;

Duncan & NICHD Early Child Care Research Network, 2003) provides a more conservative estimation of the relationship between the study variables, as it helps to account for time invariant, unobserved characteristics (e.g., genetics, stable household traits) that may underlie associations between study variables. The residualized change approach also allows for the interpretation of outcome scores as "gains" in children's cognitive and social-emotional abilities across the Head Start year.

The final model was developed using procedures adapted from Preacher and colleagues (2010), and allows for the inclusion of multiple mediators and outcomes in a single model while also attempting to take into account the nested nature of the data. In this study, individual children were nested within Head Start classrooms using the TYPE=COMPLEX command in Mplus (version 7; Muthén & Muthén, 2012). Although in reality classrooms were also nested within Head Start centers, and centers within grantees, we did not use a three- or four-level model due to a number of limitations and uncertainties of this approach within a SEM framework (Preacher, Zhang, & Zyphur, 2011) and a lack of model convergence. This choice was justified by classrooms' relatively low levels of nesting in this study (an average of 2.96 classrooms per center). We did, however, test the robustness of our findings to two alternative nesting strategies (i.e., nesting children in centers instead of in classrooms and randomly selecting one classroom per center to eliminate classrooms' nesting in center), both of which revealed coefficients that were highly similar in direction and magnitude to the results of the chosen model.

Our final model included correlations between the residuals of each classroom quality mediator and each child outcome. In addition to testing the direct paths between each study variable, we also tested the indirect relationships between neighborhood economic disadvantage and children's outcomes via each of the classroom quality mediators using Preacher and colleagues' (2010) strategy. In particular, we used the product of the estimates of the *a* (predictor to mediator) and *b* (mediator to outcome) pathways to determine each indirect pathway. Several criteria were used to gauge adequate model fit: (a) a root mean square error of approximation (*RMSEA*) value of less than 0.08 (with <0.06 considered ideal); (b) a comparative t index (*CFI*) of 0.90 or above (with >0.95 considered ideal); and (c) a standardized root mean square residual (*SRMR*) of less than 0.09 (with <0.08 considered ideal; Hatcher, 1994; Hu & Bentler, 1999).

A full information maximum likelihood (FIML) approach was used to account for missing data (including 3.15% of cases for neighborhood poverty, an average of 8.80% of cases across classroom quality, 9.30% of cases across child outcome scores in Fall, and 5.64% of cases across covariates). FIML takes into account information from all non-missing data to provide estimates of model parameters without imputation. Finally, several variables were re-scaled using linear transformation for analyses to allow for appropriate model convergence and to make coefficients more interpretable. In particular, individual children's raw early cognitive skills on the PPVT and WJAP were divided by 100, raw scores on the negative interactions classroom quality variable were multiplied by 10, and neighborhood poverty scores were divided by 100 to represent proportions (i.e., a theoretical range from 0 to 1) rather than percentages (i.e., a theoretical range from 0 to 100).

Results

Descriptive and Bivariate Results

Results of descriptive analyses revealed a great deal of heterogeneity in the present sample for neighborhood poverty and Head Start classroom quality. In particular, an average of 23.56% of resident families in the 304 census tract neighborhoods surrounding the Head Start centers in this study fell below the poverty line, with a range of 2.05% to 78.61% (See Figure 1 for full distribution). Average levels of structural quality and positive teacher-child interactions were moderate to high at 0.66 (range = 0.05 to 1.00) and 0.76 (range = 0.10 to 1.00), respectively, on a scale of 0 to 1. Conversely, average levels of negative teacher-child interactions were quite low at 0.05, though classrooms ranged from scores of 0.00 to 0.78, on a scale of 0 to 1. Bivariate correlations between study variables revealed small to moderate correlations between child outcomes in the Spring, with the strongest correlation emerging between early math and literacy skills. Moderate correlations were also observed between the three classroom climate variables (see Table 2).

