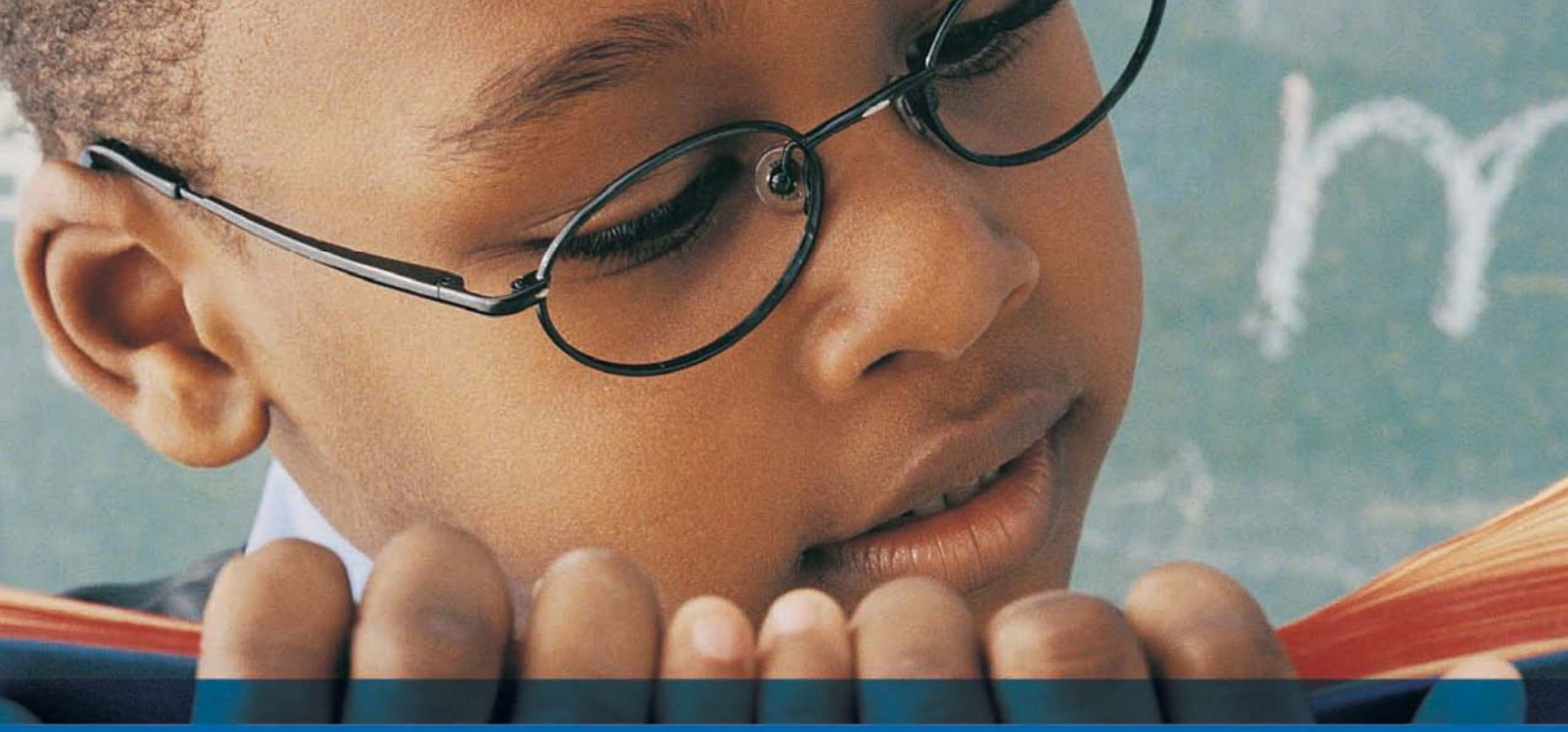

Beyond Free Lunch—Alternative Poverty Measures in Educational Research and Program Evaluation

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A paper prepared for the annual meeting of the
American Educational Research Association, Montreal, Canada, April 11–15, 2005

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The contents of this document were developed under a grant from the United States Department of Education (PR/Award Number R306S000012). The contents, however, do not necessarily represent the policy of the Department of Education, and you should not assume endorsement by the Federal Government.

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Beyond Free Lunch—Alternative Poverty Measures in Educational Research and Program Evaluation

Abstract

Most education studies use a simple and convenient measure of poverty: the percentage of children eligible for free/reduced-price lunch. Although this measure provides the proportion of children coming from disadvantaged backgrounds, it does not capture all dimensions of poverty, such as neighborhood effects.

In the context of a large-scale evaluation, we examine alternative, neighborhood-based measures for poverty (the Dissimilarity Index, the Isolation Index, the poverty level of the school neighborhood, and the percentage of single-parent households with children in the school neighborhood). We investigate the relationship between these indices and the free/reduced-price lunch measure, and then explore the alternative poverty measures' relationship to student achievement by including them as covariates in multilevel regression models. According to our results, school neighborhoods' poverty levels, percentage of single-parent families, and degree of poverty concentration as measured by the Isolation Index are significantly related to student achievement; however, another measure of concentrated poverty, the Dissimilarity Index, is not. In addition, we found separate neighborhood effects for 2000–2001 student achievement, hence confirming results from earlier studies that connect neighborhood effects to educational outcomes (Datcher, 1982; Dornbusch, Ritter, & Steinberg, 1991; Aaronson, 1998).

Beyond Free Lunch—Alternative Poverty Measures in Educational Research and Program Evaluation

Introduction

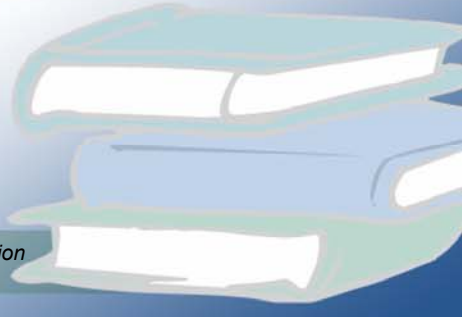
Poverty has long been linked to student achievement and comprehensive school reform (CSR) implementation (Adams, 1994; Grinion, 1999; Cooper, 1998).

Most education studies use the simplest and most convenient measure of poverty: the percentage of a school's students who are eligible for free/reduced-price lunch. Although this measure provides a picture of the proportion of children who come from disadvantaged backgrounds, it also has some problems. First, it does not necessarily capture all relevant dimensions of poverty, such as the effects of concentrated poverty in a school's neighborhood and the neighborhood effects (Aaronson, 1997; Furstenberg & Hughes, 1997). Second, the accuracy of this measure has been questioned because many eligible families do not apply, and some schools give free lunch to all students, regardless of their status. In addition, because children from families that are below 185% of the federal poverty level are eligible for free/reduced-price lunch, the actual median family incomes for two schools, both having 100% student eligibility, can be vastly different.

The objective of this paper is to examine four alternative poverty measures that quantify neighborhood disadvantage. The first measure, the Dissimilarity Index (Massey, Gross, & Eggers, 1990), illustrates the intensity of concentrated poverty by calculating the proportion of poor families that would have to move to achieve an equal distribution of poor families in the school neighborhood. The Isolation Index (Massey & Danton, 1993) measures the extent to which poor families are likely to be in contact only with other poor families. In addition to these poverty-related indices, we created two other poverty measures based on census data: the poverty level of the school neighborhood and the percentage of single-parent households with children in the school neighborhood.

