Early Care and Education and Children's School Readiness: Do Impacts vary by Neighborhood Poverty?

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Abstract

Neighborhoods provide social and institutional resources that may affect children's achievement or moderate the influences of other developmental contexts, such as early care and education (ECE). Using a large, nationally representative sample (N = ~4,400) from the Early Childhood Longitudinal Study-Birth Cohort (ECLS-B), merged with zip code-level poverty data from the American Community Survey (ACS), this paper examines associations between household poverty, neighborhood poverty, ECE attendance, and children's math and reading scores at school entry (age 4-6). Findings suggest that neighborhood poverty has significant, negative associations with children's school readiness among children living in non-poor households (d = 0.14-0.16). However, the positive association between ECE, and Head Start specifically, and children's school readiness are consistent regardless of neighborhood context. Research and policy implications are discussed.

Early Care and Education and Children's School Readiness: Do Impacts vary by Neighborhood Poverty?

The experience of family poverty during childhood has strong, negative, and long-term impacts on children's development (Bhattacharya, Currie, & Haider, 2004; Brooks-Gunn & Duncan, 2000; Evans, Wells, & Schamberg, 2010; Murasko, 2009; Jack P Shonkoff & Garner, 2012). The experience of poverty during the early years of life has particularly detrimental effects (Duncan, Kalil, & Ziol-Guest, 2013; Duncan, Magnuson, Kalil, & Ziol-Guest, 2011). Poverty during early childhood negatively affects children's readiness to enter school (Committee on Integrating the Science of Early Childhood Development, 2000; Duncan, Magnuson, et al., 2011), which can set children on a lower achievement trajectory. The income gap in achievement appears well before kindergarten and widens during elementary school (Hutchison, Morrissey, & Burgess, 2014; Reardon, 2011).

While the family context arguably has the largest impacts on children's short- and long-term outcomes, neighborhoods provide both structural (i.e., schools, employment opportunities) and social (i.e., relationships, role models) supports that together constitute an important context for children's development. Following Leventhal and Brooks-Gunn (2000), neighborhoods affect children through three potential mechanisms: institutional resources (e.g., availability of schools, health care), relationships (e.g., social support, mental health), and norms/collective efficacy (e.g., community-level informal and formal institutions, physical risk, crime). For example, disadvantaged neighborhoods often have fewer institutionalized resources (e.g., Jencks & Mayer, 1990), such as high-quality K-12 schools and healthy food options (Fuller, Coonerty, Kipnis, & Choong, 1997; Gordon & Chase-Lansdale, 2001; Leventhal & Brooks-Gunn, 2000; Powell, Slater, Mirtcheva, Bao, & Chaloupka, 2007). Other research finds that poor neighborhoods are

no less likely to have fewer child care centers, but that they have different center types (publicly-funded centers vs. private centers) (Small & Stark, 2005) and quality (Dupere, Leventhal, Crosnoe, & Dion, 2010; Mccoy, Connors, Morris, Yoshikawa, & Friedman-Kraus, 2014).

Indeed, a growing body of research finds that growing up in areas of concentrated disadvantage affects the educational, social-emotional, and health outcomes of the children growing up in such environments, above and beyond their own household disadvantage (Carpiano, Lloyd, & Hertzman, 2009; Dupere et al., 2010; Frech & Kimbro, 2011; Kessler et al., 2014; Leventhal & Brooks-Gunn, 2000; Mccoy et al., 2014; McCoy, Roy, & Sirkman, 2013; Roy, Mccoy, & Raver, 2014; Sanbonmatsu et al., 2011). Much of this research is grounded in bioecological systems theory (Bronfenbrenner & Morris, 1998, 2006), which emphasizes the importance of interactions between the individual and the environment in producing development. For example, a recent study estimates that sustained exposure to neighborhood disadvantage during childhood decreases the probability of high school graduation from 96 to 76 percent for Black children, and from 95 to 87 percent for non-Black children (Wodtke, Harding, & Elwert, 2011). Exposure to neighborhood disadvantage even has negative effects across generations, with estimates of a reduction in child cognitive ability by more than half of a standard deviation (Sharkey & Elwert, 2011). There is also evidence that poor children in poor neighborhoods experience higher rates of food insecurity, compared to their poor peers in lower-poverty neighborhoods (Morrissey, Oellerich, Meade, Simms, & Stock, 2013); in turn, food insecurity can negatively affect achievement (Nord, 2009). Recent research finds that moves from high poverty to low poverty neighborhoods are associated with improved child self-regulation, whereas the opposite was true for moves from low to high poverty neighborhoods (Roy et al., 2014). However, other research finds no effects of neighborhood disadvantage on

cognitive outcomes such as working memory (Hackman et al., 2014). Likewise, Moving to Opportunity (MTO), a study involving the random assignment of housing vouchers to move to lower-poverty neighborhoods, found no significant effects on test scores for children aged six to 20 years old (Sanbonmatsu, Kling, Duncan, & Brooks-Gunn, 2006).

Much of this work uses a cumulative risk framework, which suggests that growing up in a neighborhood with severe disadvantage compounds the already harmful consequences of family or household poverty (Bronfenbrenner & Morris, 2006; Evans, 2003; Rutter, 1993). However, it is also feasible that family and neighborhood poverty interact. For example, it may be that children who experience family poverty are less affected by neighborhood poverty, as the disadvantaged circumstances within family that they experience have stronger negative impacts. To date, while most studies control for family poverty and other household conditions, little research has examined the interactive effects of experiencing both household and neighborhood disadvantage on school readiness.

Given the long-term social and economic consequences of the achievement gap (Hutchison et al., 2014; Reardon, 2011), policymakers have a keen interest in preventing or narrowing the gap. One strategy found effective at promoting school readiness among low-income children is high-quality early care and education (ECE) (Barnett, 2011; Yoshikawa et al., 2013). The federal Head Start program was created in 1965 as part of President Johnson's War on Poverty to give children in poverty the early learning opportunities they need to be on par with their more advantaged peers upon entering school. A wealth of experimental and non-experimental research on Head Start indicates that attendance increases children's academic outcomes in the short term, and has lasting impacts on children's social, health, and economic outcomes (Deming, 2009; Johnson, 2010; Morrissey, Hutchison, & Burgess, 2014; U.S.

Department of Health and Human Services, 2010). Other public prekindergarten programs, such as those sponsored by states, have also been shown to positively affect children's academic and other outcomes (Gormley, Gayer, Phillips, & Dawson, 2005; Weiland & Yoshikawa, 2013; Yoshikawa et al., 2013). Similarly, high-quality center-based settings show positive short- and longer-term impacts on children's cognitive outcomes (NICHD ECCRN, 2006; Vandell et al., 2010).

While the average treatment effect is most often studied, whether ECE attendance is more beneficial for subgroups of children is also policy relevant. Following Miller et al. (2014), the *compensatory hypothesis* theorizes that interventions will have the largest impacts on children from the most disadvantaged backgrounds (Sameroff & Chandler, 1975). In contrast, the *accumulated advantages hypothesis* predicts that children from the most advantaged environments will benefit most from interventions, a la the "skill begets skill" theory (Heckman, 2000). Finally, the *Goldilocks* hypothesis expects that children with some, but not severe, disadvantage will benefit most from ECE attendance. That is, children from advantaged backgrounds do not need particular early learning opportunities to be ready for school entry, whereas the opportunities provided by ECE are not adequate for overcoming severe disadvantage.