Students also saw a range of improvements in outcomes across the Head Start year. In particular, relatively large average gains were seen for early literacy (26.73 points, or 0.66 *SDs*) and moderate gains for applied problems (8.93 points, or 0.33 *SDs*) from Fall to Spring. Children also showed very slight average improvements in approaches to learning (0.17 points, or 0.10 *SDs*) and very small reductions in behavior problems (0.26 points, or 0.07 *SDs*) across the Head Start year.

Results of Multilevel Structural Equation Modeling

Results of MSEM analyses revealed adequate overall model fit. In particular, the *RMSEA* value was 0.063, the *CFI* value was 0.932, and the *SRMR* was 0.049. Within this model, several significant direct pathways were found (see Figure 2). First, neighborhood socioeconomic disadvantage was significantly and negatively predictive of gains (i.e., spring outcome scores net of fall outcome scores) in children's early literacy, $b = -0.210$ (0.050), $p < .01$, and early math skills, $b = -0.136$ (0.040), $p < .01$, but not directly related to children's approaches to learning or behavior problems. Second, neighborhood socioeconomic disadvantage was significantly related to all three dimensions of classroom quality, with higher poverty associated with lower structural quality, $b = -0.206$ (0.042), $p < .01$, higher levels of negative teacher-child interactions, $b = 1.138$ (0.312), $p < .01$, and lower levels of positive teacher-child interactions, $b = -0.136$ (0.046), $p < .01$. Third, structural quality and negative teacher-child interactions were related to different child outcomes. In particular, higher levels of negative teacher-child interactions predicted higher increases in behavior problems, $b = 0.204$ (0.095), $p < .05$, and higher levels of structural quality predicted lower gains in approaches to learning, $b = -1.134$ (0.453), $p < .01$. No other relationships between classroom quality and gains in child outcomes were found.

Results of tests for indirect pathways revealed significant indirect relationships between neighborhood socioeconomic disadvantage and gains in child behavior problems via negative teacher-child interactions, $b = 0.232$ (0.107), $p < .05$, and between socioeconomic

disadvantage and approaches to learning via structural quality, $b = 0.234$ (0.102), $p < .05$. No other indirect pathways were found.

Discussion

The aim of the present study was to empirically evaluate the longstanding theory that neighborhood economic disadvantage has important, indirect influences on children's cognitive and social-emotional growth through its effects on the structural and relational qualities of neighborhood-embedded institutions. Although recent work has found that childcare quality may partially explain the relationships between neighborhood economic advantage and later achievement (Dupéré et al., 2010), this is the first study to our knowledge to examine this indirect association as it pertains to Head Start classroom quality and to children's social-emotional functioning. In particular, we evaluated the quality of materials and space, positive teacher-child interactions, and negative teacher-child interactions in Head Start classrooms as mechanisms for explaining the overall relationship between neighborhood poverty and child outcomes within the nationally representative Head Start Impact Study. Results of this study revealed significant indirect relationships between neighborhood economic disadvantage and children's approaches to learning via the quality of classroom materials and space, as well as behavior problems via negative teacher-child interactions. Although there was a direct relationship between higher levels of neighborhood poverty and children's cognitive outcomes (lower literacy and math growth), this relationship was not mediated by Head Start classroom quality.

Results of descriptive analyses showed a high degree of socioeconomic diversity in the neighborhoods in which Head Start centers are located. Although Head Start is explicitly designed to serve low-income children, approximately half of neighborhoods surrounding the centers in the present nationally representative sample showed poverty rates of less than 25 percent. The relatively low average rates of poverty seen in these neighborhoods are reflective, in part, of the significant changes seen in low-income communities since the inception of Head Start in the 1960's. More generally, the socioeconomic heterogeneity of Head Start neighborhoods serves as an important reminder of the dispersion of low-income families in a diversity of communities across the United States, and provides additional justification for the need to measure and explore the effects of poverty at multiple ecological levels.