We will first test how closely these indices correlate with the percentage of children eligible for free/reduced-price lunch measure, and then we will explore the extent to which the negative relationship between poverty and student achievement holds when using these alternative poverty measures. In particular, to summarize, we seek answers to the following research questions in our quest to explore the robustness of census-based poverty measures:

- Do the census-based poverty measures correlate with the free/reduced-price lunch measure?
- Are census-based poverty measures negatively correlated to student achievement?
- Are poverty measures significant predictors of student achievement when other factors related to student achievement are controlled for?
- Can neighborhood effects be separated from school-level effects measured by the percentage of students eligible for free/reduced-price lunch?
- How robust are the census-based poverty measures over time?



We explore the first two questions by conducting a simple correlational analysis, and we examine the last three questions by applying two-level hierarchical linear models (HLM).

Theoretical Framework

In this paper, we apply a "neighborhood effects" framework (Duncan, Connell, & Klebanov, 1997; Duncan & Aber, 1997) that hinges upon the notion that the immediate geographic area (i.e. the neighborhood) where a person lives fundamentally molds that individual's life chances: his or her educational, social, and financial future. The consequences of neighborhood effects have been widely studied and connected to school achievement, educational attainment, teenage pregnancy, and dropout rates (Aaronson, 1998; Ainsworth, 2002; Brooks-Gunn, Duncan, Klebanov, & Sealand, 1993; Crowder and South, 2003; Dornbusch, Ritter, & Steinberg, 1991; Duncan, 1994; Garner & Raudenbush, 1991; Jargowsky, 1996; Newman & Harkness, 1999). Neighborhood effects have been measured in numerous ways in these studies, from using individual socioeconomic characteristics to forming complex multidimensional indices. Most importantly, these studies have been able to show a neighborhood effect that is distinct from a family background effect.

Brooks-Gunn et al. (1993) situate neighborhood effects within developmental psychology's concept of ecological models; an individual's development takes place across a series of social and environmental contexts (such as families, schools, and neighborhoods), all of which must be taken into account when examining that individual and his or her development. Researchers have theorized numerous explanations for how neighborhoods affect an individual's development. Collective socialization theories of neighborhood effects focus on the importance of role models and social networks in fostering positive social contributions (Jencks & Mayer, 1990). Brooks-Gunn et al.'s (1993) analysis of neighborhood effects on various developmental outcomes suggested that high poverty neighborhoods' lack of affluent role models was producing more social problems than the presence of economically disadvantaged residents. The authors also found that the relationships between the effects of high poverty neighborhoods and childhood IQ, teenage births, and school dropout rates remained significant even when the analysis controlled for family socioeconomic characteristics. Dornbusch et al. (1991) analyzed data on socioeconomic and racial characteristics of six neighborhoods surrounding San Francisco schools and found that community factors were more important in predicting African-American students' high school achievement than family characteristics were.

Researchers have also theorized numerous explanations for the effects of neighborhoods with highly concentrated poverty levels. Contagion theories emphasize how peer influences spread social problems across neighborhood populations similar to the way in which people's interaction with others spreads contagious diseases (Jencks & Mayer, 1990). Building on these ideas, Crane (1991) posited an "epidemic" theory of spatial poverty. A subset of contagion theory, epidemic theory is based on the notion that in large cities, residents of neighborhoods with extreme or "epidemic" concentrations of poverty and social problems (areas that Crane characterized as "ghettos") are significantly more likely to develop social problems than residents in other poor, minority-dominated neighborhoods. Thus, neighborhood effects not only vary between poor and affluent communities but also between poor and abjectly poor communities. Concentrated poverty is assumed to amplify the effects of individual poverty: neighborhoods with a high concentration of poor individuals and families have a higher concentration of social ills, from unsafe streets to lack of economic opportunity, than more stable, middle class neighborhoods (Altshuler, Morrill, Wolman, & Mitchell, 1999).

In this paper, we focus on both the level and concentration of neighborhood poverty as predictors of student achievement. We assume that poverty measures, especially when based on data from school neighborhoods, serve as appropriate proxies for neighborhood effects related to the neighborhoods' socioeconomic climate. Some of the most commonly mentioned consequences of highly concentrated spatial poverty are:

- **Lack of positive role models**—Theories of collective socialization often examine role models' function in spreading socially positive behavior (Jencks & Mayer, 1990; Dietz, 2000; Wilson, 1987) among disadvantaged communities. With respect to education outcomes, the absence of role models may lower attendance rates, increase dropout rates, and decrease student achievement (Ainsworth, 2002; Crane, 1991).
- **High concentration of nontraditional families**—Single-parent households may have less school involvement and parental supervision (Altshuler et al., 1999). With fewer parents available to watch over, guide, and interact with children, peer influences—including peer pressure toward unfavorable behavior—may have a stronger impact (Duncan, 1994). Studies have indicated that adolescents raised in neighborhoods with large numbers of single-parent households are at greater risk of high school attrition (Flores, 2002) and antisocial behavior due to peer pressure (Steinberg, 1987, cited in Crane, 1991).
- **Lack of economic opportunities**—The need to travel far from one's neighborhood for employment results in increased commuting time and hence less school involvement and parental supervision (Altshuler et al., 1999). The Gautreaux housing experiment in Chicago, which offered a choice for public housing complex residents to move into another public housing complex or into an apartment located in the suburbs, clearly shows the importance of economic opportunities: children of families who moved to suburbs were more likely to be employed and had higher salaries than children of families who decided to move to another public housing complex located in the city.
- **Lack of empowerment**—Wilson (1991) suggests that the high rates of joblessness and the weak connection to the labor force that characterize high poverty neighborhoods result in reduced feelings of empowerment or self-efficacy. Social cognitive theorists have argued that people's perceived self-efficacy, their belief in their ability to achieve goals and to affect events around them, determines the amount of effort and perseverance they will exert in the face of a challenge. Socially and economically marginalized groups living in concentrated poverty tend to feel less empowered to achieve common societal goals, and these feelings of low self-efficacy are reinforced by members of the neighborhood who share similar beliefs (Bandura, 1982, cited in Wilson, 1991). These feelings may cause parents to be less demanding concerning their children's needs and the needs of their children's schools (Orfield, 1998).

Our goal is to explore whether the effects of a neighborhood's poverty level and the degree to which its poverty is spatially concentrated are related to student achievement. Most importantly, as other neighborhood effect studies have done, we will explore whether a neighborhood effect—separate from a family background effect—exists regarding student achievement.

Data

All data related to school characteristics are from the National Center for Education Statistics's Common Core of Data (CCD) database, but the sample of schools is limited to those included in the National Longitudinal Evaluation of Comprehensive School Reform (NLECSR). From all schools included in the study ($N = 649$), we have chosen schools located in seven large urban school districts; we could only include schools in urban areas where population density is high to create alternative census data-based poverty measures. Two of the school districts are located in the South, one in the Northeast, two in the Midwest, and one on the West Coast. In total, the sample for these analyses includes 352 schools.