Public ECE programs are predicated on the compensatory hypothesis, to provide disadvantaged children with learning opportunities on par with those enjoyed by many of their more advantaged peers (Morrissey et al., 2014), and in general, recent evidence surrounding ECE largely suggests that the most disadvantaged children (e.g., the lowest income, those receiving low parental preacademic stimulation) show the largest benefits from attending Head Start (Bitler et al., 2014; Bradley, McKelvey, & Whiteside-Mansell, 2011; Cooper & Lanza,

2014; Miller, Farkas, Vandell, & Duncan, 2014), public pre-K programs (Gormley et al., 2005; Weiland & Yoshikawa, 2013; Yoshikawa et al., 2013), and high-quality ECE (McCartney, Dearing, Taylor, & Bub, 2007; Watamura, Phillips, Morrissey, McCartney, & Bub, 2011). For example, the final report on the Head Start Impact Study (HSIS) reported that dual-language learners and the children of mothers with depressive symptoms displayed greater gains in vocabulary compared to their peers not in Head Start (U.S. Department of Health and Human Services, 2010). However, research on the United Kingdom's Sure Start program indicated that the program was less effective for children in single-parent households or with teenage mothers (Belsky, Melhuish, Barnes, Leyland, & Romaniuk, 2006), lending some support to the accumulated advantage hypothesis. The Goldilocks hypothesis has little empirical support in terms of ECE's effects; however, in the neighborhood effects literature, Carpiano et al. (2009), using a sample of neighborhoods in British Columbia, find that children growing up in mixed-income areas (neighborhoods with relatively equal proportions of high- and low-socioeconomic residents) averaged the highest school readiness scores at kindergarten.

Despite the growing body of research surrounding the moderating effects of key child and family characteristics in the relationship between ECE attendance and children's outcomes, little attention has been given to how the context in which families live and work – specifically their residential neighborhoods – may moderate the effects of ECE. One exception is Morris et al. (2013), which exploited the random assignment to Head Start participation in the HSIS data to examine the extent to which the impacts of assignment to Head Start on children's cognitive outcomes varied by the availability of alternative ECE arrangements in the neighborhood, or the level of competition in the local ECE market. They found that impacts were greater when local competition was low, possibly because children living in areas with greater ECE availability had

alternatives to Head Start – thus the counterfactual to attending Head Start attended ECE settings quite similar to those of the treatment group (Morris et al., 2013).

A key aspect of neighborhoods is its poverty rate. Poor communities tend to have fewer institutional resources and poorer measures of relationships and collective efficacy – lower-quality ECE programs (Fuller et al., 1997; Gordon & Chase-Lansdale, 2001; Mccoy et al., 2014), higher rates of parental depression and reduced social support (Klebanov, Brooks-Gunn, & Duncan, 1994; Mcloyd, 1990), lower levels of collective efficacy, and higher rates of crime (Sampson, 1997). Likewise, high neighborhood crime, more common in high poverty areas, is associated with decreases in academic achievement at the school level over time (McCoy et al., 2013). Children facing both family poverty and neighborhood disadvantage may be at a greater disadvantage than their counterparts growing up in poor families in more advantaged neighborhoods; however, they may benefit most from an intervention like high-quality ECE. To date, the moderating effects of neighborhood poverty on ECE's impacts children's school readiness have not been explored.

The Current Study

This study extends the extant literature by examining the interactive effects of neighborhood poverty and ECE attendance on children's school readiness. Given the importance of school readiness in predicting later academic outcomes, and the recent public investments in place-based policies such as the federal Promise Zones initiative, understanding the differential impacts of ECE by neighborhood poverty is important for identifying effective intervention strategies. Despite the policy implications for public ECE investments and programming, whether early learning experiences have differential effects on children's school readiness based on their neighborhood contexts remains unexplored. Using data from the Early Childhood

Longitudinal Study-Birth Cohort (ECLS-B) linked with corresponding contextual data from the American Community Survey (ACS), we test three research questions:

1. How do measures of children's school readiness vary by the poverty level of their residential neighborhoods? We hypothesize that children living in high-poverty neighborhoods will have lower scores than their counterparts in more advantaged neighborhoods.
2. Does neighborhood poverty exacerbate associations between family poverty and measures of children's school readiness? We expect a compounding effect, such that poor children living in high-poverty neighborhoods will have lower scores than their poor counterparts in more advantaged neighborhoods.
3. Does neighborhood poverty moderate associations between ECE attendance and measures of children's school readiness? We expect a main effect of higher school readiness scores among children who attended ECE, and we test for moderating effects of neighborhood using the three hypotheses described above – the compensatory hypothesis, the accumulated advantages hypothesis, and the Goldilocks hypothesis. Following the compensatory hypothesis, one would expect that children living in areas of concentrated disadvantage disproportionately benefit from ECE attendance, compared to children living in more advantaged neighborhoods. By contrast, using the accumulated advantage hypothesis, one would predict that children living in high-poverty areas benefit less from ECE attendance than their peers in more advantaged neighborhoods. Finally, the Goldilocks hypothesis would predict that children living in moderate-poverty areas benefit from ECE attendance more than either their peers in more advantaged and more disadvantaged neighborhoods.

Method

Data

This study uses two data sources. First, the ECLS-B, collected by the National Center for Education Statistics (NCES) in the Department of Education, is a longitudinal dataset of approximately 10,700 children and was designed to be nationally representative of children born in the United States in 2001.[1] The ECLS-B follows children from birth through kindergarten with data collection occurring when the children are 9 months of age (2001-02) including information from birth certificates, 2 years of age (2003-04), approximately 4 years of age (preschool: 2005-06), and at two waves of kindergarten entry (2006-08). Information about child and family characteristics and residential zip codes were collected through interviews with parents and child assessments.

Using children's residential zip codes, we merged the child-level data with zip code-level information on poverty rates that was collected from the U.S. Census Bureau's 2007-2011 ACS five-year estimates. This multiyear data offers the advantage of increased statistical reliability for less populated areas and small population subgroups, and it is the only source for poverty rates at the zip code-level. Notably, the child-level and environmental data were collected at different years. Unfortunately, contemporaneous data are not available. Given the lack of variability in neighborhood poverty over time, we assume that our neighborhood measures, taken in 2007-2011, are representative of the concentrated disadvantage from 2001-2007, when our child-level independent and dependent variables were assessed.

We limit our sample to children with nonmissing data on school readiness measures at kindergarten entry, control variables, residential zip codes, and zip code level poverty data, and

[1] The reported sample sizes are rounded to the nearest 50, per NCES regulations regarding disclosure of restricted-use data. Asian and American-Indian children, twins, and low and very low birthweight children were oversampled.

who reported being enrolled in kindergarten in wave 4, the first (2006) kindergarten entry wave (N = 4,400). Slightly fewer children had reading scores than math, so the (rounded) sample size for the reading score analyses is 4,350. The analysis sample was less likely to experience household poverty at wave 1 than the sample that were dropped due to missing data or not entering kindergarten at wave 4 (23% vs. 25%), but did not differ on measures of neighborhood poverty.

Measures

School readiness. Children's reading and math scores at Kindergarten serve as the dependent variables. The reading portion of the assessment consisted of 60 items to measure language and oral skills; phonological awareness; letter and letter-sound knowledge; print conventions; word recognition; and vocabulary. The measure was administered in both English and Spanish, depending on the results from a screener administered prior to the assessment. The mathematics assessment consisted of 58 items to assess number sense, properties, and operations; measurement; geometry and spatial sense; data analysis, statistics, and probability; and patterns, algebra, and functions.[2] Separate math and reading scores standardized on the grand mean were used as the dependent variables in regression analyses.

Family poverty. At each wave, respondents reported their total household annual incomes and household size. NCES used these responses to calculate a household's poverty status using the contemporaneous Federal poverty thresholds.

Neighborhood poverty. We define neighborhood poverty as living in a zip code with a poverty rate of 20% or greater. Using this definition of concentrated poverty, about 23% of children in our subsample lived in high-poverty neighborhoods at wave 3 (the preschool wave). While some children did move between each of waves 1 to 3, no children moved into or out of

[2] For more information on the reading and math assessments, see: http://nces.ed.gov/pubs2010/2010009.pdf

poor neighborhoods, as defined in this study; that is, those who moved did so among different poor neighborhoods, or different non-poor neighborhoods.