Results of this study revealed direct relationships between neighborhoods' levels of socioeconomic disadvantage and all three dimensions of Head Start classroom quality, where a 10 percent increase in neighborhood poverty was related to a 0.13 standard deviation decrease in the availability of structural resources for learning, a 0.11 standard deviation increase in the levels of emotionally negative interactions between children and teachers, and a 0.08 standard deviation decrease in levels of emotionally positive, supportive teacher-child relationships. Although variation in Head Start quality is well documented (Zill & Resnick, 2006; Zill et al., 2003), these results provide new evidence to suggest that community characteristics may be linked to this inequality in implementation. Future research is needed to understand how neighborhood socioeconomic disadvantage translates into lower classroom quality (e.g., through reduced availability of funding, well-trained

teachers, or professional development opportunities in low-income contexts), as well as the best ways to ensure equal provision of high-quality learning opportunities for all low-income children, regardless of community conditions.

Results of indirect pathways revealed that classrooms' structural quality may explain part of the relationship between neighborhood poverty and children's social-emotional functioning. Surprisingly, however, these results showed that *lower* structural quality (i.e., material and spatial resources such as furniture, toys, equipment, books, and pictures in the classroom) is associated with *higher* levels of students' positive approaches to learning, net of children's baseline approaches to learning, other child- and family-level covariates, and other quality indicators. Although this finding is somewhat counterintuitive, past research has shown that children's adoption of particular learning strategies is highly dependent on their teachers and classroom environment (Trigwell, Prosser, & Waterhouse, 1999). In the context of resource-poor classroom environments, it is possible that teachers become more creative in developing curricula that support children's adaptability, interests in learning, creativity, and problem solving independent of available materials, whereas teachers in resource-rich contexts may rely on pre-existing curricula that do not promote such flexibility. As a result, children in material-poor contexts receiving similar levels of relational quality may actually see improvements in their openness to new things, imagination, and flexibility. In addition to work that replicates these findings using more reliable measures of these skills, further research is needed to understand the origins of children's approaches to learning, how they relate specifically to different instructional approaches, as well as how teachers can best promote their development regardless of physical resources.

In addition, a significant mediating pathway between neighborhood poverty and developmental outcomes for children was observed via levels of negative–but not positive–teacher-child interactions in the classroom, such that higher levels of negativity were associated with greater increases in behavior problems over the year. This finding is in line with a large body of past research showing that caregivers' harsh and critical interactions with their children and their provision of unsupportive or punitive environments may undermine children's adaptive behavioral and emotional development (Bates, Maslin, & Frankel, 1985). Previous work suggests that students with higher levels of baseline behavior problems may evoke greater negative reactions from their teachers than peers with minimal behavior disturbances (Henricsson & Rydell, 2004). Additional research is needed in order to better understand the specific individual and dyadic/interactional qualities that contribute to children's behavioral difficulties, the temporality of these relationships, as well as the most effective ways to reduce emotionally negative interactions in the classroom.

Unlike in past research showing small associations (effect sizes up to 0.20) between quality and children's cognitive development using residualized change approaches (Burchinal et al., 2008; Peisner-Feinberg et al., 2001), neither relational nor structural dimensions of quality were related to children's gains in literacy or math in the present analyses. We did, however, find a direct relationship between neighborhood poverty and reduced gains in early literacy and math scores. These results could suggest either that 1) the processes through which neighborhood characteristics are associated with cognitive outcomes are outside of the Head Start classroom context (e.g., through changes in family functioning, direct

impacts on biological functioning or stress responses, etc.), or 2) that the present study did not appropriately capture the dimensions of classroom quality that may serve as mediators of these specific processes. In particular, past research has found instructional quality – a dimension not explicitly captured in this study – to be a key predictor of children's early literacy and math skills (Mashburn et al., 2008; Peisner-Feinberg et al., 2001). Future research is needed that includes more comprehensive dimensions of classroom processes, as well as additional contextual and individual mechanisms for explaining this relationship.