The data are challenging for exploring the relationship between poverty and student achievement. Schools included in this sample have very poor (measured by eligibility for free/reduced-price lunch) and high minority student populations (see Table 1). In addition, these schools have student achievement scores that are on average about one-third of a standard deviation lower than the mean level of student achievement in their respective school districts. Because the sample is limited to high-poverty, low-achieving schools, the relationship between poverty and student achievement is more difficult to establish than if the sample were to include a range of schools more varied in poverty levels and student achievement. However, these data offer a great opportunity to test the suitability of neighborhood-based poverty measures. First, neighborhood-based measures can be created even if schools have not reported valid free/reduced-price lunch measures. Second, these measures are likely to be less skewed than the free/reduced-price lunch measure. Third, we assume that neighborhood effects related to spatially concentrated poverty not only magnify the effect of student-level or family poverty but also have their own negative effect on student achievement. The schools in this sample with high-poverty student populations are often located in high-poverty neighborhoods, which allows us to test this hypothesis.

Table 1. Descriptive Statistics

Variable	Mean	Std.	*N*	Nmiss	Min.	Max.
Percentage free/reduced-price lunch, 2000	0.845	0.167	280	85	0.000	1.00
Percentage free/reduced-price lunch, 2003	0.824	0.160	359	6	0.000	1.00
Poverty level for school neighborhood	0.272	0.110	352	13	0.023	0.52
Poverty level for school neighborhood	0.117	0.047	352	13	0.022	0.27
Dissimilarity Index	0.233	0.086	352	13	0.038	0.61
Isolation Index	0.323	0.121	352	13	0.041	0.65
Percentage single-parent households	0.176	0.069	352	13	0.025	0.33
Reading achievement, 2000	–0.285	0.801	358	7	–2.239	2.53
Math achievement, 2000	–0.277	0.813	358	7	–3.241	1.91
Reading achievement, 2001	–0.312	0.830	361	4	–2.834	2.34
Math achievement, 2001	–0.276	0.857	347	18	–5.821	2.57
Reading achievement, 2002	–0.284	0.826	360	5	–2.320	2.10
Math achievement, 2002	–0.255	0.826	360	5	–2.672	2.65
Reading achievement, 2003	–0.309	0.830	352	13	–2.621	1.87
Math achievement, 2003	–0.269	0.832	352	13	–2.737	1.97
Percentage minority, 2000	0.940	0.126	362	3	0.189	1.00
School size, 2000	7.487	4.253	362	3	0.910	42.39
Student–teacher ratio, 2000	18.003	3.157	362	3	7.900	28.10
Percentage minority, 2003	0.940	0.151	361	4	0.000	1.00
School size, 2003	7.156	4.430	357	8	0.610	42.79
Student–teacher ratio, 2003	19.423	6.284	353	12	5.100	55.30

The alternative poverty measures used in these analyses are based on 2000 Census data (SFA-3 file). Using ArcGIS™ software by ESRI, we mapped block-group level census data to the areas surrounding the schools included in our seven districts. We defined a school's neighborhood to be the area covered by block groups that are fully or partially within a 1-kilometer radius of the school. The 1-kilometer radius was selected as a result of using two criteria: first, we wanted the school neighborhood to be small enough in size that it can be fully explored by walking; and second, we wanted to avoid having mostly overlapping school neighborhoods.[1] Once the schools' neighborhoods were defined and the census data were mapped onto these neighborhoods, we could create our alternative poverty measures.

[1]We explored the option of using block groups within a 1-mile radius, but the 1-mile radius resulted in too many overlapping school neighborhoods.

School-level achievement data were collected for all schools included in the NLECSR study. We standardized school-level achievement scores within districts to have a mean of 0 and a standard deviation of 1 (*z*-scores). This procedure converts test scores based on different matrices and scales into a common scale.[2] The value in the new score matrix represents a school's position within its district relative to the district mean measured by the unit of district standard deviation, independent of the original scale. Thus, negative *z*-score values for schools' achievement levels indicate that these schools are ranked below the district achievement average, which is set at 0.

Methods

We use simple correlation analysis to find out how similar the percentage of children eligible for free/reduced-price lunch measure is to the alternative, neighborhood-based poverty measures. We expect our alternative measures to be highly correlated with the free/reduced-price lunch measure, but we also expect them to provide more robust school-level poverty measures. That is, these measures will not suffer from the large amount of missing data and inconsistency that stem from school-level differences in processes for reporting the number of free/reduced-price lunch eligible children. Moreover, the suggested neighborhood-based poverty measures more adequately incorporate consequences of geographically concentrated poverty. In addition, we explore the relationships between these poverty indices and school achievement by including the indices as control variables in cross-sectional (HLM) models for school-level achievement during the 2000–2001 school year. We include alternative poverty measures as controls both on their own and together with the free/reduced-price lunch measure to see their relative contributions, allowing us to separate school-level poverty effects from neighborhood-level poverty effects. We hypothesize that a separate neighborhood effect exists, especially for schools located in the most disadvantaged neighborhoods.

The main drawback of census-based poverty measures is the fact that full census data are collected and published only every 10 years. Although neighborhoods do not change overnight, significant changes do take place over the course of 10 years, and the student composition of schools is likely to change even faster. Therefore, it is important to see how well census-based poverty measures work for some years after the collection of census data. We will explore this question by predicting 2003 school-level student achievement using the poverty measures based on 2000 Census data.

[2] During the years we collected school-level achievement data, some states tested only a few grades, and the tested grades vary across states. It becomes arbitrary if we pick any single tested grade as the measure of student achievement. Because the average of tested grades gives better reliability in representing school-level student achievement than any single tested grade, we take the average of grades 2 through 5 as the measure for elementary schools and grades 6 through 8 as the measure for middle schools. When a score was reported in more than one format, we selected a proper one based on our understanding of the score property and the availability of the score across years. Our preference in selection, in order, was scale score, normal curve equivalent (NCE) or percentile rank, and percent passing the lowest proficiency level. The proficiency scores usually are reported for three levels. We used the lowest level for the concern that most CSR schools are low-achieving schools and the largest gain they made should start the improvement at the lowest level. We expect the average *z*-score to be negative, indicating that such schools are ranked below the district average. Test scores used in this study are listed by state in Appendix A.

Dependent Variables

Student achievement is measured at the school level using student achievement data from 1999 to 2003; it is calculated using *z*-scores for both English/language arts and mathematics.

Alternative Poverty Measures

The Dissimilarity and Isolation Indices are calculated based on 2000 Census block-group data for block groups located within a 1-kilometer radius around the school to capture the idea of a school's neighborhood. These poverty indices can be calculated only for schools located in areas with high population density (to calculate these measures, many census block groups need to be included in a school's neighborhood). More specifically, the indices are constructed as follows:

Dissimilarity Index

$$D^{jm} = \sum_{i=1}^{N} \frac{t_i \left| p_i - P \right|}{2TP(1-P)}$$

Where t_i = total population of areal subunit (census bloc/tract) *i*
p_i = proportion of poor of areal subunit (census bloc/tract) *i*
T = the population size of the whole geographic area (school neighborhood) *j*
P = proportion of poor of the whole geographic area (school neighborhood) *j*
N = number of areal subunits

Index values range from *0* (no economic segregation) to *1* (complete economic segregation).

The Dissimilarity Index[3] describes what proportion of poor families would have to move to achieve an even socioeconomic distribution throughout a school neighborhood.

The Isolation Index

$$P^{jm} = \sum_{i=1}^{N} \frac{x_i}{X} - \frac{x_i}{t_i}$$

Where: t_i = total population of areal subunit (census bloc) *i*
x_i = poor population of areal subunit (census bloc) *i*
X = the sum of all poor for the whole geographic area (school neighborhood)
N = number of areal subunits

Index values range from *0* (no economic isolation) to *1* (complete economic isolation).