Covariates. We exploit the child-level data available in the ECLS-B to control for a rich set of child, parental, and household characteristics. Covariates (most measured contemporaneously with the dependent variables) include child gender, age in months at wave 4, race/ethnicity (*non-Hispanic Black*, *Hispanic, non-Hispanic White*, *Other*), whether the child had a disability at wave 4 (including learning, physical, vision, and hearing), mother's age at child's birth in years, whether the mother was married at wave 4, the total number of individuals living in the household at wave 4, and whether the family owned a car at wave 4. To control for the level of exposure to ECE, we controlled for the number of hours per week the child attended Head Start and other center-based care (in tens of hours for ease of interpretation, coded as 0 for children not attending). We use a series of binary indicators of respondent-reported highest level of parental education at wave 4 (*neither parent graduated high school, at least one parent has a high school degree, at least one parent had some college, and at least one parent graduated from college*). Also at each wave, respondents reported their employment status and weekly work hours at wave 4 (*mother worked 35 or more hours per week*, *mother worked fewer than 35 hours per week, mother was not employed*). The geographic region (*Northeast, Midwest, West, South*), and urbanicity (*urban, rural*, or *suburban*) of the child's residence at wave 4 were also controlled. Finally, we included children's Bayley scores at wave 1 to control for baseline cognition.

Analytic Plan

This paper examines relationships among family poverty, neighborhood poverty, and ECE attendance by estimating a series of Ordinary Least Squares (OLS) regression models,

using robust standard errors clustered at the zip code level. First, to test the first research question, how neighborhood poverty relates to children's school readiness, we test Equations 1 and 2.

$$Y_4 = B_0 + B_1 FPOV_3 + B_2 NPOV_3 + B_3 ECE_3 + B_4 Z_i + \varepsilon \quad (1)$$

In Equation 1, Y_4 captures the two dependent variables, math and reading scores, for child *i* at wave 4 (kindergarten entry). $FPOV_3$ and $NPOV_3$ represent dummies for family poverty and neighborhood poverty, respectively, at the prior wave (wave 3, i.e., preschool), ECE_3 represents a dummy for whether the child attended Head Start or any center-based care at wave 3, and Z_i represents the child, parent, and household covariates for child *i*, as described above. Equation 2 below is similar, with the independent variables representing whether the child ever experienced family poverty, neighborhood poverty, or attended Head Start or other center-based care at waves 1, 2, or 3.

$$Y_4 = B_0 + B_1 FPOV_{1\text{-}3} + B_2 NPOV_{1\text{-}3} + B_3 ECE_{1\text{-}3} + B_4 Z_i + \varepsilon \quad (2)$$

To test the second research question, whether neighborhood poverty exacerbates associations between family poverty and children's school readiness, we test Equations 3 and 4. These equations are similar to 1 and 2, with an interaction term for family and neighborhood poverty added.

$$Y_4 = B_0 + B_1 FPOV_3 + B_2 NPOV_3 + B_3 ECE_3 + B_4 (FPOV_3 \times NPOV_3) + B_5 Z_i + \varepsilon \quad (3)$$

$$Y_4 = B_0 + B_1 FPOV_{1\text{-}3} + B_2 NPOV_{1\text{-}3} + B_3 ECE_{1\text{-}3} + B_4 (FPOV_{1\text{-}3} \times NPOV_{1\text{-}3}) + B_5 Z_i + \varepsilon \quad (4)$$

Finally, to examine the third research question, whether neighborhood poverty moderates associations between ECE attendance and children's school readiness, we test Equations 5 and 6. Again, these equations are similar to 1 and 2, this time with interaction terms for neighborhood poverty and ECE attendance added.

$$Y_4 = B_0 + B_1 FPOV_3 + B_2 NPOV_3 + B_3 ECE_3 + B_4 (NPOV_3 \times ECE_3) + B_5 Z_i + \varepsilon \quad (5)$$

$$Y_4 = B_0 + B_1 FPOV_{1\text{-}3} + B_2 NPOV_{1\text{-}3} + B_3 ECE_{1\text{-}3} + B_4 (NPOV_{1\text{-}3} \times ECE_{1\text{-}3}) + B_5 Z_i + \varepsilon \quad (6)$$

Results

Descriptive Results

Sample descriptive statistics are provided in Table 1. In general, children living in non-poor households in low-poverty neighborhoods were less likely to attend Head Start, and more likely to attend other types of center-based care, than their counterparts in households below the poverty line or in disadvantaged communities. These more advantaged children were also less likely to be a racial/ethnic minority or have a depressed mother, and were more likely to speak English as a primary language, have more educated parents, live in a two-parent household, and have a mother employed part-time. Among this sample, children living in rural communities and in the South were more likely to live in zip codes considered to be high-poverty. Among children in poor households, those in high-poverty neighborhoods attended Head Start at higher rates than their counterparts in lower-poverty neighborhoods.

Figure 1 shows the annual income ranges by family and neighborhood poverty. Among those households under the federal poverty line, those living in high-poverty areas had lower incomes compared to their poor counterparts in low-poverty neighborhoods. Likewise, non-poor families living in higher-poverty neighborhoods were less likely to have incomes above $75,000, and more likely to have incomes below $35,000 than non-poor households in low-poverty neighborhoods. Results indicate that in general, households in high-poverty areas average lower incomes than those in more affluent neighborhoods, even when taking into account whether their annual income falls under or above the federal poverty threshold.

Figure 2 displays the dependent variables, standardized math and reading scores, as measured at kindergarten entry (wave 4) by family and neighborhood poverty. As expected, children in poor households averaged lower math scores than those in non-poor households.

However, interestingly, children in households below the poverty line but living in low-poverty neighborhoods scored higher in reading than children in higher-income households in high-poverty neighborhoods, suggesting that neighborhood poverty may have particular associations with literacy.

Regression Results

The main regression results are displayed in Table 2. Models 1 and 2 display the main effects of how household poverty, neighborhood poverty, and ECE attendance are associated with children's school readiness, or the first research question. Living in a high-poverty neighborhood during preschool (wave 3) is associated with lower math and reading scores of about one-tenth of a standard deviation, about half the effect size of living in a household below the poverty line at preschool, suggesting that both family and neighborhood poverty in the year before Kindergarten are associated with poorer school readiness. Table 3 displays the results using dummy terms for ever experiencing household poverty, ever experiencing neighborhood poverty, or ever attending Head Start or other center-based care from 9 months to 4 years of age (preschool), and Models 7 and 8 show the main effects. Together, results suggest that attending Head Start or another type of center-based care at preschool, or at any point between 9 months and 4 years of age, is associated with about a one-eighth to one-sixth of a standard deviation higher scores. To better understand the Goldilocks hypothesis, we also re-ran the models with a recorded neighborhood poverty variable with three categories (less than 20%, 20-30%, and 30% or greater; results available upon request. These results provide some evidence that living in a neighborhood where the poverty rate is 20-30% is associated with lower math and reading scores than living in a neighborhood where the poverty rate is greater than 30%.

Models 3 and 4 in Table 2, and Models 9 and 10 in Table 3, address the second research question of whether living in a high-poverty neighborhood moderates the effect of household poverty on children's school readiness. In contrast with hypotheses, the interaction term between household and neighborhood poverty in Models 3 and 4 is significant and positive, essentially negating the associations between neighborhood poverty and school readiness among poor children. By contrast, the interaction term in Models 9 and 10 is not significant, suggesting that the timing of household poverty and neighborhood poverty during the year before school entry, or the contemporaneous timing of neighborhood and household poverty, is important.