Limitations and Future Directions

Although this study has numerous strengths – including its measures of multiple dimensions of Head Start structural and relational quality, large sample across the United States, and multiple measures of child outcomes – it is limited in several important ways. First, although our model included a core set of family-level covariates and a statistically conservative residualized change approach, we are unable to establish causality of the relationships between neighborhood poverty, classroom quality, and children's outcomes. Given the lack of children's random assignment to neighborhood and classroom contexts, it is possible that omitted variable bias lead to an overestimate of the strength of the relationships between study variables, or, as mentioned above, that some of the associations that were identified in this study were bidirectional (rather than unidirectional) in nature. This issue is of particular concern given that classroom quality was measured in the spring only, and may have been affected by children's skills over time. Additional quasi-experimental and experimental research is needed to build a broader knowledge base around the direction of these relationships.

Second, a major limitation of the present study is that it does not explicitly include information on classrooms' instructional quality or use of specific curricula. As mentioned previously, it is possible that different instructional practices relating to the broader socioeconomic context could confer different advantages and disadvantages for children's cognitive, social-emotional, and behavioral development. Furthermore, although the present study focuses on the quality of the early educational environments in which three- and four-year-old children spend a great amount of their time, it is likely that additional family and community characteristics affected by neighborhood poverty (e.g., neighborhood resource availability, family emotional climate) also impact children's developmental outcomes in this age range. Finally, although we use a MSEM approach that nests children in classrooms, we were unable to fully account for the ways that higher-order characteristics of centers or Head Start grantees might influence the structure and interactions taking place within classrooms. Future research using methodologically advanced models that better account for multiple layers of nesting is needed to explore how additional facets of the classroom, Head Start center, grantee, family, and neighborhood may further explain the relationship between neighborhood poverty and child development.

Third, although our use of the Head Start Impact Study allowed us to include a large number of children from Head Start classrooms across many contexts, we cannot fully generalize these findings to the population of Head Start children in the United States due to several reasons, including our focus exclusively on those who were both offered and accepted the

opportunity to attend Head Start, non-random missing data, study attrition, and our inability to use the sampling weights in our analyses. Similarly, because geocodes were only provided for Head Start center addresses, we are unable to draw conclusions about whether and how children's residential neighborhoods may predict similar or different gains in their outcomes over time. As children grow and develop, they spend increasing amounts of time in both their residential and school neighborhoods, as well as traveling between these contexts. Understanding how these contexts independently and additively contribute to children's wellbeing is a critical area of needed research. Finally, it is important to note that we were only able to access neighborhood poverty information for children's Head Start center of random assignment, and classroom quality information for the centers they actually attended, with no way of knowing whether these centers were the same. There is a small but non-negligible chance that children attended a Head Start center other than the one to which they were randomly assigned, which may have introduce bias to our estimates, but is not something we can determine from our data.

Conclusions

The present study provides important evidence to suggest that neighborhood economic disadvantage is critical for shaping several dimensions of low-income children's cognitive and social-emotional development, as well as the structural and relational quality of classrooms in Head Start centers embedded within them. Importantly, the ways that neighborhoods and Head Start centers are associated with each other and together are associated with children's developmental outcomes is highly complex. Although the present data suggest that the impact of neighborhood poverty on children's cognitive development may operate in ways other than through the Head Start classroom, classroom structural and negative relational quality appear to be important mediating mechanisms for explaining neighborhood poverty's relationship with approaches to learning and behavior problems, respectively. As such, enhancing the classroom environment through improved professional development and resource allocation may be one method of improving the social-emotional development of children from low-income communities.

Beyond the classroom, these data suggest that future interventions and policies aimed at improving children's developmental outcomes should also take into account the broader neighborhood context. This study provides new evidence that Head Start classroom quality varies significantly based on location in high versus low poverty neighborhoods. Given that Head Start is designed to be a "great equalizer" in reducing educational inequities associated with poverty, these findings reinforce the need for additional efforts to improve equity in the quality of services provided to young children from different contexts. Future research is also needed in order to better understand the specific sources of this inequality (e.g., differential funding practices, teacher retention, teacher qualifications, etc.), as well as methods for reducing neighborhood poverty and improving classroom quality for all children.