[3] Jargowsky (1996) has suggested replacing the Dissimilarity Index with the Neighborhood Sorting Index when more than two groups are compared to one another. We could not apply the Neighborhood Sorting Index because we did not have enough households in each income bracket to reliably interpolate income distributions for each income bracket.

The Isolation Index describes the extent to which poor persons are likely to be in contact with members of this same group.

As a result, both the Dissimilarity and Isolation Indices, although based on poverty, measure different concepts related to a neighborhood's level of poverty. The small geographical size of a school neighborhood defined for this paper affects the value of these indices, because smaller neighborhoods tend to be more homogeneous than larger ones.[4] In addition, because our sample includes schools that are very high in poverty, it is likely that these schools are located in rather high poverty neighborhoods. Therefore, the values for the Dissimilarity Index may be rather low; that is, it is possible that the school neighborhoods as defined in this paper are homogeneously poor. For the same reason, the values of the Isolation Index may be high. However, the Dissimilarity and Isolation Indices' relationships to school-level student achievement are assumed to be negative: both indices are measures of neighborhoods' concentration of poverty, and we assume that higher levels of concentrated poverty are negatively related to student achievement.

The other neighborhood-based measures of poverty—the schools' neighborhood poverty level and percentage of single-parent households with children—are based on census data for block groups within the school neighborhoods. The poverty level is calculated by dividing the number of poor persons by the number of total persons in the school neighborhood. Similarly, the percentage of single-parent households with children is created by dividing the number of single-parent households with children by the total number of households in the school neighborhood. These two neighborhood-based measures are more similar to the free/reduced-price lunch measure: one is a direct measure of neighborhood poverty while the other is a proxy for childhood poverty/disadvantage.

These alternative poverty measures are compared with the percentage of children eligible for free/reduced-price lunch, which was attained from the CCD database. This database also provided other school-level control variables, including schools' size, percentage of minority students, and student–teacher ratio. A measure of prior school-level student achievement is also included as a control variable.

Statistical Model

To take the multilevel nature of the data into account, we employed HLM methods. HLM estimates the variance of a dependent variable by the levels defined in the model and allows us to estimate the proportion of variance at each defined level. The model includes two levels: school and school district. The school district level is added in the model to correct for correlated school-level error terms, but due to the small number of districts included in the analysis, we do not include any district-level variables. Thus our model can be described as follows:

School-Level Model

$$\eta_{ij} = \beta_{0j} + \beta_{1j} SchoolSize_{ij} + \beta_{2j} Pct\_Minority_{ij} + \beta_{3j} Pct\_Freelunch_{ij} / CensusPovertyMeasure + \beta_{4j} S - TRatio + \beta_{5j} PreviosuAchievement + \varepsilon_{ij}$$

[4] These indices are also sensitive to the level of census data used in calculation. In general, the smaller the units used, the larger the values of these indices. Therefore, Dissimilarity and Isolation Indices used in different studies should be compared to each other only if the same level of census data was used in creation of the indices.

Where:

η_{ij} is the level of mathematics or reading achievement (z-score) in 2000 or 2003
$SchoolSize_{ij}$ is the number of students enrolled x 100 in 2000 or 2003
$Pct\_Minority_{ij}$ is the percentage of minority students enrolled in 2000 or 2003
$Pct\_Freelunch_{ij}$ is the percentage of free/reduced-price lunch students enrolled in 2000 or 2003
CensusPovertyMeasure is a poverty measure based on 2000 Census data
S–TRatio is the student–teacher ratio in 2000 or 2003
ε_{ij} is the normally distributed error term with a mean of 0

District-Level Model

$$\begin{bmatrix} \beta_{0j} \\ \beta_{1j} \\ . \\ . \\ \beta_{7j} \end{bmatrix} = \begin{bmatrix} \gamma_{00} \\ \gamma_{10} \\ . \\ . \\ \gamma_{70} \end{bmatrix} + \begin{bmatrix} \nu_{0j} \\ 0 \\ . \\ . \\ 0 \end{bmatrix}$$

Where:

γ_{00} is the average intercept
ν_{0j} is the normally distributed error term with a mean of 0

Results

Correlations Among Poverty Measures and Between Poverty Measures and Student Achievement

The free/reduced-price lunch measure is significantly and highly correlated with some, but not all, of the poverty measures based on census data (see Table 2). The poverty level for a school's neighborhood, the percentage of single-parent households, and the Isolation Index are all positively and highly significantly correlated with the free/reduced-price lunch variable (0.46, 0.33, and 0.44 levels of correlation, respectively). The Dissimilarity Index is negatively and surprisingly weakly related to the free/reduced-price lunch measure as well as all other poverty measures except the Isolation Index. The significance levels of these correlations are also rather low. These insignificant results, as was mentioned earlier, may be due to our definition of a school neighborhood and the sample of schools included in our data set.

Table 2 also shows how the correlations between free/reduced-price lunch and the census-based poverty measures do decrease rapidly between 2000 and 2003, implying that schools change considerably over a short period of time.[5] The degree of correlation between the neighborhood poverty level (2000) and free/reduced-price lunch measure (2003), although still highly significant, has dropped from 0.46 to 0.29.

[5] Neighborhoods could change in a similar way, but we cannot assess short-term change in the neighborhoods due to a lack of data.

Similarly, the level of correlation between the free/reduced-price lunch measure and the percentage of single-parent households and Isolation Index decreases, from 0.33 to 0.13 and from 0.44 to 0.30, respectively. These correlations remain highly significant, except for the correlation between the percentage of single-parent households and the percentage of free/reduced-price lunch.

Although the level and significance of correlations among the different poverty measures fluctuate over time, the relationship of these measures to school-level student achievement is surprisingly robust. All poverty measures, except the Dissimilarity Index, are negatively and very significantly related to student achievement, both in 2000 and 2003. In addition, all poverty measures (except the Dissimilarity Index) have about the same level of correlation with student achievement, the Isolation Index constantly being a bit more closely correlated with it than the other measures. These results, together with the fact that the correlations between the free/reduced-price lunch measure and the census-based poverty measures fluctuate over time, offer weak support for the idea that the census-based poverty measures are capturing a different dimension of poverty.

Our preliminary correlation analysis offers encouraging results: three out of four poverty measures based on census data have negative, significant, and as high correlations with student achievement as the free/reduced-price lunch measure. In addition, although most of the alternative poverty measures are relatively highly correlated with the free/reduced-price lunch measure, it seems plausible that these measures capture a different dimension of poverty.