To address the third research question, Models 5 and 6 in Table 2 and Models 11 and 12 in Table 3 included interaction terms between neighborhood poverty and a child's attendance of Head Start or other type of center-based care. The interaction term was not significant in any of these models. Finally, to test the Goldilocks hypothesis, we again re-ran the models with a recoded neighborhood poverty variable with three categories, as described above (results available upon request). The interaction between Head Start and other center-based care attendance moderate neighborhood poverty (20-30% poverty) was marginally statistically significant (-.12) for math scores. However, in general, results on a whole indicate that associations between Head Start and other center-based care attendance and children's math and reading scores at Kindergarten do not vary with their neighborhood's poverty level.

Sensitivity Analyses

Several sensitivity analyses were conducted to test the robustness of results. First, models were tested using the subsample of households above the poverty line (N = 3,500). Results indicate that neighborhood poverty was strongly related to lower math scores (-.19) among non-poor households, although the coefficient for reading scores was negative but not statistically

significant, and as with the broader sample, interactions between Head Start or other center-based care attendance and neighborhood poverty were not significant. Second, among the entire sample, a higher threshold of neighborhood poverty replaced the 20 percent or greater poverty rate in analyses. Results (available upon request) were substantively similar to models using the 20 percent threshold, in the size and direction of coefficients; however, results were not statistically significant, likely because of the smaller sample sizes of those in the zip codes with 30 percent or more poverty. Third, because Head Start was designed specifically as an anti-poverty program, the effects of Head Start, as opposed to center-based care more generally, on children's school readiness may be stronger among those in more disadvantaged neighborhoods compared to those in lower-poverty neighborhoods, we tested models that included the interaction between Head Start attendance and neighborhood poverty. These models were conducted on both the broader analysis sample and on a subsample of children who attended some type of center-based care (either Head Start or center-based care). Compared to children in other types of care, Head Start attendees averaged lower reading scores, which is likely due to selection of more disadvantaged children attending Head Start. There was no evidence that associations Head Start attendance's associations with children's school readiness were moderated by neighborhood poverty. Finally, because neighborhood poverty has different characteristics in rural vs. urban settings, we ran the analyses on separate rural and urban subsamples (results available upon request). In general, patterns were similar in rural and urban areas as they were in the full sample in terms of direction and magnitude of coefficients, although in the rural sample, associations between neighborhood poverty and school readiness were not statistically significant, and associations between household poverty and school readiness were stronger. However, the cell sizes in the rural subsample were small; of the

approximately 700 children in rural areas, only 100 lived in poor households in low-poverty neighborhoods, and an additional 100 lived in poor households in high-poverty neighborhoods.

Discussion

A wealth of research links family poverty to children's achievement (Duncan, Morris, & Rodrigues, 2011; Morrissey, Hutchison, & Winsler, 2014; Reardon, 2011). However, less research has examined neighborhood poverty and children's achievement. As an important developmental context, neighborhoods provide social and institutional resources varying in availability and quality with their level of disadvantage. Further, neighborhood characteristics such as poverty may moderate the influences of other developmental contexts, including their own household poverty and educational interventions, particularly early care and education (ECE).

This paper addresses these gaps by investigating associations between household poverty, neighborhood poverty, ECE attendance, and children's math and reading scores at school entry. Findings suggest that neighborhood poverty matters for school readiness among children in families above the poverty line, whereas household conditions appear to trump neighborhood poverty among poor families. There was no evidence that neighborhood poverty moderated associations between center-based ECE attendance and school readiness, suggesting that ECE is similarly effective across neighborhood contexts – that it may serve as a rising tide that lifts all boats.

Consistent with much of the previous literature (Leventhal & Brooks-Gunn, 2000; Mccoy et al., 2014; Morrissey et al., 2013; Sampson, Sharkey, & Raudenbush, 2008), results indicate that neighborhood disadvantage, as measured by the local poverty rate at the zip code level, has significant, negative associations with children's school readiness, particularly math scores,

among children in households above the poverty line. This relationship was especially strong among children living in neighborhoods where the poverty rate was between 20 and 30%. The magnitude of associations is considerable, amounting to about one-seventh to one-fifth of a standard deviation of school readiness scores at school entry, approximately the same magnitude of association identified between center-based ECE attendance and scores. These relationships were consistent among the rural and urban subsamples.

However, the interaction between household and neighborhood poverty was significant and such that it zeroed out associations between neighborhood poverty and school readiness among children living in households below the poverty line. One explanation is that household poverty trumps neighborhood poverty. Indeed, theory and previous research suggests that household processes and characteristics are more salient to young children than out-of-home contexts (Bronfenbrenner & Morris, 2006; Leventhal & Brooks-Gunn, 2000), and the scarcity of resources in households below the poverty line may be the dominating developmental influence on young children's achievement. A second explanation is that neighborhood poverty is buffering, rather than exacerbating, associations between family poverty during preschool and children's math and reading scores at kindergarten. Notably, this pattern of results was not true for family poverty as ever experienced between infancy and preschool, indicating that the timing of the experience of household poverty during the year before school entry, and the simultaneous experience of neighborhood poverty, is important. It is possible that in more advantaged neighborhoods, a child from a household under the poverty line experiences greater "relative poverty" than his counterpart in a more disadvantaged neighborhood, which negatively impacts school readiness. Another possibility is that high-poverty neighborhoods have more resources

that target and benefit poor children, whereas lower-poverty neighborhoods are less equipped to do so.

In contrast with expectations, neighborhood poverty did not moderate the impacts of Head Start and other types of center-based care on children's school readiness, and did not provide support to any of the three hypotheses considered – the compensatory hypothesis, accumulated advantages hypothesis, or Goldilocks hypothesis. Rather, it seems that center-based ECE may provide similar benefits to children's cognitive outcomes across neighborhood contexts. However, much previous research indicates that the most disadvantaged children, in terms of child and family characteristics, benefit most from Head Start and pre-K (Bitler et al., 2014; Gormley et al., 2005; Miller et al., 2014; Yoshikawa et al., 2013); given that these children are most concentrated in high-poverty neighborhoods, prioritizing the expansion of ECE services in these neighborhoods, as in the federal Early Head Start-Child Care Partnerships and Preschool Development Grants, may be an efficient and effective means of targeting those most in need of services.

These results should be interpreted within the context of the study's limitations. First, we are unable to draw causal associations, as our independent variables, neighborhood poverty, household poverty, and ECE attendance, are associated with a range of other characteristics known to impact children's development, such as parenting behaviors and ECE quality. Families' decisions about the neighborhoods in which they live are endogenous to their and the neighborhoods' resources (e.g., Sampson & Sharkey, 2008). While we use the wealth of child and household characteristics in the ECLS-B to control for many of these known factors, it is likely that there are unmeasured and thus uncontrolled confounding factors. Second, in general, households located in high-poverty neighborhoods averaged lower incomes than those in more

affluent neighborhoods, even when taking into account whether their annual income falls under or above the federal poverty threshold. Thus, even among non-poor families, those living in more disadvantaged neighborhoods also likely had lower incomes than their peers in more advantaged neighborhoods, which could also be related to children's school readiness. It should be noted, however, that including a series of dummies for income (income is less than $20,000, income is between $20,000 and $35,000, income is between $35,000 and $75,000, and income over $75,000) does not substantially change the results of our primary models (Table 2, Models 1 and 2). Third, this study lacks the capacity to understand the mechanisms underlying the identified associations. For example, we do not know how neighborhood poverty relates to children's math and reading scores, whether it be through fewer or lower-quality community resources, poor nutrition, inadequate cognitive stimulation in the home or at ECE, or other factors. Fourth, there are data limitations. The contextual data collected by the Census are averaged across 2007 to 2011, while the ECLS-B data were collected between 2001 and 2008, with this study focusing on data from 2004 and 2005. We argue that neighborhood poverty is relatively consistent over such a short period time; however, to the degree it changes quickly (i.e., yearly), our results may be problematic. Fifth, neighborhood poverty is merely one measure of neighborhood disadvantage, although we lacked data on other characteristics. Finally, due to attrition and missing data resulting from merging in the contextual data sources, we included a subsample of the total ECLS-B sample, limiting the generalizability of our findings.

