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Parsing the Data on Student Achievement in High-Poverty Schools

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PARSING THE DATA ON STUDENT ACHIEVEMENT IN HIGH-POVERTY SCHOOLS

RUSSELL W. RUMBERGER*

The growth of state and federal accountability systems has fueled more interest into research on understanding both the causes and the solutions to the widespread disparities in student achievement. This study utilized data from a longitudinal study of elementary school students to examine trends in student achievement over the first six years of school—from the beginning of kindergarten to the end of fifth grade—and to investigate the effects of attending high-poverty schools on student achievement. The analysis revealed that trends in student achievement varied by socioeconomic status, race, and ethnicity, with narrowing gaps between white and Hispanic students, but widening gaps between white and black students. The study also found that attending high-poverty schools, on average, did not adversely affect student achievement, but attending low-poverty schools significantly improved student achievement.

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INTRODUCTION

Interest in improving student achievement and closing achievement gaps in American education may be at an all-time high. The growth of state and federal accountability systems has put public schools under increased pressure to raise achievement for all students. The Federal No Child Left Behind Act of 2001,¹ for

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1. Pub. L. No. 107-110, 115 Stat. 1425 (2002) (codified at 20 U.S.C. §§ 6301–6578 (Supp. II 2002)).

example, holds schools and districts accountable for demonstrating annual progress in improving the achievement of *all* students, including disabled students, poor students, English learners, and students from major racial and ethnic groups.²

This increased focus on improving student achievement has fueled interest in research on understanding both the causes of and the solutions to the widespread disparities in student achievement. Researchers, of course, have been interested in understanding disparities in student achievement for many years. The most well-known study of student achievement, the so-called Coleman report,³ was undertaken in 1965 to investigate the equality of educational opportunity in America as part of the federal government's commitment to overcoming the detrimental effects of poverty.⁴

Two findings from the Coleman study continue to shape research on student achievement. First, Coleman found that schools had relatively little impact on student achievement compared to the background of the students who attended these schools.⁵ Second, he found that the social composition of the student body was the most important factor affecting student achievement, more important than teacher characteristics or school facilities.⁶ These findings generated widespread debate among scholars,⁷ yet the findings have been replicated in many subsequent studies.⁸

Coleman's finding about the importance of the social composition of schools underscored the movement to integrate America's schools. The country was slow to integrate schools

2. See 20 U.S.C. § 6301 (Supp. II 2002).

3. JAMES S. COLEMAN ET AL., U.S. DEPT' OF HEALTH, EDUC., & WELFARE, EQUALITY OF EDUCATIONAL OPPORTUNITY (1966).

4. See *id.* at 325. For a summary of the research and commentary, see generally JAMES S. COLEMAN, EQUALITY AND ACHIEVEMENT IN EDUCATION 67-164 (1990).

5. COLEMAN ET AL., *supra* note 3, at 325.

6. *Id.*

7. See, e.g., ON EQUALITY OF EDUCATIONAL OPPORTUNITY (Frederick Mosteller & Daniel P. Moynihan eds., 1972) (presenting papers from a yearlong Harvard University seminar that raised methodological questions about the sampling procedures, survey response rates, and some of the measures used in the analysis); Debra Viadero, *Race Report's Influence Felt 40 Years Later*, EDUC. WK., June 21, 2006, <http://www.edweek.org/ew/articles/2006/06/21/41coleman.h25.html?qs=Coleman> (recounting various scholarly viewpoints on the Coleman report, including its impact and weaknesses).

8. See, e.g., Christopher Jencks & Susan E. Mayer, *The Social Consequences of Growing Up in a Poor Neighborhood*, in INNER-CITY POVERTY IN THE UNITED STATES 111, 138-46 (Laurence E. Lynn, Jr. & Michael G.H. McGeary eds., 1990); Russell W. Rumberger & Gregory J. Palardy, *Multilevel Models for School Effectiveness Research*, in HANDBOOK OF QUANTITATIVE METHODOLOGY FOR THE SOCIAL SCIENCES 235, 241-48 (David W. Kaplan ed., 2004).

following the 1954 landmark case of *Brown v. Board of Education*,⁹ but federal legislation and activist courts during the 1960s and 1970s helped to increase racial integration, especially in Southern schools.¹⁰ In the last twenty years, however, these trends have been reversed, resulting in increased segregation.¹¹ Nationwide, more than 70% of all black and Latino students in the United States attended predominantly minority schools in 2000, a higher percentage than thirty years earlier.¹²

Racial and ethnic segregation is closely tied to socioeconomic segregation because blacks and Latinos have much higher poverty rates than other racial and ethnic groups. In 2004, almost one-third of all black and Latino children under the age of eighteen were living in poverty, compared to 14% of white children.¹³ Thus, not only are black and Latino children more likely to be poor, they are also more likely to attend schools with other poor children. In 2000, the average black or Latino student attended a school in which over 44% of students were poor, whereas the average white student attended a school in which 19% of the students were poor.¹⁴

To the extent that both individual poverty and school poverty affect academic achievement, black and Hispanic students are doubly disadvantaged. Some recent data suggest this is indeed the case among elementary school students. Data from the fourth-grade results of the 2003 National Assessment of Educational Progress not only showed that poor students had lower math achievement than students who were not poor, but also that both poor and non-poor students had lower achievement in high-poverty schools.¹⁵ In fact,

9. 347 U.S. 483 (1954) (holding that separate schools for black and white students were inherently unequal and deprived the students of their equal protection rights); CHARLES J. OGLETREE, JR., *ALL DELIBERATE SPEED: REFLECTIONS ON THE FIRST HALF CENTURY OF BROWN V. BOARD OF EDUCATION* 125–34 (2004) (describing the slow implementation of *Brown* by the states in the years following the decision).

10. See ERICA FRANKENBERG ET AL., CIVIL RIGHTS PROJECT, HARVARD UNIV., *A MULTIRACIAL SOCIETY WITH SEGREGATED SCHOOLS: ARE WE LOSING THE DREAM?* 30–46 (2003), available at <http://www.civilrightsproject.harvard.edu/research/reseg03/AreWeLosingtheDream.pdf>.