Table 2. Correlations Between Poverty and Student Achievement Measures

Free lunch, 2000	1.000	0.659	0.458	–0.137	0.438	0.331	–0.301	–0.315	–0.281	–0.291	–0.252	–0.242	–0.238	–0.259
	_	(.0001)	(.0001)	(0.024)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)
Free lunch, 2003	0.659	1.000	0.288	–0.077	0.301	0.131	–0.296	–0.334	–0.292	–0.295	–0.195	–0.280	–0.275	–0.343
	(.0001)	_	(.0001)	(0.149)	(.0001)	(0.015)	(.0001)	(.0001)	(.0001)	(.0001)	(0.001)	(.0001)	(.0001)	(.0001)
Neighborhood poverty	0.458	0.288	1.000	–0.248	0.908	0.703	–0.331	–0.326	–0.285	–0.344	–0.271	–0.345	–0.258	–0.317
	(.0001)	(.0001)	_	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)
Dissimilarity Index	–0.137	–0.077	–0.248	1.000	0.111	–0.140	–0.028	–0.042	–0.016	–0.038	–0.046	0.028	–0.039	0.009
	(0.024)	(0.149)	(.0001)	_	(0.037)	(0.009)	(0.609)	(0.442)	(0.774)	(0.480)	(0.396)	(0.602)	(0.478)	(0.862)
Isolation Index	0.438	0.301	0.908	0.111	1.000	0.666	–0.363	–0.358	–0.308	–0.372	–0.310	–0.362	–0.304	–0.341
	(.0001)	(.0001)	(.0001)	(0.037)	_	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)
Percentage single-parent households	0.331	0.131	0.703	–0.140	0.666	1.000	–0.381	–0.352	–0.335	–0.344	–0.297	–0.326	–0.234	–0.267
	(.0001)	(0.015)	(.0001)	(0.009)	(.0001)	_	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)
Math achievement, 2000	–0.301	–0.296	–0.331	–0.028	–0.363	–0.381	1.000	0.757	0.630	0.653	0.633	0.654	0.544	0.550
	(.0001)	(.0001)	(.0001)	(0.609)	(.0001)	(.0001)	_	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)
Reading achievement, 2000	–0.315	–0.334	–0.326	–0.042	–0.358	–0.352	0.757	1.000	0.618	0.709	0.570	0.676	0.535	0.623
	(.0001)	(.0001)	(.0001)	(0.442)	(.0001)	(.0001)	(.0001)	_	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)
Math achievement, 2001	–0.281	–0.292	–0.285	–0.016	–0.308	–0.335	0.630	0.618	1.000	0.771	0.641	0.661	0.612	0.554
	(.0001)	(.0001)	(.0001)	(0.774)	(.0001)	(.0001)	(.0001)	(.0001)	_	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)
Reading achievement, 2001	–0.291	–0.295	–0.344	–0.038	–0.372	–0.344	0.653	0.709	0.771	1.000	0.608	0.703	0.599	0.661
	(.0001)	(.0001)	(.0001)	(0.480)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	_	(.0001)	(.0001)	(.0001)	(.0001)
Math achievement, 2002	–0.252	–0.195	–0.271	–0.046	–0.310	–0.297	0.633	0.570	0.641	0.608	1.000	0.768	0.706	0.631
	(.0001)	(0.000)	(.0001)	(0.396)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	_	(.0001)	(.0001)	(.0001)

Table 2. Correlations Between Poverty and Student Achievement Measures (continued)

Reading achievement, 2002	–0.242	–0.280	–0.345	0.028	–0.362	–0.326	0.654	0.676	0.661	0.703	0.768	1.000	0.682	0.753
	(.0001)	(.0001)	(.0001)	(0.602)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	_	(.0001)	(.0001)
Math achievement, 2003	–0.238	–0.275	–0.258	–0.039	–0.304	–0.234	0.544	0.535	0.612	0.599	0.706	0.682	1.000	0.781
	(.0001)	(.0001)	(.0001)	(0.478)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	_	(.0001)
Reading achievement, 2003	–0.259	–0.343	–0.317	0.009	–0.341	–0.267	0.550	0.623	0.554	0.661	0.631	0.753	0.781	1.000
	(.0001)	(.0001)	(.0001)	(0.862)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	_

Do Neighborhood Poverty Measures Matter in Addition to the Free/Reduced-Price Lunch Measure?

We tested whether the census-based poverty measures work by running two different sets of HLM statistical models. The first set of models tests whether poverty measures significantly predict the level of student achievement in 2000 while controlling for other student achievement-related factors. The second set of models aims to separate individual/family poverty from neighborhood effects by including the free/reduced-price lunch measure together with the census-based poverty measure in the HLM.

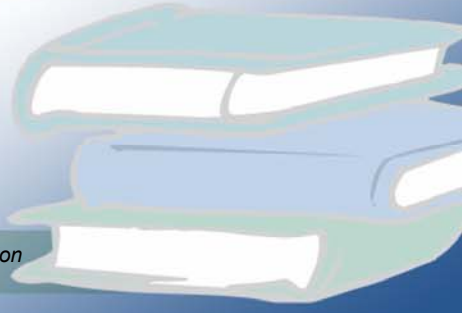
Does Poverty Predict Student Achievement?

We ran separate achievement models for mathematics and reading because poverty measures work very differently with respect to mathematics and reading achievement: none of the poverty measures significantly predict the level of mathematics achievement in 2000–2001 (see Table 3). The level of mathematics achievement is consistently predicted by schools' percentage of minority students, size, student–teacher ratio, and previous mathematics achievement. School size and percentage of minority students are negatively related to the level of mathematics achievement, while student–teacher ratio is positively, but weakly, related to mathematics achievement. As discussed before, the fact that the sample includes only high poverty schools with high percentages of minority students and low achievement makes establishing the relationship between poverty measures and student achievement more challenging. However, it is also possible that mathematics is learned in a different way from reading, making poverty a less relevant predictor regarding mathematics achievement.[6]

The results for reading achievement are quite surprising. The free/reduced-price lunch measure is not significantly related to reading achievement, while the school neighborhood poverty level, the Isolation Index, and the percentage of single-parent households are negatively and significantly related to schools' level of reading achievement. What could cause the census-based poverty measures to outperform the free/reduced-price lunch measure? Again, one plausible explanation is the sample of schools used in the analysis. There is less variation in the free/reduced-price lunch measure than in the census-based poverty measures. Alternatively, the census-based poverty measures more adequately capture the dimensions of poverty related to low achievement: less parental time and oversight, lack of positive role models, and lack of parent advocacy.

When the free/reduced-price lunch measure is added to the models including census-based poverty measures, the results are very similar (see Table 4). The free/reduced-price lunch measure remains insignificant, while the percentage of single-parent households, the level of poverty in the school neighborhood, and the Isolation Index are still negatively and significantly related to student achievement in reading in 2000–2001. The census-based poverty measures seem to more robustly capture the level of poverty (neighborhood poverty level/single-parent households) than the free/reduced-price lunch measure. In addition, the Isolation Index measuring poverty concentration also proves to be important regarding student achievement. These results confirm our hunch that neighborhood-based poverty measures are better able to predict achievement, especially in a sample that includes only high poverty

[6] It is possible that regardless of the poverty level, mathematics is less often taught in the home environment. In other words, teaching mathematics is more or less left to teachers.



schools. These results also demonstrate the importance of neighborhood effects: the neighborhoods in which children live may not only amplify the effects of family poverty but also have an independent effect on student achievement. In particular, spatially concentrated poverty has been connected to several social ills, from lack of role models and parental oversight to nonexistent economic opportunities.