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Highlights

- We test relations between neighborhood poverty, classroom quality, and child skills
- Neighborhood poverty predicts lower structural and relational quality in Head Start
- Neighborhood poverty predicts smaller gains in children's math and literacy skills
- The relation between poverty and child socioemotional skills is mediated by quality

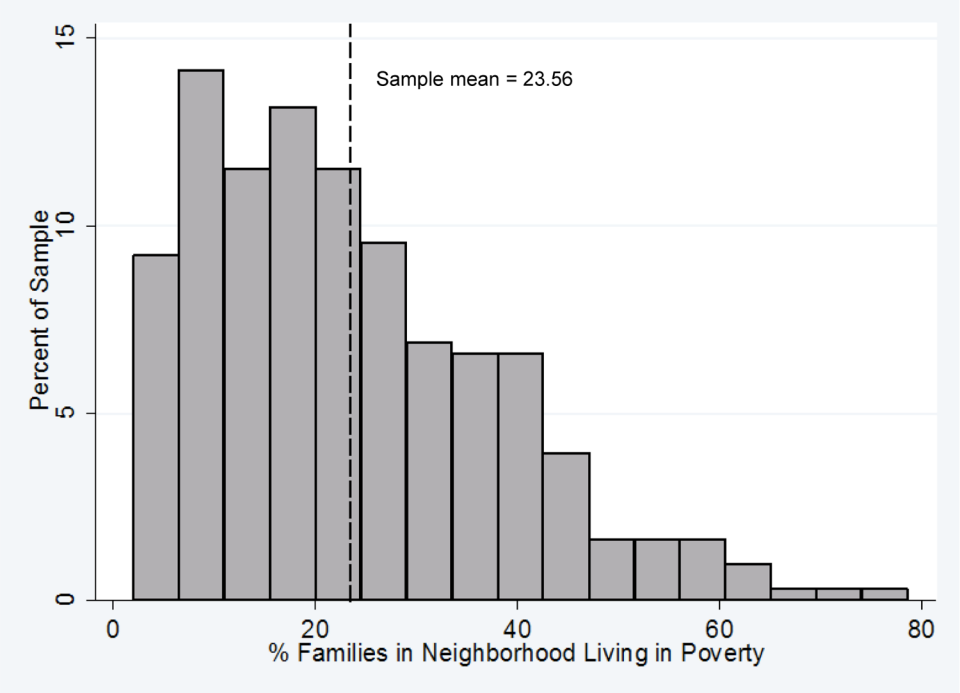

Figure 1.
Histogram of neighborhood poverty in study sample

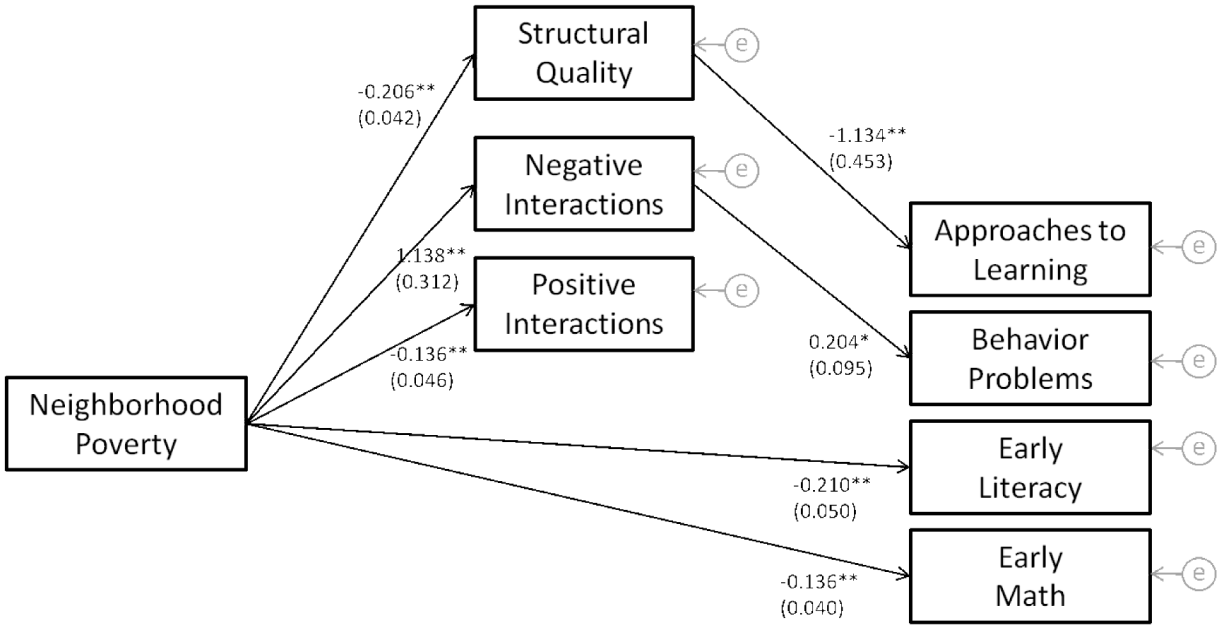

Figure 2.

Results of SEM model predicting spring outcome scores from Head Start neighborhood socioeconomic disadvantage and classroom quality

Notes: Model controls for fall outcome scores, child gender, child race, child age, maternal education, and family income-to-needs. Residual variances between classroom quality and between child outcomes correlated but not shown. All standard errors adjusted to account for children's nesting within classrooms.

Table 1

Descriptive statistics of analytic variables.

	N	%	Mean	*S.D.*	Min	Max
Individual Covariates						
Boys	1802	48				
Black	1799	37				
Hispanic	1783	34				
Income-to-needs	1619		0.86	0.57	0.00	7.46
Mother less than high school education	1792	37				
Age	1813		3.57	0.59	2.00	5.00
Individual Fall Outcome Scores						