11. See *id.*

12. *Id.* at 31.

13. NAT'L CTR. FOR EDUC. STATISTICS, U.S. DEP'T OF EDUC., *DIGEST OF EDUCATION STATISTICS* 2005, at 39–40 (2006), available at http://nces.ed.gov/pubs2006/2006030_1.pdf.

14. FRANKENBERG ET AL., *supra* note 10, at 35.

15. See NAT'L CTR. FOR EDUC. STATISTICS, U.S. DEP'T OF EDUC., *THE CONDITION OF EDUCATION* 2003, at 33 (2003), available at <http://nces.ed.gov/pubs2003/2003067.pdf>.

non-poor students attending high-poverty schools had lower achievement than poor students attending low-poverty schools.¹⁶

These findings are suggestive only because they account for differences in initial achievement levels of students when they first enter school. Research has demonstrated that students vary greatly in their initial levels of “school readiness” when they enter kindergarten.¹⁷ Moreover, student background characteristics vary widely among schools.¹⁸ As a result, observed differences in student achievement among schools may reflect differences in background characteristics of students rather than differences in the effects of schools themselves.

This study investigates the effects of attending high-poverty schools on student achievement. It utilizes a longitudinal study of a national sample of elementary school students to examine trends in student achievement over the first six years of school—from the beginning of kindergarten to the end of fifth grade. It examines differences in these trends related to socioeconomic status, race, and ethnicity. It also examines differences in these trends related to the concentration of poor and low-income students in schools. Finally, it examines the extent to which the concentration of poor and low-income students affects student achievement in fifth grade.

I. PREVIOUS RESEARCH

Researchers have developed a voluminous body of literature on the determinants of student achievement since the publication of the Coleman report in 1966.¹⁹ This research has identified a wide array of

16. *See id.*

17. *See* VALERIE E. LEE & DAVID T. BURKAM, INEQUALITY AT THE STARTING GATE: SOCIAL BACKGROUND DIFFERENCES IN ACHIEVEMENT AS CHILDREN BEGIN SCHOOL 23–45 (2002); RUSSELL W. RUMBERGER & LOAN TRAN, PRESCHOOL PARTICIPATION AND THE COGNITIVE AND SOCIAL DEVELOPMENT OF LANGUAGE MINORITY STUDENTS 25–48 (2006), available at http://www.lmri.ucsb.edu/publications/06_rumberger-tran.pdf.

18. LEE & BURKAM, *supra* note 17, at 63–77.

19. *See generally* THE BLACK-WHITE TEST SCORE GAP (Christopher Jencks & Meredith Phillips eds., 1998) (presenting papers that examine trends and explanations of the black-white achievement gap); RICHARD ROTHSTEIN, CLASS AND SCHOOLS: USING SOCIAL, ECONOMIC, AND EDUCATIONAL REFORM TO CLOSE THE BLACK-WHITE ACHIEVEMENT GAP (2004) (examining the nature of the black-white achievement gap and alternative solutions to closing it); STEPHAN THERNSTROM & ABIGAIL THERNSTROM, NO EXCUSES: CLOSING THE RACIAL GAP IN LEARNING (2003) (reviewing evidence on the racial achievement gap and school-based solutions to closing it); George Farkas, *Racial Disparities and Discrimination in Education: What Do We Know, How Do We Know It, and What Do We Need To Know?*, 105 TCHRS. C. REC. 1119 (2003) (examining the role of discrimination in explaining racial differences in

factors that contribute to educational achievement. Although many in number, these factors vary along two primary dimensions.

First, they vary with respect to whether they focus on the attributes of individual students or the attributes of the three primary settings in which these students live: families, schools, and communities.²⁰ Although student achievement is clearly the result of individual attitudes, behaviors, and experiences, these individual attributes are shaped by the institutional settings in which people live.²¹ One challenge, therefore, is to determine the extent to which the attributes of individuals versus the attributes of institutional settings explain educational outcomes. Addressing this challenge is important not only to better understand achievement differences, but also to help determine where policy interventions should be targeted. If individual attributes, such as ability and motivation, can largely explain educational outcomes, then policies should largely focus on altering the attributes of individual students and their families. If, however, attributes of schools, such as the quality of the teachers and educational programs, can largely explain educational outcomes, then policies should largely focus on altering the attributes of schools.

In the largest study of student achievement ever undertaken, Coleman found that schools accounted for only 5% to 38% of the total variation in student test scores among different grade levels, ethnic groups, and regions of the country.²² Since that time, virtually every study of school effectiveness has confirmed that most of the variation in student achievement is attributable to differences among students and their families, rather than differences among schools.²³ Yet despite the common understanding that the Coleman report and subsequent studies show that schools do not make a significant difference, research clearly demonstrates that schools can still have a

achievement); Jaekyung Lee, *Racial and Ethnic Achievement Gap Trends: Reversing the Progress Toward Equity?*, EDUC. RESEARCHER, Jan.–Feb. 2002, at 3, 3–12 (analyzing recent trends in racial and ethnic achievement gap and various factors that explain it).

20. See, e.g., COMM. ON INTEGRATING THE SCI. OF EARLY CHILDHOOD DEV., NAT'L RESEARCH COUNCIL & INST. OF MED., FROM NEURONS TO NEIGHBORHOODS: THE SCIENCE OF EARLY CHILDHOOD DEVELOPMENT 222–87 (2000) [hereinafter FROM NEURONS TO NEIGHBORHOODS] (arguing that contextual factors have strong influences on student development); PANEL ON HIGH-RISK YOUTH, NAT'L RESEARCH COUNCIL, LOSING GENERATION: ADOLESCENTS IN HIGH RISK SETTINGS 1 (1993) (arguing that high-risk settings are the primary source of poor student outcomes).