Table 3. Models Predicting Student Achievement in 2000

	Math achievement				Reading achievement			
	Estimate	StdErr	T	Prob	Estimate	StdErr	T	Prob
Model 1: Free/reduced-price lunch								
Intercept	–0.068	0.0461	–1.49	0.1375	–0.083	0.040	–2.06	0.0405
Percentage free/reduced-price lunch	–0.045	0.0521	–0.87	0.3867	–0.054	0.044	–1.22	0.225
Percentage minority	–0.111	0.0486	–2.29	0.0225	–0.046	0.042	–1.11	0.2681
School size	–0.110	0.0516	–2.14	0.0336	–0.076	0.045	–1.71	0.0889
Student–teacher ratio	0.084	0.0556	1.51	0.1324	0.066	0.047	1.38	0.1672
Previous achievement	0.551	0.0565	9.75	<.0001	0.667	0.049	13.43	<.0001
Model 2: School neighborhood poverty level								
Intercept	–0.121	0.0481	–2.51	0.0342	–0.117	0.036	–3.2	0.0114
School neighborhood poverty level	–0.013	0.0424	–0.31	0.7531	–0.085	0.035	–2.42	0.0161
Percentage minority	–0.147	0.0434	–3.4	0.0008	–0.065	0.036	–1.78	0.076
School size	–0.074	0.0443	–1.69	0.0921	–0.054	0.037	–1.46	0.147
Student–teacher ratio	0.086	0.0466	1.84	0.0661	0.045	0.039	1.17	0.2436
Previous achievement	0.572	0.0516	11.09	<.0001	0.6526	0.044	14.81	<.0001
Model 3: Dissimilarity Index								
Intercept	–0.121	0.0471	–2.57	0.0335	–0.113	0.033	–3.41	0.0007
Dissimilarity Index	–0.013	0.0375	–0.35	0.7291	–0.022	0.031	–0.71	0.4766
Percentage minority	–0.153	0.0406	–3.78	0.0002	–0.096	0.033	–2.89	0.0041
School size	–0.076	0.0446	–1.71	0.0894	–0.054	0.037	–1.47	0.143
Student–teacher ratio	0.087	0.0461	1.9	0.0588	0.060	0.037	1.6	0.1109
Previous achievement	0.576	0.0503	11.44	<.0001	0.675	0.042	15.72	<.0001

Table 3. Models Predicting Student Achievement in 2000 (continued)

	Math achievement				Reading achievement			
	Estimate	StdErr	T	Prob	Estimate	StdErr	T	Prob
Model 4: Isolation Index								
Intercept	–0.121	0.0476	–2.55	0.0321	–0.121	0.032	–3.67	0.0003
Isolation Index	–0.019	0.0421	–0.46	0.6445	–0.096	0.035	–2.74	0.0065
Percentage minority	–0.146	0.0429	–3.4	0.0008	–0.064	0.034	–1.85	0.0657
School size	–0.076	0.0444	–1.71	0.0882	–0.058	0.036	–1.62	0.1066
Student–teacher ratio	0.084	0.0465	1.82	0.0692	0.042	0.037	1.13	0.2577
Previous achievement	0.570	0.0520	10.96	<.0001	0.646	0.043	14.73	<.0001
Model 5: Percentage single-parent households								
Intercept	–0.125	0.0455	–2.76	0.0243	–0.118	0.035	–3.33	0.0108
Percentage single-parent households	–0.060	0.0436	–1.39	0.1661	–0.076	0.036	–2.09	0.0388
Percentage minority	–0.132	0.0429	–3.09	0.0023	–0.070	0.036	–1.94	0.0538
School size	–0.077	0.0440	–1.77	0.0788	–0.056	0.037	–1.51	0.1336
Student–teacher ratio	0.088	0.0460	1.92	0.0566	0.063	0.038	1.64	0.1013
Previous achievement	0.559	0.0516	10.84	<.0001	0.654	0.044	14.85	<.0001

Table 4. Models Including Both Percentage Free/Reduced-Price Lunch and Census-Based Poverty Measures, 2000

	Math achievement				Reading achievement			
	Estimate	StdErr	T	Prob	Estimate	StdErr	T	Prob
Model 1: Free/reduced-price lunch and school neighborhood poverty level								
Intercept	–0.079	0.047	–1.69	0.0927	–0.080	0.040	–1.99	0.0473
Percentage free/reduced-price lunch	–0.035	0.054	–0.66	0.511	–0.016	0.045	–0.35	0.7259
School neighborhood poverty	–0.037	0.056	–0.67	0.5052	–0.113	0.046	–2.45	0.0149
Percentage minority	–0.107	0.051	–2.07	0.0395	–0.026	0.043	–0.62	0.5372
School size	–0.124	0.052	–2.36	0.0192	–0.097	0.044	–2.18	0.0304
Student–teacher ratio	0.101	0.059	1.71	0.0887	0.062	0.049	1.27	0.2038
Previous achievement	0.525	0.060	8.72	<.0001	0.623	0.050	12.23	<.0001

Table 4. Models Including Both Percent Free/Reduced-Price Lunch and Census-Based Poverty Measures, 2000 (continued)

	Math achievement				Reading achievement			
	Estimate	StdErr	T	Prob	Estimate	StdErr	T	Prob
Model 2: Free/reduced-price lunch and Dissimilarity Index								
Intercept	–0.077	0.047	–1.62	0.1059	–0.078	0.041	–1.92	0.0561
Percentage free/reduced-price lunch	–0.041	0.053	–0.79	0.432	–0.043	0.045	–0.97	0.3343
Dissimilarity Index	0.0080	0.052	0.15	0.8786	–0.010	0.044	–0.23	0.8221
Percentage minority	–0.116	0.049	–2.36	0.0192	–0.055	0.042	–1.33	0.184
School size	–0.120	0.053	–2.27	0.0242	–0.093	0.045	–2.05	0.041
Student–teacher ratio	0.106	0.058	1.81	0.0711	0.080	0.049	1.63	0.1033
Previous achievement	0.646	0.050	12.73	<.0001	0.535	0.058	9.19	<.0001
Model 3: Free/reduced-price lunch and Isolation Index								
Intercept	–0.082	0.047	–1.74	0.0836	–0.089	0.040	–2.22	0.0273
Percentage free/reduced-price lunch	–0.037	0.053	–0.69	0.4917	–0.018	0.045	–0.4	0.6878
Isolation Index	–0.038	0.060	–0.64	0.5212	–0.129	0.049	–2.6	0.0097
Percentage minority	–0.107	0.051	–2.08	0.0382	–0.025	0.043	–0.58	0.5616
School size	–0.125	0.053	–2.37	0.0187	–0.101	0.044	–2.26	0.0247
Student–teacher ratio	0.101	0.058	1.72	0.0858	0.063	0.048	1.3	0.1954
Previous achievement	0.524	0.060	8.61	<.0001	0.617	0.051	12.04	<.0001
Model 4: Free/reduced-price lunch and percentage of single-parent households								
Intercept	–0.092	0.047	–1.95	0.052	–0.085	0.040	–2.11	0.0362
Percentage free/reduced-price lunch	–0.034	0.052	–0.64	0.5207	–0.033	0.045	–0.74	0.4577
Percentage single-parent households	–0.097	0.054	–1.81	0.0709	–0.073	0.045	–1.62	0.106
Percentage minority	–0.094	0.050	–1.85	0.065	–0.038	0.043	–0.89	0.3746
School size	–0.130	0.052	–2.48	0.0137	–0.098	0.045	–2.18	0.0305
Student–teacher ratio	0.107	0.058	1.84	0.067	0.080	0.048	1.65	0.1005
Previous achievement	0.503	0.060	8.31	<.0001	0.627	0.051	12.12	<.0001

How Stable Is the Relationship Between Neighborhood Poverty Measures and Student Achievement Over Time?