In sum, this study suggests that neighborhood poverty may be an important factor in children's school readiness for children in households above the poverty line. Findings have implications for place-based policy strategies to address poverty, such as the Obama Administration's recent Promise Zones effort. Specifically, policies that target families in high-

poverty neighborhoods with additional early childhood resources may be effective in promoting readiness at Kindergarten entry. More research is needed to better understanding the potential causal directions and mechanisms underlying these relationships and the policies that may effectively promote school readiness in areas of concentrated disadvantage.

References

Barnett, W. S. (2011). Effectiveness of early educational intervention. *Science*, *333*(6045), 975–8. doi:10.1126/science.1204534

Belsky, J., Melhuish, E., Barnes, J., Leyland, A. H., & Romaniuk, H. (2006). Effects of Sure Start local programmes on children and families: early findings from a quasi-experimental, cross sectional study. *BMJ (Clinical Research Ed.)*, *332*(7556), 1476. doi:10.1136/bmj.38853.451748.2F

Bhattacharya, J., Currie, J., & Haider, S. (2004). Poverty, food insecurity, and nutritional outcomes in children and adults. *Journal of Health Economics*, *23*(4), 839–862. doi:10.1016/j.jhealeco.2003.12.008

Bitler, M. P., Hoynes, H. W., Currie, J., Duncan, G., Farkas, G., Feller, A., … Farran, D. (2014). *Experimental Evidence on Distributional Effects of Head Start* (No. 20434). Retrieved from http://www.nber.org/papers/w20434.pdf

Bradley, R. H., McKelvey, L. M., & Whiteside-Mansell, L. (2011). Does the quality of stimulation and support in the home environment moderate the effect of early education programs? *Child Development*, *82*(6), 2110–22. doi:10.1111/j.1467-8624.2011.01659.x

Bronfenbrenner, U., & Morris, P. A. (1998). The ecology of developmental processes. In W. Damon & R. M. Lerner (Eds.), *Handbook of child psychology: Vol. 1 Theoretical models of human development* (Vol. 5th editio, pp. 993–1028). New York: Wiley.

Bronfenbrenner, U., & Morris, P. A. (2006). The Bioecological Model of Human Development. In W. Damon & R. Lerner (Eds.), *Handbook of child psychology: Vol. 1 Theoretical models of human development* (Sixth., pp. 793–838). New York: John Wiley & Sons Ltd.

Brooks-Gunn, J., & Duncan, G. J. (2000). Family poverty, welfare reform, and child development. *Child Development*, *71*, 188–196.

Carpiano, R. M., Lloyd, J. E. V, & Hertzman, C. (2009). Concentrated affluence, concentrated disadvantage, and children's readiness for school: a population-based, multi-level investigation. *Social Science & Medicine*, *69*(3), 420–32. doi:10.1016/j.socscimed.2009.05.028

Committee on Integrating the Science of Early Childhood Development Youth, and Families, B. on C., & Press, N. A. (2000). *From neurons to neighborhoods: The science of early childhood programs*. (J. P. Shonkoff & D. A. Phillips, Eds.). Washington, DC: Board on Children, Youth, and Families, National Academies of Science.

Cooper, B. R., & Lanza, S. T. (2014). Who Benefits Most From Head Start? Using Latent Class Moderation to Examine Differential Treatment Effects. *Child Development*, *00*(0), n/a–n/a. doi:10.1111/cdev.12278

Deming, D. (2009). Early Childhood Intervention and Life-Cycle Skill Development: Evidence from Head Start. *American Economic Journal: Applied Economics*, *1*(3), 111–134. doi:10.1257/app.1.3.111

Duncan, G. J., Kalil, A., & Ziol-Guest, K. M. (2013). Early childhood poverty and adult achievement , employment and health. *Family Matters*, *93*, 27–36.

Duncan, G. J., Magnuson, K., Kalil, A., & Ziol-Guest, K. (2011). The Importance of Early Childhood Poverty. *Social Indicators Research*, *108*(1), 87–98. doi:10.1007/s11205-011-9867-9

Duncan, G. J., Morris, P. A., & Rodrigues, C. (2011). Does money really matter? Estimating the impacts of family income on young children's achievement with data from random-assignment experiments. *Developmental Psychology*, *47*(5), 1263–1279.

Dupere, V., Leventhal, T., Crosnoe, R., & Dion, E. (2010). Understanding the Positive Role of Neighborhood Socioeconomic Advantage in Achievement: The Contribution of the Home, Child Care, and School Environments. *Developmental Psychology*, *46*(5), 1227–1244. Retrieved from http://ovidsp.ovid.com.proxyau.wrlc.org/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=ovftl&AN=00063061-201009000-00017

Evans, G. W. (2003). A multimethodological analysis of cumulative risk and allostatic load among rural children. *Developmental Psychology*, *39*(5), 924–933. doi:10.1037/0012-1649.39.5.924

Evans, G. W., Wells, N. M., & Schamberg, M. A. (2010). The Role of the Environment in Socio-economic status and obesity. In *Obesity Prevention: The Role of Brian and Society on Individual Behavior*. Elsevier Inc.

Frech, A., & Kimbro, R. (2011). Maternal Mental Health, Neighborhood Characteristics, and Time Investments in Children. *Journal of Marriage and Family*, *73*(3), 605–620. doi:1 0. 1 1 86/1479-5868-3- 1 9. Doi: 10.1016/s0140-6736(06)69075-2 10.1146/annurev.so.18.080192.000311. 10.2307/1129836 10.1016/0272-7358(86)90009-7 10.1111/j.1467-8624.2007.00986.x.2007-04480-00510.1111/j.1467-8624.2007.00986.x 10.1111/j.1467-8624.2007.01117.x 10.1016/s0272-7358(98)00100-7 10.1111/j.1467-8624.2008.01176.x 10.1097/00004583-200112000-00006

Fuller, B., Coonerty, C., Kipnis, F., & Choong, Y. (1997). *An unfair head start: California families face gaps in preschool and child care availability* (p. 200). Berkley, CA.

Gordon, R. A., & Chase-Lansdale, P. L. (2001). Availability of child care in the United States: A description and analysis of data sources. *Demography*, *38*, 299–316.

Gormley, W. T., Gayer, T., Phillips, D., & Dawson, B. (2005). The Effects of Universal Pre-K on Cognitive Development. *Developmental Psychology*, *41*(6), 872–884. doi:10.1037/0012-1649.41.6.872

Hackman, D. a, Betancourt, L. M., Gallop, R., Romer, D., Brodsky, N. L., Hurt, H., & Farah, M. J. (2014). Mapping the trajectory of socioeconomic disparity in working memory: parental and neighborhood factors. *Child Development*, *85*(4), 1433–45. doi:10.1111/cdev.12242

Heckman, J. J. (2000). Policies to foster human capital. *Research in Economics*, *54*(1), 3–56. doi:10.1006/reec.1999.0225

Hutchison, L., Morrissey, T. W., & Burgess, K. (2014). *The Early Achievement and Development Gap*. Washington, DC. Retrieved from http://aspe.hhs.gov/hsp/14/achievementgap/rb_AchievementGap.pdf

Johnson, R. C. (2010). The Health Returns of Education Policies from Preschool to High School and Beyond. *American Economic Review: Papers and Proceedings*, *100*(2), 188–194.

Kessler, R. C., Duncan, G. J., Gennetian, L. A., Katz, L. F., Kling, J. R., Sampson, N. a, … Ludwig, J. (2014). Associations of housing mobility interventions for children in high-poverty neighborhoods with subsequent mental disorders during adolescence. *JAMA : The Journal of the American Medical Association*, *311*(9), 937–48. doi:10.1001/jama.2014.607

Klebanov, P. K., Brooks-Gunn, J., & Duncan, G. J. (1994). Does Neighborhood and Family Poverty Affect Mothers' Parenting , Mental Health , and Social Support? *Journal of Marriage and the Family*, *56*(2), 441–455.