21. See FROM NEURONS TO NEIGHBORHOODS, *supra* note 20, at 222–87.

22. COLEMAN, *supra* note 4, at 77.

23. Rumberger & Palardy, *supra* note 8, at 241.

powerful effect on student achievement.²⁴ For example, one recent study found that students learn twice as much in the highest-performing high schools compared to the lowest-performing high schools.²⁵ A more reasonable conclusion from existing research is that student achievement results both from the actions and attributes of individuals, and from the actions and attributes of their families, schools, and communities.

Second, the factors on education achievement vary with respect to the types of attributes they identify. Although a wide array of specific attributes has been identified, they primarily are of two types. The first type concerns material resources. Many researchers have argued that the major factor that explains differences in student achievement is the disparity in material resources and conditions that exists among students, their families, and their schools.²⁶ For example, research has consistently found that socioeconomic status—a measure of parental education and family income, or family resources—is often the single most powerful predictor of student achievement.²⁷ School resources have also been shown to affect student achievement,²⁸ although there is considerable controversy over whether financial resources matter or simply human resources, such as the quality of teachers.²⁹ Because racial and ethnic minority students are more likely to live in families and attend schools with

24. See Russell W. Rumberger & Gregory J. Palardy, *Test Scores, Dropout Rates, and Transfer Rates as Alternative Indicators of High School Performance*, 42 AM. EDUC. RES. J. 3, 3–42 (2005).

25. Russell W. Rumberger & Gregory J. Palardy, *Does Segregation Still Matter? The Impact of Student Composition on Academic Achievement in High School*, 107 TCHRS. C. REC. 1999, 2010–11 (2005).

26. See, e.g., ROTHSTEIN, *supra* note 19, at 51–59.

27. JULIAN R. BETTS ET AL., EQUAL RESOURCES, EQUAL OUTCOMES? THE DISTRIBUTION OF SCHOOL RESOURCES AND STUDENT ACHIEVEMENT IN CALIFORNIA 202 (2000); Guang Guo & Kathleen M. Harris, *The Mechanisms Mediating the Effects of Poverty on Children's Intellectual Development*, 37 DEMOGRAPHY 431, 442 (2000).

28. BETTS ET AL., *supra* note 27, at 171–204; Rumberger & Palardy, *supra* note 8, at 244.

29. See generally Eric A. Hanushek, *Assessing the Effects of School Resources on Student Performance: An Update*, 19 EDUC. EVALUATION & POL'Y ANALYSIS 141, 141–64 (1997) (reviewing existing studies that conclude there is little relationship between school resources and student achievement); Larry V. Hedges et al., *Does Money Matter? A Meta-Analysis of Studies of the Effects of Differential School Inputs on Student Outcomes*, EDUC. RESEARCHER, Apr. 1994, at 5, 5–14 (finding a positive relationship between school resources and student achievement while using different techniques than Hanushek).

fewer resources, these differences also contribute to differences in student achievement.³⁰

The second category of attributes that contribute to student achievement are attitudes and behaviors of students, families, and school personnel. Research has found that, among students, social and academic-related behaviors—sometimes referred to as social and academic engagement—are strongly related to student achievement in early elementary school.³¹ Research has also found that parental beliefs and practices—sometimes referred to as parenting style—are related to student achievement and help explain the relationship between family resources (socioeconomic status) and achievement.³² And research has demonstrated that within schools, teachers' beliefs and instructional practices are related to student achievement.³³

Differences in the relative importance of material resources versus attitudes and behaviors also have important implications for policy. If material resources are most important in affecting student achievement, then policies should be aimed at improving the material resources of students and the settings in which they live—their families, schools, and communities. If, however, attitudes and behaviors matter most, then policies should be aimed at improving the attitudes and behaviors of students, their parents, and school personnel.

30. See BETTS ET AL., *supra* note 27, at 190–201; Patricia Gándara et al., *English Learners in California Schools: Unequal Resources, Unequal Outcomes*, 11 EDUC. POL'Y ANALYSIS ARCHIVES 1, 8–10, 25–36 (2003), available at <http://epaa.asu.edu/epaa/v11n36/v11n36.pdf>.

31. See, e.g., Megan M. McClelland et al., *Children at Risk for Early Academic Problems: The Role of Learning-Related Social Skills*, 15 EARLY CHILDHOOD RES. Q. 307, 307–29 (2000); Marcelo M. Suarez-Orozco & Carola E. Suarez-Orozco, *The Cultural Patterning of Achievement Motivation: A Comparison of Mexican, Mexican Immigrant, Mexican American, and Non-Latino White American Students*, in CALIFORNIA'S IMMIGRANT CHILDREN: THEORY, RESEARCH, AND IMPLICATIONS FOR EDUCATIONAL POLICY 161, 161–90 (Rubén G. Rumbaut & Wayne A. Cornelius eds., 1995); Mara Welsh et al., *Linkages Between Children's Social and Academic Competence: A Longitudinal Analysis*, 39 J. SCH. PSYCHOL. 463, 463–82 (2001).

32. See Ronald Gallimore & Claude Goldenberg, *Analyzing Cultural Models and Settings To Connect Minority Achievement and School Improvement Research*, 36 EDUC. PSYCHOLOGIST 45, 45–56 (2001); Guo & Harris, *supra* note 27, at 442.

33. See John Schacter & Yeow M. Thum, *Paying for High- and Low-Quality Teaching*, 23 ECON. EDUC. REV. 411, 411–30 (2004); Yange Xue & Samuel J. Meisels, *Early Literacy Instruction and Learning in Kindergarten: Evidence from the Early Childhood Longitudinal Study—Kindergarten Class of 1998–1999*, 41 AM. EDUC. RES. J. 191, 210–12 (2004).

II. THE PRESENT STUDY

This study investigates student achievement in high-poverty schools. The study uses data from the Early Childhood Longitudinal Study of the Kindergarten Class of 1998–99 (“ECLS-K”), a national sample of about 20,000 kindergarteners who entered about 1,000 public and private schools in the fall of 1998.³⁴ The ECLS-K data provide measures of students’ academic, social, and physical development as they progress through elementary school and extensive data on their backgrounds as well as the characteristics of their families, teachers, and schools.³⁵ Data were collected in the fall and spring of kindergarten (in the fall for a subset of the sample), in the spring of first grade, in the spring of third grade, and in the spring of fifth grade.³⁶ This study is based on a subsample of 9,726 students from the original study who were followed through the end of fifth grade and for whom comprehensive student, parent, teacher, and school data are available. Because this study provides a weighting variable that compensates for differences in sample selection and response rates, the data can be used to estimate student achievement rates nationally.