The biggest drawback of the census-based poverty measures is the fact that census data are only collected every 10 years. Neighborhoods and especially schools are likely to undergo considerable changes over 10 years, making census-based poverty measures outdated. Therefore, it is important to start to assess how fast census-based measures lose their predictive power. The latest student achievement data that we have are for the year 2003, which is only a couple of years removed from the census data collection. If the predictive relationship has already disappeared, the census-based measures do not prove very useful in between the census data collections.

The cross-sectional models that predict school-level mathematics and reading achievement show interesting results (see Table 5). The free/reduced-price lunch measure significantly predicts achievement in both mathematics and reading. This is also true for the poverty level in the school neighborhood, but the association is much weaker. The Isolation Index has a significant and negative relationship to achievement, but the percentage of single-parent households has lost its predictive power. In general, the census-based poverty measures that quantify the level of poverty in a school neighborhood are doing less well, while the Isolation Index measuring concentration of poverty continues to have a strong relationship to achievement.

When the free/reduced-price lunch measure is added in the models including census-based poverty measures, it produces a significant result in every model (see Table 6). The poverty level of a school neighborhood has lost its statistical significance, implying that the level of poverty is better captured by the free/reduced-price lunch measure. However, the Isolation Index remains significant, further corroborating the idea that the concentration of poverty in a school neighborhood, in addition to the level of poverty, is an important predictor of student achievement.

Table 5. Models Predicting Student Achievement in 2003

	Math achievement				Reading achievement			
	Estimate	StdErr	tValue	Probt	Estimate	StdErr	tValue	Probt
Model 1: Free/reduced-price lunch								
Intercept	–0.09119	0.06153	–1.48	0.1923	–0.1104	0.03013	–3.66	0.0003
Percentage free/reduced-price lunch	–0.09656	0.03772	–2.56	0.011	–0.123	0.03197	–3.85	0.0001
Percentage minority	–0.06658	0.046	–1.45	0.1487	–0.00548	0.04118	–0.13	0.8943
School size	–0.02087	0.03471	–0.6	0.5484	–0.03979	0.02879	–1.38	0.1679
Student–teacher ratio	–0.1106	0.03026	–3.65	0.0003	–0.02756	0.02864	–0.96	0.3366
Previous achievement	0.6429	0.03926	16.37	<.0001	0.7024	0.0376	18.68	<.0001

Table 5. Models Predicting Student Achievement in 2003 (continued)

	Math achievement				Reading achievement			
	Estimate	StdErr	T	Prob	Estimate	StdErr	T	Prob
Model 2: School neighborhood poverty level								
Intercept	–0.07977	0.06759	–1.18	0.2806	–0.1019	0.04551	–2.24	0.0566
School neighborhood poverty level	–0.06021	0.03354	–1.8	0.0735	–0.057	0.03364	–1.69	0.0911
Percentage minority	–0.06372	0.04633	–1.38	0.1699	–0.03515	0.04474	–0.79	0.4327
School size	–0.02436	0.03522	–0.69	0.4899	–0.0369	0.03268	–1.13	0.2604
Student–teacher ratio	–0.1066	0.03	–3.55	0.0004	–0.02676	0.02951	–0.91	0.3653
Previous achievement	0.652	0.03978	16.39	<.0001	0.6896	0.0399	17.28	<.0001
Model 3: Dissimilarity Index								
Intercept	–0.0785	0.06413	–1.22	0.2655	–0.0972	0.04405	–2.21	0.0611
Dissimilarity Index	–0.0258	0.03184	–0.81	0.4184	–0.02828	0.03135	–0.9	0.3676
Percentage minority	–0.09353	0.0438	–2.14	0.0335	–0.05888	0.04257	–1.38	0.1676
School size	–0.02251	0.03532	–0.64	0.5247	–0.0335	0.03268	–1.02	0.307
Student–teacher ratio	–0.1097	0.03015	–3.64	0.0003	–0.02819	0.02964	–0.95	0.3422
Previous achievement	0.6638	0.0394	16.85	<.0001	0.7096	0.03869	18.34	<.0001
Model 4: Isolation Index								
Intercept	–0.08278	0.06594	–1.26	0.254	–0.1046	0.04409	–2.37	0.0462
Isolation Index	–0.07916	0.03368	–2.35	0.0193	–0.07364	0.03371	–2.18	0.0296
Percentage minority	–0.05716	0.04589	–1.25	0.2138	–0.02882	0.04448	–0.65	0.5175
School size	–0.03119	0.03525	–0.88	0.3773	–0.04253	0.03265	–1.3	0.1946
Student–teacher ratio	–0.1075	0.02988	–3.6	0.0004	–0.02741	0.02943	–0.93	0.3522
Previous achievement	0.6456	0.03987	16.19	<.0001	0.6844	0.03982	17.19	<.0001
Model 5: Percentage single-parent households								
Intercept	–0.08026	0.06943	–1.16	0.2914	–0.09998	0.0471	–2.12	0.0703
Percentage single-parent household	–0.03954	0.03615	–1.09	0.2749	–0.0326	0.03551	–0.92	0.3594
Percentage minority	–0.0726	0.04716	–1.54	0.1246	–0.04433	0.04563	–0.97	0.332
School size	–0.01517	0.03509	–0.43	0.6661	–0.02881	0.03261	–0.88	0.3783
Student–teacher ratio	–0.1093	0.03005	–3.64	0.0003	–0.02885	0.0296	–0.97	0.3304
Previous achievement	0.6574	0.03975	16.54	<.0001	0.6996	0.0394	17.75	<.0001

Table 6. Models Including Both Percent Free/Reduced-Price Lunch and Census-Based Poverty Measures, 2003

	Math achievement				Reading achievement			
	Estimate	StdErr	T	Prob	Estimate	StdErr	T	Prob
Model 1: Free/reduced-price lunch and school neighborhood poverty level								
Intercept	–0.08244	0.05916	–1.39	0.2168	–0.1128	0.03074	–3.67	0.0003
Percentage free/reduced-price lunch	–0.07885	0.03796	–2.08	0.0388	–0.1249	0.03258	–3.83	0.0001
School neighborhood poverty	–0.04559	0.03401	–1.34	0.181	–0.03564	0.03292	–1.08	0.2798
Percentage minority	–0.0419	0.04746	–0.88	0.378	0.000495	0.04294	0.01	0.9908
School size	–0.03204	0.03468	–0.92	0.3569	–0.04597	0.02947	–1.56	0.1197
Student–teacher ratio	–0.1084	0.02987	–3.63	0.0003	–0.02894	0.02869	–1.01	0.3137
Previous achievement	0.6444	0.03986	16.17	<.0001	0.6709	0.03946	17	<.0001
Model 2: Free/reduced-price lunch and Dissimilarity Index								
Intercept	–0.08244	0.05373	–1.53	0.1836	–0.1089	0.03053	–3.57	0.0004
Percentage free/reduced-price lunch	–0.0933	0.03745	–2.49	0.0135	–0.132	0.03233	–4.08	<.0001
Dissimilarity Index	–0.0336	0.03181	–1.06	0.2916	–0.03883	0.02987	–1.3	0.1945
Percentage minority	–0.0601	0.04565	–1.32	0.189	–0.0118	0.04143	–0.28	0.776
School size	–0.03669	0.03458	–1.06	0.2905	–0.04696	0.02943	–1.6	0.1116
Student–teacher ratio	–0.1115	0.02995	–3.72	0.0002	–0.03235	0.02867	–1.13	0.26
Previous achievement	0.6512	0.03957	16.46	<.0001	0.6816	0.03832	17.79	<.0001
Model 3: Free/reduced-price lunch and Isolation Index								
Intercept	–0.0851	0.05823	–1.46	0.1978	–0.1154	0.03069	–3.76	0.0002
Percentage free/reduced-price lunch	–0.06692	0.03404	–1.97	0.0501	–0.05764	0.03339	–1.73	0.0852
Isolation Index	–0.07612	0.0377	–2.02	0.0445	–0.1219	0.03252	–3.75	0.0002
Percentage minority	–0.03491	0.04713	–0.74	0.4594	0.007697	0.04284	0.18	0.8575
School size	–0.03825	0.03474	–1.1	0.2724	–0.05114	0.0296	–1.73	0.085
Student–teacher ratio	–0.109	0.02975	–3.66	0.0003	–0.02982	0.02858	–1.04	0.2976
Previous achievement	0.6382	0.03995	15.98	<.0001	0.6639	0.03951	16.8	<.0001