Leventhal, T., & Brooks-Gunn, J. (2000). The Neighborhoods They Live in: The Effects of Neighborhood Residence on Child and Adolescent Outcomes. *Psychological Bulletin*, *126*(2), 309–337. Retrieved from http://ovidsp.ovid.com.proxyau.wrlc.org/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=ovftd&AN=00006823-200003000-00006

McCartney, K., Dearing, E., Taylor, B. a, & Bub, K. L. (2007). Quality Child Care Supports the Achievement of Low-Income Children: Direct and Indirect Pathways Through Caregiving and the Home Environment. *Journal of Applied Developmental Psychology*, *28*(5-6), 411–426. doi:10.1016/j.appdev.2007.06.010

Mccoy, D. C., Connors, M. C., Morris, P. A., Yoshikawa, H., & Friedman-Kraus, A. H. (2014). *Neighborhood economic disadvantage and children's cognitive and social-emotional development: Exploring Head Start classroom quality as a mediating mechanism*. Cambridge, MA.

McCoy, D. C., Roy, A. L., & Sirkman, G. M. (2013). Neighborhood crime and school climate as predictors of elementary school academic quality: a cross-lagged panel analysis. *American Journal of Community Psychology*, *52*(1-2), 128–40. doi:10.1007/s10464-013-9583-5

Mcloyd, V. C. (1990). The Impact of Economic Hardship on Black Families and Children: Psychological Distress , Parenting , and Socioemotional Development. *Child Development*, *61*(2), 311–346.

Miller, E. B., Farkas, G., Vandell, D. L., & Duncan, G. J. (2014). Do the effects of Head Start vary by parental preacademic stimulation? *Child Development*, *85*(4), 1385–400. doi:10.1111/cdev.12233

Morris, P. A., Connors, M., Mccoy, D. C., Yoshikawa, H., Gomez, C., & Aber, J. L. (2013). *Do Head Start impacts vary by neighborhood context?*. New York, NY.

Morrissey, T. W., Hutchison, L., & Burgess, K. (2014). *The short- and long-term impacts of large public early care and education programs*. Washington, DC. Retrieved from http://aspe.hhs.gov/hsp/14/longtermimpact/rb_longTermImpact.pdf

Morrissey, T. W., Hutchison, L., & Winsler, A. (2014). Family income, school attendance, and academic achievement in elementary school. *Developmental Psychology*, *50*(3), 741–53. doi:10.1037/a0033848

Morrissey, T. W., Oellerich, D., Meade, E., Simms, J., & Stock, A. (2013). *Food insecurity and food assistance receipt: Variations by family and neighborhood poverty* (Vol. 2013). Washington, DC.

Murasko, J. E. (2009). Socioeconomic status, height, and obesity in children. *Economics and Human Biology*, *7*(3), 376–386. doi:10.1016/j.ehb.2009.04.004

Network, N. I. of C. H. and H. D. E. C. C. R. (2006). Child care effect sizes for the NICHD Study of Early Child Care and Youth Development. *American Psychologist*, *61*, 99–116.

Nord, M. (2009). *Food Insecurity in Households with Children: Prevalence , Severity , and Household Characteristics*.

Powell, L. M., Slater, S., Mirtcheva, D., Bao, Y., & Chaloupka, F. J. (2007). Food store availability and neighborhood characteristics in the United States. *Preventive Medicine*, *44*(3), 189–195. doi:10.1016/j.ypmed.2006.08.008

Reardon, S. F. (2011). The Widening Academic Achievement Gap Between the Rich and the Poor: New Evidence and Possible Explanations. In G. J. Duncan & R. Murnane (Eds.), *Whither Opportunity? Rising Inequality, Schools, and Children's Life Chances*. New York, NY: Russell Sage Foundation.

Roy, A. L., Mccoy, D. C., & Raver, C. C. (2014). Instability Versus Quality : Residential Mobility, Neighborhood Poverty, and Children' s Self-Regulation. *Developmental Psychology*, *50*(7), 1891–1896.

Rutter, M. (1993). Stress, coping, and development. In N. Garmezy & M. Rutter (Eds.), *Stress, coping and development in children* (pp. 1–41). New York: McGraw-Hill.

Sameroff, A. J., & Chandler, M. J. (1975). Reproductive risk and the continuum of caretaking casualty. In F. D. Horoqitz, M. Hetherington, S. Scarr-Salapatek, & G. Sigel (Eds.), *Review of Child Development Research* (Volume 4., Vol. 4, pp. 187–240). Chicago, IL: University of Chicago Press.

Sampson, R. J. (1997). Neighborhoods and Violent Crime: A Multilevel Study of Collective Efficacy. *Science*, *277*(5328), 918–924. doi:10.1126/science.277.5328.918

Sampson, R. J., Sharkey, P., & Raudenbush, S. W. (2008). Durable effects of concentrated disadvantage on verbal ability among African-American children. *Proceedings of the National Academy of Sciences of the United States of America*, *105*(3), 845–52. doi:10.1073/pnas.0710189104

Sanbonmatsu, L., Kling, J. R., Duncan, G. J., & Brooks-gunn, J. (2006). Neighborhoods and Academic Achievement Results from the Moving to Opportunity Experiment. *Journal of Human Resources*, *2*(X).

Sanbonmatsu, L., Ludwig, J., Katz, L. F., Gennetian, L., Duncan, G. J., Kessler, R., … Lindau, S. T. (2011). *Moving to Opportunity for Fair Housing Demonstration Program: Final impacts evaluation*. U.S. Department of Housing and Urban Development, Office of Policy Development and Research. Retrieved from http://isites.harvard.edu/fs/docs/icb.topic964076.files/mto_final_exec_summary.pdf

Sharkey, P., & Elwert, F. (2011). The Legacy of Disadvantage : Multigenerational Neighborhood Effects on Cognitive Ability. *American Journal of Sociology*, *116*(6), 1934–1981.

Shonkoff, J. P., & Garner, A. S. (2012). The lifelong effects of early childhood adversity and toxic stress. *Pediatrics*, *129*(1), e232–46. doi:10.1542/peds.2011-2663

Small, M. L., & Stark, L. (2005). Are Poor Neighborhoods Resource Deprived? A Case Study of Childcare Centers in New York. *Social Science Quarterly*, *86*(s1), 1013–1036. doi:10.1111/j.0038-4941.2005.00334.x

U.S. Department of Health and Human Services, A. for C. and F. (2010). *Head Start Impact Study, Final Report*. Washington, DC. Retrieved from http://www.acf.hhs.gov/sites/default/files/opre/hs_impact_study_final.pdf

Vandell, D. L., Belsky, J., Burchinal, M., Steinberg, L., Vandergrift, N., & Network, N. E. C. C. R. (2010). Do Effects of Early Child Care Extend to Age 15 Years? Results From the NICHD Study of Early Child Care and Youth Development. *Child Development*, *81*(3), 737–756. doi:10.1111/j.1467-8624.2010.01431.x

Watamura, S. E., Phillips, D. A., Morrissey, T. W., McCartney, K., & Bub, K. (2011). Double Jeopardy: Poorer Social-Emotional Outcomes for Children in the NICHD SECCYD Experiencing Home and Child-Care Environments That Confer Risk. *Child Development*, *82*(1), 48–65. doi:10.1111/j.1467-8624.2010.01540.x

Weiland, C., & Yoshikawa, H. (2013). Impacts of a prekindergarten program on children's mathematics, language, literacy, executive function, and emotional skills. *Child Development*, *84*(6), 2112–30. doi:10.1111/cdev.12099

Wodtke, G. T., Harding, D. J., & Elwert, F. (2011). Neighborhood Effects in Temporal Perspective. *American Sociological Review*, *76*(5), 713–736. doi:10.1177/0003122411420816

Yoshikawa, H., Weiland, C., Brooks-Gunn, J., Burchinal, M. R., Espinosa, L. M., Gormley, W. T., … Brooks-gunn, J. (2013). *Investing in Our Future : The Evidence Base on Preschool Education Investing in Our Future : The Evidence Base on Preschool Education*. Washington, DC. Retrieved from http://www.srcd.org/sites/default/files/documents/washington/mb_2013_10_16_investing_in_children.pdf

Table 1. Sample Descriptives by Household and Neighborhood Poverty.