The primary measure of achievement used in this study is a direct assessment of students’ mathematics abilities, which were assessed through untimed, one-on-one, computer-assisted interviews by trained field workers. Mathematics was used because a sizeable portion of kindergarten students were not proficient in English; because a majority of these students were Spanish-speaking, a Spanish version of the mathematics assessment was provided for these students.

Measures of student achievement, as well as key background measures, such as socioeconomic status, were normalized so that the mean score for the entire population of kindergartners was zero and the standard deviation was one. This method allows easy comparisons among different groups and different assessments using a common metric—standard deviation—that is sometimes referred to as effect size (“ES”).³⁷ Although there are no absolute standards for

34. NAT’L CTR. FOR EDUC. STATISTICS, U.S. DEP’T OF EDUC., EARLY CHILDHOOD LONGITUDINAL STUDY, KINDERGARTEN CLASS OF 1998–99 (ECLS-K), COMBINED USER’S MANUAL FOR THE ECLS-K FIFTH-GRADE DATA FILES AND ELECTRONIC CODEBOOKS 4-4, 4-6 (2006), available at <http://nces.ed.gov/pubs2006/2006032.pdf>.

35. *Id.* at 2-1 to -8.

36. *Id.* at 2-2.

37. JACOB COHEN, STATISTICAL POWER ANALYSIS FOR THE BEHAVIORAL SCIENCES 8–14 (2d ed. 1988) (describing the concept of effect size).

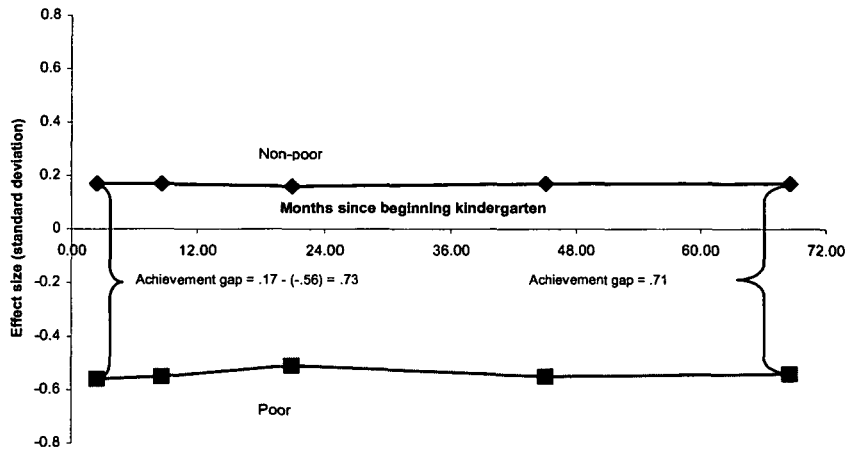
interpreting effect sizes, statistician Jacob Cohen considers an ES of 0.2 standard deviations (“SD”) a small effect, because it corresponds to moving someone from the fiftieth to the fifty-eighth percentile on a normalized distribution; he considers an ES of 0.5 a medium effect, because it corresponds to moving someone from the fiftieth to the sixty-ninth percentile; and he considers an ES of 0.8 to be large, because it corresponds to moving someone from the fiftieth to the seventy-ninth percentile.³⁸

A. Differences in Student Achievement by Demographic Groups

The first part of the study examined differences in student achievement from the beginning of kindergarten to the end of sixth grade. The first comparison, illustrated in Figure 1, was between poor students and non-poor students. In the fall of kindergarten, non-poor students had a mean (normalized) math achievement level of 0.17 SD—that is, their average score was 0.17 standard deviations above the mean for all kindergartners nationally. Poor students had a mean math achievement level of -0.56 SD, or 0.56 standard deviations below the national mean. As a result, the gap in math achievement between non-poor and poor students was 0.73 SD (= 0.17 - [- 0.56]). Based on the criteria discussed above, this represents a large achievement gap. As shown in the figure, the achievement gap in mathematics between non-poor and poor students remained essentially constant over the first six years of school. By the end of sixth grade, the gap was 0.71 SD, almost exactly the same as six years earlier. In other words, there was little change in the math achievement gap between poor and non-poor children during elementary school.

38. *Id.* at 25–26.

Figure 1. Poverty Status and Achievement Gap in Mathematics by Months Since Beginning Kindergarten.

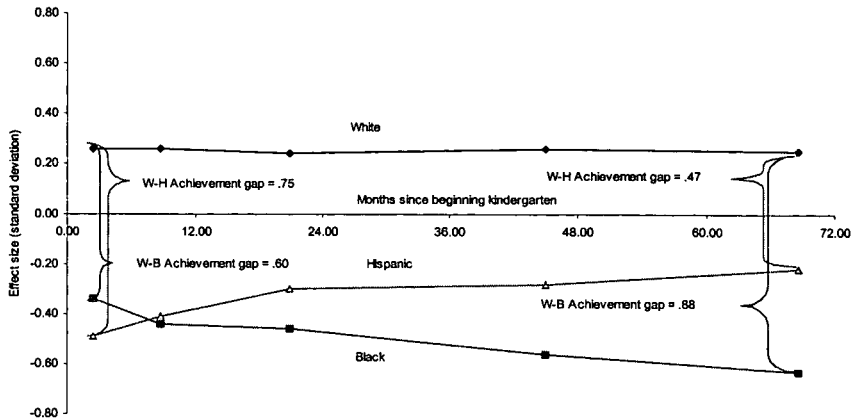


Source: Early Childhood Longitudinal Study of the Kindergarten Class of 1988 (N=9,796).

Note: Results are weighted (weight variable = C1_6FC0) to yield population estimates.