Table 6. Models Including Both Percent Free/Reduced-Price Lunch and Census-Based Poverty Measures, 2003 (continued)

	Math achievement				Reading achievement			
	Estimate	StdErr	T	Prob	Estimate	StdErr	T	Prob
Model 4: Free/reduced-price lunch and percentage of single-headed households								
Intercept	–0.08269	0.05909	–1.4	0.2186	–0.1114	0.0308	–3.62	0.0003
Percentage free/reduced-price lunch	–0.08561	0.03763	–2.27	0.0238	–0.1305	0.03238	–4.03	<.0001
Percentage single-parent households	–0.02781	0.0362	–0.77	0.4429	–0.02059	0.03211	–0.64	0.5219
Percentage minority	–0.04715	0.04847	–0.97	0.3313	–0.00288	0.04368	–0.07	0.9474
School size	–0.02644	0.0345	–0.77	0.4446	–0.04164	0.02912	–1.43	0.1536
Student–teacher ratio	–0.1103	0.02989	–3.69	0.0003	–0.02983	0.0287	–1.04	0.2993
Previous achievement	0.648	0.03986	16.26	<.0001	0.6754	0.03937	17.15	<.0001

Discussion

The most commonly used poverty measure in education studies is the percentage of a school's students who are eligible for free/reduced-price lunch. This measure is not entirely reliable due to selection bias (some eligible families will not apply), inconsistencies in reporting, and school practices such as universal feeding. But more importantly, this measure does not adequately account for all effects related to poverty, particularly in urban school districts with neighborhoods of concentrated poverty. In these high poverty neighborhoods, the effects of individual and family-level poverty are amplified by the consequences associated with concentrated poverty: lack of positive role models, social norms against mainstream behavior, and lack of economic opportunities, among others.

This paper evaluated alternative census-based poverty measures that at least partially capture the negative effects of concentrated spatial poverty in school neighborhoods and tests whether these measures are related to student achievement. In particular, the Dissimilarity and Isolation Indices are measures of poverty *concentration*, while the school neighborhood's poverty level and percentage of single-parent households are more similar to the free/reduced-price lunch measure, being estimates of the *level* of poverty in the neighborhood and capturing neighborhood effects. These measures are not meant to be sole substitutes for the traditional free/reduced-price lunch measure; rather, they control for another dimension of poverty.

Our results are similar to those found by Datcher (1982), Dornbusch et al. (1991), and Aaronson (1998), confirming that neighborhood factors are important predictors of education outcomes. Particularly, in this

paper, census-based poverty measures that also capture dimensions of neighborhood effects are powerful predictors of student achievement (the exception being the Dissimilarity Index) for years in which census data were collected. When these poverty measures were added to HLM models together with the more traditional free/reduced-price lunch measure, they remained statistically significant while the free/reduced-price lunch measure was statistically insignificant. The poverty measures' effect sizes were also respectable at approximately 0.1 standard deviations. The results calculated with 2003 data show how the relationships between census-based poverty measures and student achievement have weakened, the exception being the Isolation Index, which still significantly predicted both mathematics and reading achievement, with and without the free/reduced-price lunch measure.

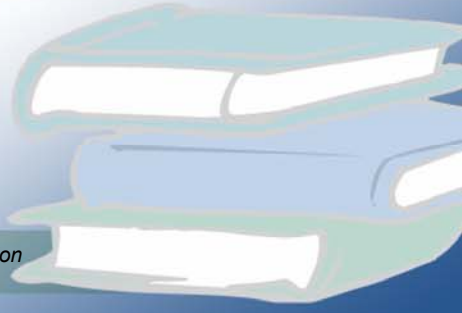
These results imply that in addition to individual or family-level dimensions of poverty, neighborhood poverty effects are important predictors of student achievement. Most children are still enrolled in schools located in their neighborhoods,[7] and the physical neighborhood and social institutions (or lack of social institutions) within them influence parents' and children's choices regarding education. Neighborhoods with negative peer pressure, lack of positive role models and parental oversight, and low levels of public safety tend to be neighborhoods with higher levels of concentrated poverty. These consequences associated with concentrated poverty are likely to amplify the effects of individual or family-level poverty and negatively affect children's lives and social outcomes, including educational attainment and achievement.

Several caveats have to be taken into account when the significance of these results is evaluated. First, the sample of schools used in this paper only includes high-poverty, low-achieving schools. Consequently, establishing a relationship between poverty and student achievement in general is a more difficult task than it would be if the sample were to include schools that were more heterogeneous in terms of poverty and student achievement. Thus, the results we have established here might (or might not) be more profound for another, more heterogeneous set of schools. In other words, the results presented here are not generalizable and might be quite different depending on the sample of schools used. Second, it is clear that the alternative census data-based measures suffer from a serious drawback: census data are collected only every 10 years. Although the results in this paper are very preliminary, it seems to be the case that these measures become outdated rather fast, the sole exception being the Isolation Index. Third, our definition of a school neighborhood affects its values for the Dissimilarity and Isolation Indices. We defined school neighborhood to include all census block groups that are fully or partially included within a 1-kilometer radius from a school. Thus, our neighborhoods are small and more likely to be homogeneous: more specifically, homogeneously poor.

Even when all of these caveats are acknowledged, the preliminary results presented in this paper are encouraging, and the topic deserves additional investigation.

Our plan is to further explore the validity of the census-based poverty measures in a heterogeneous sample that includes all schools in a large, urban school district. We will also have access to student-level achievement scores in addition to our school-level achievement data from 1999 to 2004.

[7] This is likely to change with No Child Left Behind (NCLB) if parents use the opportunity to move their children away from consistently underperforming schools.



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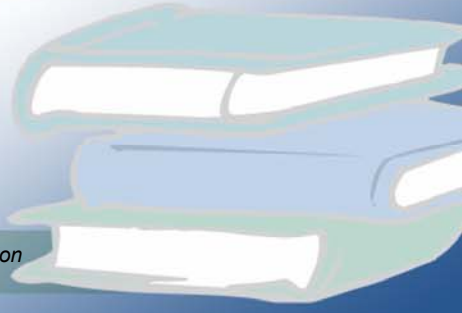

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