		Household below 100% FPL		Household above 100% FPL		
		Poor neighborhood (N=500,11.5%)	Non-poor neighborhood (N=500, 11.7%)	Poor neighborhood (N=800, 17.6%)	Non-poor neighborhood (N=2,600, 59.2%)	Total (N=4,400, 100%)
Standardized Math Score at Wave 4	mean	-0.41***	-0.31***	0.06***	0.43	0.18
	sd	0.90	0.87	0.88	0.87	0.94
Standardized Reading Score at Wave 4	mean	-0.34***	-0.25***	0.09***	0.45	0.21
	sd	0.86	0.87	0.86	0.92	0.95
Head Start or Center Based Care	mean	0.71**	0.67***	0.73*	0.78	0.75
	sd	0.45	0.47	0.44	0.41	0.43
Head Start	mean	0.42***	0.33***	0.24***	0.08	0.18
	sd	0.49	0.47	0.43	0.28	0.38
Center Based Care	mean	0.34***	0.38***	0.53***	0.71	0.60
	sd	0.47	0.49	0.50	0.45	0.49
Hours in Head Start/Week (in tens of hours)	mean	1.20***	0.96***	0.72***	0.24	0.52
	sd	1.44	1.41	1.28	0.81	1.13
Hours in Center Based Care/Week (in tens of hours)	mean	0.84***	0.93***	1.27***	1.56	1.35
	sd	1.41	1.51	1.56	1.57	1.57
Male	mean	0.54	0.45*	0.49	0.50	0.49
	sd	0.50	0.50	0.50	0.50	0.50
Age of Child in Months	mean	66.29	66.29	66.42	66.41	66.38
	sd	2.98	3.12	3.17	3.15	3.13
White	mean	0.13***	0.30***	0.29***	0.50	0.40
	sd	0.33	0.46	0.46	0.50	0.49
Black	mean	0.41***	0.20***	0.24***	0.08	0.16
	sd	0.49	0.40	0.42	0.27	0.36
Hispanic	mean	0.30***	0.33***	0.26***	0.16	0.21
	sd	0.46	0.47	0.44	0.36	0.41
Other Race	mean	0.16***	0.18***	0.21**	0.26	0.23
	sd	0.37	0.38	0.40	0.44	0.42
Disability	mean	0.16	0.19	0.20*	0.16	0.17
	sd	0.37	0.39	0.40	0.37	0.38
English not primary language	mean	0.25*	0.24	0.22	0.20	0.21
	sd	0.43	0.43	0.41	0.40	0.41
Age of Mother (in 10s of years)	mean	3.06***	3.10***	3.32***	3.54	3.39
	sd	0.73	0.72	0.70	0.65	0.70

Mom Depressed	mean	0.28***	0.25***	0.15	0.14	0.17
	sd	0.45	0.43	0.36	0.34	0.38
Mom Employed Full Time	mean	0.35***	0.35***	0.54**	0.48	0.46
	sd	0.48	0.48	0.50	0.50	0.50
Mom Employed Part Time	mean	0.13***	0.16**	0.16***	0.22	0.19
	sd	0.34	0.37	0.36	0.41	0.39
Married	mean	0.33***	0.39***	0.67***	0.82	0.69
	sd	0.47	0.49	0.47	0.38	0.46
Parent Education Less than HS	mean	0.26***	0.21***	0.08***	0.03	0.09
	sd	0.44	0.40	0.27	0.18	0.28
Parent Education HS Degree	mean	0.44***	0.42***	0.26***	0.14	0.23
	sd	0.50	0.49	0.44	0.34	0.42
Parent Education Some College	mean	0.25	0.29	0.38***	0.29	0.30
	sd	0.43	0.45	0.49	0.45	0.46
Parent Education College +	mean	0.04***	0.08***	0.28***	0.54	0.38
	sd	0.20	0.27	0.45	0.50	0.49
Household Size	mean	5.27***	4.90***	4.58	4.57	4.69
	sd	2.02	1.68	1.43	1.20	1.43
Northeast	mean	0.08***	0.13*	0.15	0.18	0.16
	sd	0.27	0.34	0.36	0.38	0.36
Midwest	mean	0.24	0.24	0.19	0.22	0.22
	sd	0.43	0.43	0.39	0.42	0.42
South	mean	0.46***	0.35	0.41***	0.31	0.35
	sd	0.50	0.48	0.49	0.46	0.48
West	mean	0.23*	0.28	0.25*	0.29	0.27
	sd	0.42	0.45	0.43	0.45	0.45
Urban	mean	0.68*	0.61***	0.67**	0.75	0.71
	sd	0.47	0.49	0.47	0.43	0.45
Suburban	mean	0.13	0.21***	0.13	0.11	0.13
	sd	0.34	0.41	0.33	0.31	0.33
Rural	mean	0.19	0.18	0.21**	0.14	0.16
	sd	0.39	0.38	0.40	0.35	0.37
Owns a Care	mean	0.69***	0.81***	0.94***	0.98	0.92
	sd	0.46	0.40	0.23	0.14	0.27
BSF Standardized 9 month score	mean	0.05	0.09	0.09	0.09	0.08
	sd	1.04	1.01	1.05	1.01	1.02

Notes: A poor neighborhood is a zip code with a poverty rate of 20% or greater. The household above 100% in a non-poor neighborhood category serves as the reference for all comparisons. All sample sizes are rounded to the nearest 50, in accordance with NCES requirements. *** p<0.001, ** p<0.01, * p<0.05

Table 2. Regression Results: Family and Neighborhood Poverty in Preschool and Children's School Readiness.

	Main Effects		Neighborhood Poverty as a Moderator of Household Poverty		Neighborhood Poverty as a Moderator of ECE Attendance	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	Math score (std)	Reading score (std)	Math score (std)	Reading score (std)	Math score (std)	Reading score (std)
	B	*B*	*B*	*B*	*B*	*B*
	(SE)	*(SE)*	*(SE)*	*(SE)*	*(SE)*	*(SE)*
Attended Head Start or other center-based care at wave 3	0.12***	0.15***	0.12***	0.14***	0.15***	0.15***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Lives in high-poverty neighborhood (20%+) at wave 3	-0.09**	-0.11***	-0.14***	-0.16***	-0.03	-0.10+
	(0.03)	(0.03)	(0.04)	(0.04)	(0.06)	(0.06)
Lives in poor household (<100% FPL) at wave 3	-0.19***	-0.18***	-0.25***	-0.24***	-0.19***	-0.18***
	(0.04)	(0.04)	(0.05)	(0.05)	(0.04)	(0.04)
High-poverty neighborhood X poor household at wave 3			0.14*	0.16*		
			(0.06)	(0.06)		
High-poverty neighborhood X Attended Head Start or other center-based care at wave 3					-0.09	-0.01
					(0.06)	(0.06)
Tens of hours per week in Head Start at wave 3	-0.01	-0.00	-0.01	-0.00	-0.01	-0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Tens of hours per week in other center-	0.01	0.03**	0.01	0.03**	0.01	0.03**