The second comparison, shown in Figure 2, was between three major racial and ethnic groups: whites, blacks, and Hispanics. In the fall of kindergarten, white students had a mean math achievement level of 0.26 SD, or 0.26 standard deviations above the national mean, while black students had a mean math achievement level of -0.34 SD, or 0.34 standard deviations below the national mean. As a result, the white-black achievement gap was 0.60 SD ($= 0.26 - [-0.34]$). Over the six years of elementary school, the gap widened so that by the end of fifth grade, it reached 0.88 SD, or almost 50% higher. In contrast, the white-Hispanic achievement gap narrowed over this period, from 0.75 SD in the fall of kindergarten to 0.47 SD in the spring of fifth grade.

Figure 2. Race and Achievement Gap in Mathematics by Months Since Beginning Kindergarten.



Source: Early Childhood Longitudinal Study of the Kindergarten Class of 1988 (N=9,796).

Note: Results are weighted (weight variable = C1_6FC0) to yield population estimates.

Prior research on the achievement gap, which has focused almost exclusively on white and black students, has also found that the white-black achievement gap tends to widen as students progress in school.³⁹ That research has investigated two primary causes of the widening achievement gap between white and black students: (1) differences in family environments that account not only for initial differences in students' skills, behaviors, and attitudes upon school entry, but also for differences in learning rates during the school year and in the summer; and (2) differences in school environments, including segregated schools and instructional tracking practices, that provide less opportunity to learn, lower teacher expectations, and poorer instruction quality for black students compared to white students.⁴⁰

39. See Meredith Phillips et al., *The Black-White Test Score Gap, in THE BLACK-WHITE TEST SCORE GAP*, *supra* note 19, at 229, 229–72 (discussing the widening of the black-white achievement gap as students advance in grade level). It is not clear why the black-white achievement gap widens over the period addressed in this study while the white-Hispanic achievement gap narrows. The answer to that difficult question is beyond the scope of the present study.

40. Farkas, *supra* note 19, at 1134–35.

What is less clear is why there should be such divergent trends for blacks and Hispanics, when Hispanics begin school at lower levels of achievement than blacks and when both groups are equally disadvantaged in terms of socioeconomic status.⁴¹ The data from this study did show that black and Hispanic students, although similar in socioeconomic background, differed in academic learning behaviors (engagement), which contribute to student learning.⁴² This trend is clearly a focus for future research.

B. Differences in Student Achievement by School Poverty

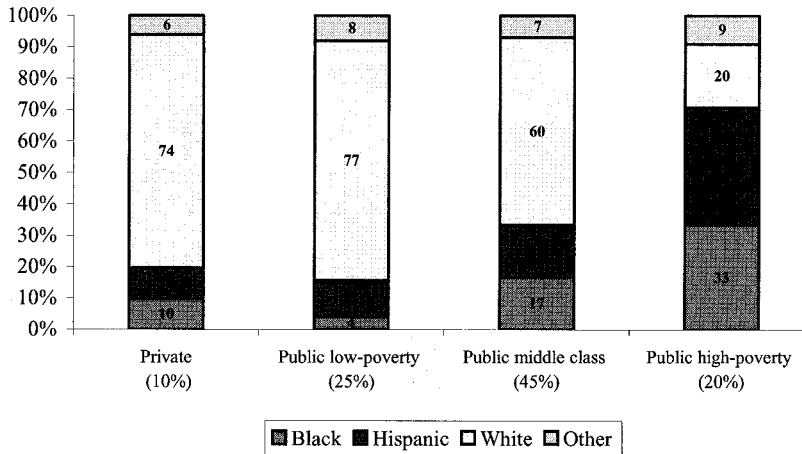
The second part of the study examined differences in achievement by the concentration of low-income and poor students in students' schools. Of particular interest was comparing the achievement of students who attended high-poverty schools in fifth grade with the achievement of students attending other types of schools. In order to conduct this part of the analysis, it was necessary to divide schools by their concentration of poor and low-income students (which was only available for public schools). In this study, schools were classified into four types: (1) private schools, which enrolled 10% of all fifth-grade students; (2) low-poverty public schools (25% or less of the students were poor or low-income), which enrolled 25% of all students; (3) middle class public schools (between 25% and 75% percent of the students were poor or low-income), which enrolled 45% of all fifth-grade students; and (4) high-poverty public schools (more than 75% of the students were poor or low-income), which enrolled 20% of all fifth-grade students.

The racial and social class composition of the schools varied as well, as Figure 3 shows.

41. The mean socioeconomic status at kindergarten entry for white, black, and Hispanic students was 0.26 SD, -0.47 SD, and -0.51 SD, respectively.

42. McClelland et al., *supra* note 31, at 316; Welsh et al., *supra* note 31, at 476. The ECLS-K data contained five measures of social development, which were assessed by the students' kindergarten teachers, including one that measured learning behaviors. The mean score on this measure at kindergarten entry for white, black, and Hispanic students was 0.07 SD, -0.26 SD, and -0.02 SD, respectively.

Figure 3. Ethnic and Racial Composition of Fifth-Grade Elementary Schools by School Poverty Status.



Source: Early Childhood Longitudinal Study of the Kindergarten Class of 1988 (N=9,796).

Note: Results are weighted (weight variable = C1_6FC0) to yield population estimates.

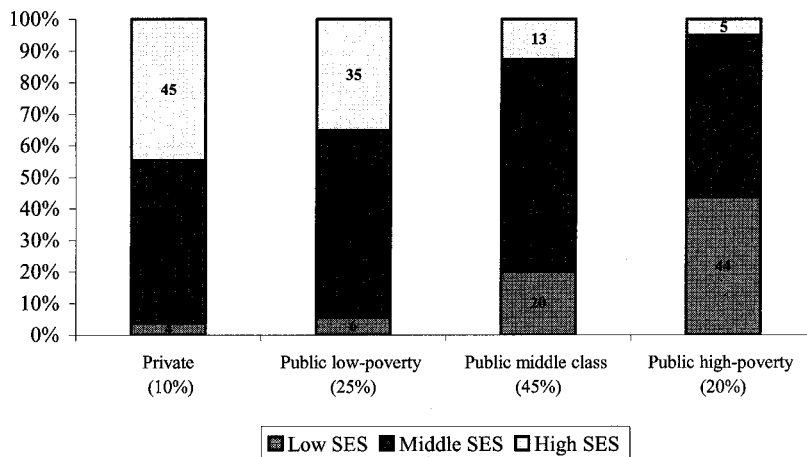
In private schools, 74% of the students were white, while only 20% of the students were black or Hispanic. Low-poverty public schools had an even higher concentration of whites (77%) and a lower concentration of blacks and Hispanics (16%) than private schools. At the other extreme, in high-poverty public schools only 20% of the students were white and 71% of the students were black or Hispanic.