Fall PPVT	1873		245.79	42.36	133.33	378.93
Fall WJIII Applied Problems	1357		376.95	27.36	318.00	432.00
Fall Approaches to Learning	1839		12.29	1.76	3.00	14.00
Fall Total Behavior Problems	1839		6.01	3.60	0.00	21.00
Individual Spring Outcomes Scores						
Spring PPVT	1904		272.52	38.52	163.19	401.42
Spring WJIII Applied Problems	1890		385.88	27.25	318.00	436.00
Spring Approaches to Learning	1839		12.46	1.74	4.00	14.00
Spring Total Behavior Problems	1839		5.75	3.64	0.00	22.00
Classroom Quality						
Materials and Space for Learning	922		0.66	0.16	0.05	1.00
Positive Teacher-Child Interactions	922		0.76	0.18	0.10	1.00
Negative Teacher-Child Interactions	920		0.05	0.10	0.00	0.78
Neighborhoods						
% Families in poverty	304		23.56	14.74	2.05	78.61

Table 2

Correlations among primary study variables.

	1	2	3	4	5	6	7
1. Neighborhood Poverty	-						
2. Materials and Space for Learning	−0.19**	-					
3. Positive Teacher-Child Interactions	−0.12**	0.64**	-				
4. Negative Teacher-Child Interactions	0.17**	−0.49**	−0.54**	-			
5. Spring PPVT	−0.24**	0.08*	0.07*	−0.08*	-		
6. Spring WJ Applied Problems	−0.17**	0.07*	0.06+	−0.08*	0.61**	-	
7. Spring Approaches to Learning	−0.04	−0.08*	−0.04	0.01	0.12**	0.11**	-
8. Spring Total Behavior Problems	−0.03	0.04	0.02	0.01	−0.15**	−0.17**	−0.25**

Note:

+ $p<.05$,

* $p<.01$,

** $p<.001$