based care at wave 3						
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Child is male	-0.06**	-0.14***	-0.06**	-0.14***	-0.06**	-0.14***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Child age in months	0.07***	0.07***	0.07***	0.07***	0.07***	0.07***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Child is White (reference)						
Child is Black	-0.18***	-0.03	-0.18***	-0.03	-0.18***	-0.03
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Child is Hispanic	-0.19***	-0.12**	-0.19***	-0.12**	-0.19***	-0.12**
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Child is other race	0.09*	0.14***	0.09*	0.14***	0.09*	0.14***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Child has a disability	-0.28***	-0.22***	-0.27***	-0.21***	-0.28***	-0.22***
	(0.04)	(0.03)	(0.04)	(0.03)	(0.04)	(0.03)
Child's primary language is not English	0.14***	0.12**	0.15***	0.12**	0.14***	0.12**
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Mother's age (in tens of years) at child's birth	0.04*	0.02	0.04*	0.02	0.04*	0.02
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Mother has moderate/severe depressive symptoms at wave 4	-0.06+	-0.05	-0.06+	-0.05	-0.06+	-0.05
	(0.03)	(0.04)	(0.03)	(0.04)	(0.03)	(0.04)
Mother is not employed (reference)						
Mother is employed 35+ hours/week at wave 4	0.06+	0.04	0.06*	0.04	0.06*	0.04
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Mother is employed less than 35	0.08*	0.03	0.08*	0.03	0.08*	0.03

hours/week at wave 4						
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Mother is married at wave 4	0.13***	0.13***	0.13***	0.13***	0.14***	0.13***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
One or both parents has a college degree (reference)						
Neither parent has a high school degree at wave 4	-0.68***	-0.74***	-0.68***	-0.74***	-0.68***	-0.74***
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
One or both parents has a high school degree at wave 4	-0.44***	-0.47***	-0.44***	-0.47***	-0.44***	-0.47***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
One or both parents had attended some college at wave 4	-0.32***	-0.33***	-0.32***	-0.33***	-0.32***	-0.33***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Household size	-0.05***	-0.07***	-0.05***	-0.07***	-0.05***	-0.07***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Household located in the West (reference)						
Household located in the Northeast	-0.03	-0.06	-0.02	-0.05	-0.03	-0.06
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Household located in the Midwest	0.00	-0.05	0.00	-0.05	0.00	-0.05
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Household located in the South	-0.02	0.07+	-0.02	0.07+	-0.02	0.07+
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Household located in a suburban area (reference)						

Household located in an urban area	0.15***	0.13**	0.14***	0.13**	0.14***	0.13**
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Household located in a rural area	0.07	0.03	0.07	0.03	0.07	0.03
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Household owns 1 or more cars	0.09+	0.09+	0.10+	0.09+	0.09+	0.09+
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Child's Bayley score at wave 1 (std)	0.08***	0.04**	0.07***	0.04**	0.08***	0.04**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Constant	-4.44***	-4.11***	-4.42***	-4.09***	-4.46***	-4.11***
	(0.28)	(0.30)	(0.28)	(0.30)	(0.28)	(0.30)
Observations	4,400	4,350	4,400	4,350	4,400	4,350
R-squared	0.32	0.30	0.33	0.30	0.33	0.30

Notes: All sample sizes are rounded to the nearest 50, in accordance with NCES requirements.
*** p<0.001, ** p<0.01, * p<0.05, + p

Table 3. Regression Results: Ever Experienced Family and Neighborhood Poverty and Children's School Readiness.

	Main Effects		Neighborhood Poverty as a Moderator of Household Poverty		Neighborhood Poverty as a Moderator of ECE Attendance	
	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
	Math score (std)	Reading score (std)	Math score (std)	Reading score (std)	Math score (std)	Reading score (std)
	B	*B*	*B*	*B*	*B*	*B*
	(SE)	*(SE)*	*(SE)*	*(SE)*	*(SE)*	*(SE)*
Ever Head Start or other center-based care before K entry	0.10*	0.11**	0.10*	0.11**	0.12**	0.10*
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)
Ever lived in high-poverty neighborhood (20%+) before K entry[a]	-0.09**	-0.10**	-0.12**	-0.12**	-0.04	-0.12+
	(0.03)	(0.03)	(0.04)	(0.04)	(0.06)	(0.06)
Ever lived in poor household (<100% FPL) before K entry	-0.19***	-0.18***	-0.21***	-0.19***	-0.19***	-0.18***
	(0.03)	(0.03)	(0.04)	(0.04)	(0.03)	(0.03)
High-poverty neighborhood X poor household before K entry			0.07	0.03		
			(0.06)	(0.06)		
High-poverty neighborhood X Attended Head Start or other center-based care before K entry					-0.06	0.02
					(0.07)	(0.07)
Observations	4,400	4,350	4,400	4,350	4,400	4,350
R-squared	0.325	0.299	0.325	0.299	0.325	0.299

Notes: The covariates shown in Table 2 are controlled (results available upon request). All sample sizes are rounded to the nearest 50, in accordance with NCES requirements. [a]Because of the lack of variability in neighborhood poverty over time, this variable is equal to that of lived in a high-poverty neighborhood at wave 3. *** p<0.001, ** p<0.01, * p<0.05, + p<.10

Figure 1. Income ranges by family and neighborhood poverty.

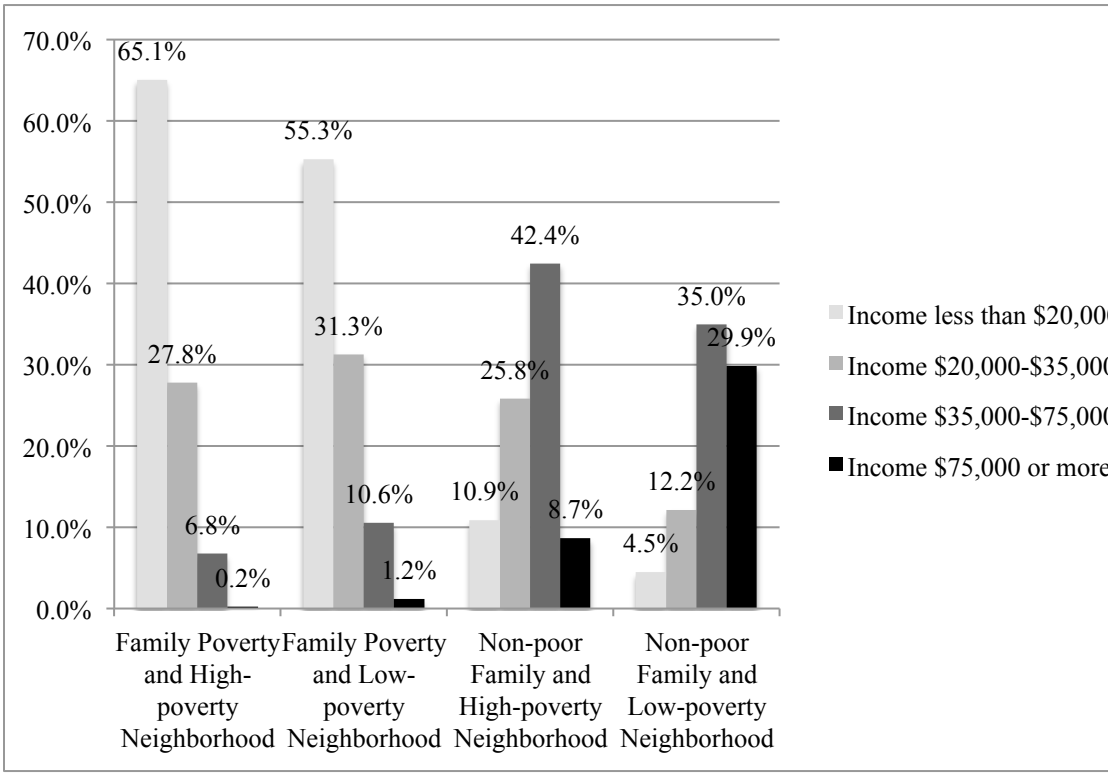

Figure 2. Standardized math and reading scores at kindergarten entry (wave 4) by family and neighborhood poverty.