Students in these schools also differed greatly in their socioeconomic backgrounds, as Figure 4 shows. In private schools, 45% of the students were from high socioeconomic status backgrounds and only 4% were from low socioeconomic status backgrounds.⁴³ Low-poverty public schools had a similar profile. At the other extreme, only 5% of students attending high-poverty public

43. High socioeconomic status students represent the top quintile of the socioeconomic status distribution, middle socioeconomic status represents the middle three quintiles, and low socioeconomic status students represent the bottom quintile.

schools came from high socioeconomic status backgrounds and 44% of the students came from low socioeconomic status backgrounds.

Figure 4. Student Socioeconomic Composition of Fifth-Grade Elementary Schools by School Poverty.

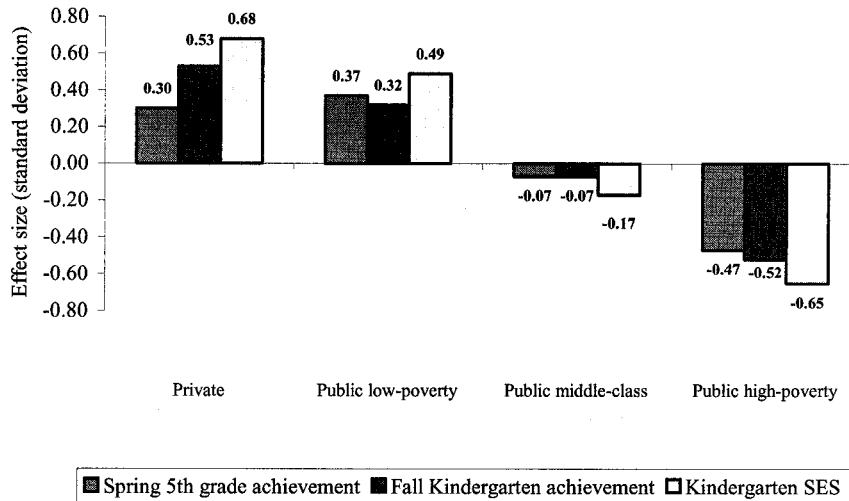


Source: Early Childhood Longitudinal Study of the Kindergarten Class of 1988 (N=9,796).

Note: Results are weighted (weight variable = C1_6FC0) to yield population estimates.

As might be expected, student achievement varied widely by school type. Mean fifth-grade math achievement was 0.30 standard deviations above the national mean for students attending private schools, 0.37 standard deviations above the national mean for students attending low-poverty public schools, -0.07 standard deviations below the national mean for students attending middle class public schools, and -0.47 standard deviations below the national mean for students attending high-poverty public schools. Looked at another way, the gap in achievement between students attending low-poverty public schools and high-poverty public schools was 0.84 SD ($= 0.37 - [-0.47]$). This is considered a large achievement gap.

Figure 5. Observed Student Achievement and Socioeconomic Status by School Poverty.



Source: Early Childhood Longitudinal Study of the Kindergarten Class of 1988 (N=9,796).

Note: Results are weighted (weight variable = C1_6FC0) to yield population estimates.

These observed differences tell us little about their origin. Are they related to the characteristics of the schools or the characteristics of the students and their families? The answer to this question is critical not only to understanding the causes of achievement differences, but also to finding solutions to overcome them. If the differences are largely related to schools, then policy interventions need to focus on reforming schools or redistributing students among schools (desegregation). If differences are largely related to differences in students and their families, then policy interventions need to focus on improving family and community resources and practices.

The data reveal widespread differences among students not only at the end of fifth grade but also at the beginning of kindergarten. The mean math achievement in the fall of kindergarten was 0.53 standard deviations above the national mean for students attending private schools, 0.32 standard deviations above the national mean for students attending low-poverty public schools, 0.07 standard deviations below the national mean for students attending middle

class schools, and 0.52 standard deviations below the national mean for students attending high-poverty schools. In other words, students entered these schools with different levels of initial achievement, which may well account for the observed differences in achievement at the end of fifth grade. Students also entered these schools with different levels of socioeconomic status, which may also contribute to differences in achievement growth between the beginning of kindergarten and the end of fifth grade.

C. *The Effects of Attending a High-Poverty School*

To try to determine the relative effects of student background characteristics and school characteristics on fifth-grade achievement, it is necessary to employ statistical models. One particular type of statistical modeling, known as hierarchical or multilevel modeling, is ideally suited to this task. Multilevel modeling can be used to partition the variance in student achievement into the proportion related to schools and the proportion related to students.⁴⁴ Once this is done, additional models can be used to estimate the effects of student and school characteristics on the respective variance components.⁴⁵ Multilevel modeling is widely used in studies of school effectiveness.⁴⁶

We estimated a series of multilevel models in this study. First, we estimated a model with no predictor variables to partition the variance in student achievement into its student and school components. The results of that model revealed that 25% of the variance in sixth-grade math achievement was attributable to student characteristics and the remaining 75% was attributable to school characteristics, a common finding in these types of multilevel models.⁴⁷

Next, we estimated a second model with a series of dummy variables representing the different types of schools. The results of that analysis confirmed what we found in the descriptive statistics of student achievement by school type reported earlier—that students attending private and low-poverty public schools had much higher achievement than students attending high-poverty public schools. For example, students attending private schools had an estimated achievement of 0.34 standard deviations above the national mean,

44. STEPHEN W. RAUDENBUSH & ANTHONY S. BRYK, *HIERARCHICAL LINEAR MODELS: APPLICATIONS AND DATA ANALYSIS METHODS* 71 (2d ed. 2002).

45. *Id.*

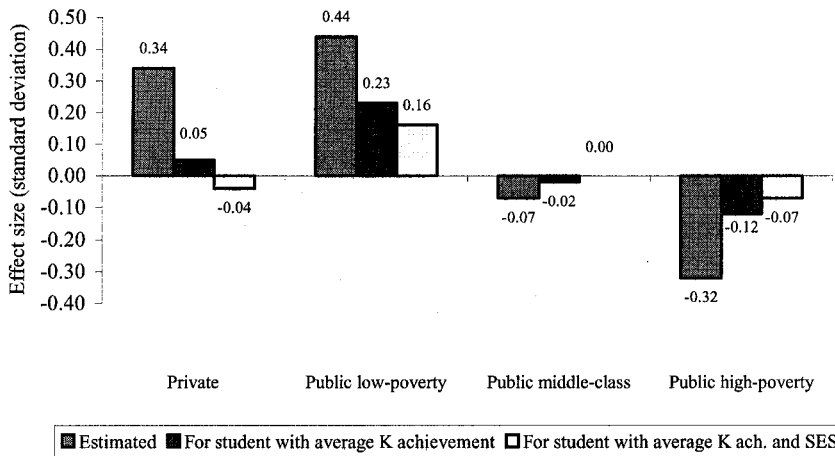
46. Rumberger & Palardy, *supra* note 8, at 240.

47. *Id.* at 241.

students attending low-poverty public schools had achievement levels 0.44 standard deviations above the national mean, students attending middle class schools had achievement levels 0.07 standard deviations below the national mean, and students attending high-poverty public schools had achievement levels 0.32 standard deviations below the national mean.⁴⁸

We then estimated a third model that included a measure of student achievement in the beginning of kindergarten. By including this variable, we are able to generate an estimate of fifth-grade achievement for a student who entered kindergarten with an average achievement level (or a mean of zero). Because students in the four types of schools differed greatly in the level of achievement upon entry to kindergarten, this model provides a way to control for those differences and estimate an achievement level for a student with the same initial achievement level—that of an average student.

Figure 6. Estimated Fifth-Grade Student Math Achievement by School Poverty.



Source: Early Childhood Longitudinal Study of the Kindergarten Class of 1988 (N=9,796).

Note: Results based on a student-weighted (weight variable = C1_6FC0), two-level hierarchical linear model.

48. The estimates from the statistical models shown in Figure 6 differ slightly from the descriptive statistics shown in Figure 5 in part because the samples used to estimate the statistical models are slightly smaller.

The results, shown in the second tier of Figure 6, reveal that much of the observed differences in fifth-grade achievement can be attributed to initial achievement levels six years earlier. For example, while the estimated achievement level of a student attending a private school in fifth grade was 0.34 SD, the estimated fifth-grade achievement level of a student who entered kindergarten with average math achievement was only 0.05 SD, or not much different than the national average. For students attending a low-poverty public school in fifth grade, the estimated achievement level for an average student was 0.23 SD, or about half of the observed level of 0.44 SD. For students attending a high-poverty public school, the estimated achievement level for an average student was -0.12 SD, or about one-third of the observed level of -0.32 SD. In other words, about two-thirds of the low achievement of students attending high-poverty schools can be attributed to differences in the characteristics of the students when they entered kindergarten. As expected, there is little difference in observed and estimated achievement levels of students in middle class schools since those students are generally “average” when they first enter school.

The final model added another predictor variable: students’ socioeconomic status. In this case, the model estimates a fifth-grade achievement level for a student with mean values of both initial math achievement and socioeconomic status in the fall of kindergarten. This model further reduces the estimated differences among students attending the four types of schools. The estimated achievement level for an “average” student attending a low-poverty public school is still 0.16 standard deviations above the national mean, which suggests there is still an educational advantage in attending that type of school. And the estimated achievement level for an “average” student attending a high-poverty public school is -0.07 SD, which is still slightly below the national mean yet almost the same as the estimated achievement for a student attending a private school.⁴⁹

The results of the final model suggest that the sizeable observed differences in fifth-grade achievement associated with the concentration of poor and low-income students in a school are largely

49. A recent national study, based on other data, also found that students in public schools outperformed comparable students in private schools, with noted differences depending on the religious affiliation of the private schools. HENRY BRAUN ET AL., *COMPARING PRIVATE SCHOOLS AND PUBLIC SCHOOLS USING HIERARCHICAL LINEAR MODELING* 11–21 (2006), available at <http://nces.ed.gov/nationsreportcard/pdf/studies/2006461.pdf>.

explained by differences in the achievement levels of students when they first enter school. Does this suggest that schools do not matter very much? Actually, it means that the difference in achievement from attending the “average” high-poverty or low-poverty school doesn’t matter very much. But that does not mean there are not substantial differences that result from attending a particular school, whether it is a private, low-poverty public, or high-poverty public school.

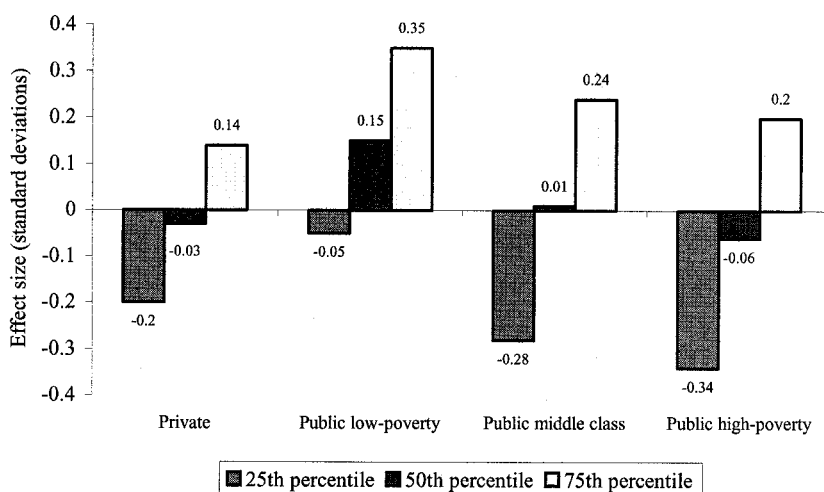
To address this question, one additional statistical analysis was performed: comparing the difference in the *estimated* achievement level for an “average” student and the *observed* level of achievement for an average student in each of the 1,838 schools in the sample.⁵⁰ This difference can be considered the school effect—the school’s effect on achievement beyond the effects of a student’s initial achievement and socioeconomic status. In some cases, the observed level of achievement was higher than the estimated achievement level, which means students in that school were achieving at levels higher than expected. Those schools could be considered “high-performing” schools. In other cases, the observed level of achievement was lower than the estimated achievement level, which means students in that school were achieving at levels lower than expected. Those schools could be considered “low-performing” schools. For each of the four types of schools, we computed how much better or worse each school was from their predicted score at the twenty-fifth, fiftieth, and seventy-fifth percentile of the distribution. The results are shown in Figure 7.

For schools at the fiftieth percentile, the results are similar to those we reported earlier. That is, they show the effects of attending an “average” private, low-poverty public, middle class, or high-poverty public school. But the results show that the predicted achievement for students who attended a high-poverty public school at the seventy-fifth percentile of the distribution—that is, a school in the top quarter of the distribution—would be 0.20 standard deviations above the national mean or higher than a student attending an average (fiftieth percentile) low-poverty public school. On the other hand, the predicted achievement for an average student attending a high-poverty public school in the twenty-fifth percentile of the distribution—that is, a school in the bottom quarter of the

50. This analysis is done by examining the residuals between the estimated achievement levels and the actual achievement levels in the hierarchical linear model. See RAUDENBUSH & BRYK, *supra* note 44, at 152–54.

distribution—would be 0.34 standard deviations below the national mean. Another way of looking at these results is that all high-poverty schools are not created equal; in some of them, students are scoring above the national mean and higher than students attending “average” private or low-poverty public schools. This finding supports the idea of high-performing or beat-the-odds schools that are able to perform at high levels even with disadvantaged students.⁵¹ Similarly, not all private, low-poverty public, or middle class public schools are created equal. Nonetheless, a student’s chances of achieving at a high level are greater in a low-poverty public school than in a high-poverty public school.

Figure 7. Distribution of Predicted Fifth-Grade Student Achievement by School Poverty.



Source: Early Childhood Longitudinal Study of the Kindergarten Class of 1988 (N=9,796).

Note: Results based on an analysis of residuals from a student-weighted (weight variable = C1_6FC0), two-level hierarchical linear model.

51. For a database of case studies of schools in each state, see National Center for Educational Accountability, Publications, http://www.just4kids.org/en/press_room/publications.cfm (last visited Apr. 11, 2007).

CONCLUSION

The increase in student segregation over the last twenty years has renewed interest in determining whether there are adverse effects of attending highly segregated schools. In *Brown*, the United States Supreme Court concluded that segregated schools were “inherently unequal.”⁵² In the landmark 1966 study *Equality of Educational Opportunity*, Coleman found that the social composition of the student body was the single most important school input affecting student achievement.⁵³ Subsequent research has also found that the social composition of the student body affects student achievement, but relatively few studies have examined the effects of socioeconomic composition of students at the elementary level.⁵⁴ Consequently, while there is increased alarm about the growing socioeconomic segregation of students, there is relatively little research that has examined its effects on elementary school achievement.

The current study was able to examine such effects using a national longitudinal study of a sample of almost 10,000 students. The great benefit of this data is that it contains information on the achievement levels and background characteristics of students when they first enter school. As a result, it is possible not only to examine observed differences in achievement among students attending low- and high-poverty public schools, as well as private schools, but also to control for differences in the initial characteristics of students when they first enter school.

The analysis revealed substantial differences in observed achievement levels of students in the fifth grade by the concentration of poor and low-income students. Students attending high-poverty public schools, where more than 75% of the students are poor or low-income, had much lower achievement levels than students who attended low-poverty public schools, where less than 25% of the students were poor or low-income. But after adjusting for differences in student background characteristics, the gap was greatly reduced. Nonetheless, students attending low-poverty public schools retained a significant educational advantage over students attending any other type of school. This finding is consistent with a recent study of high schools that found an educational advantage to students attending

52. *Brown v. Bd. of Educ.*, 347 U.S. 483, 495 (1954).

53. COLEMAN ET AL., *supra* note 3, at 325.

54. See Jencks & Mayer, *supra* note 8, at 144–46; Janet W. Schofield, *Review of Research on School Desegregation's Impact on Elementary and Secondary Students*, in HANDBOOK OF RESEARCH ON MULTICULTURAL EDUCATION 597, 597–616 (James A. Banks ed., 1995).

high socioeconomic status or affluent high schools.⁵⁵ The findings of these two studies suggest a degree of asymmetry with respect to the socioeconomic concentration of students: attending a low socioeconomic status or high-poverty school may not have a large adverse effect on achievement, yet attending a high socioeconomic status or low-poverty school may bestow a meaningful positive effect on achievement.

Although the average effect of attending a high-poverty public school was relatively small, there were substantial differences in the effectiveness of individual schools. Students who attended high-performing, high-poverty schools achieved at levels comparable to students attending average low-poverty schools. This suggests that the concentration of poor or low-income students in the school may be less important than other qualities of the school. It also suggests that a strategy of improving high-poverty schools may be more useful than a strategy of desegregating all high-poverty, high-minority schools.

Of course this conclusion concerns only student achievement. To the extent that schools attend to other student outcomes, such as exposure to and understanding of students who differ by ethnicity, race, and socioeconomic status, then desegregation may still be a worthwhile social policy.

55. Rumberger & Palardy, *supra* note 25, at 2018.