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INEQUALITY AT THE STARTING GATE

**Social Background Differences in
Achievement as Children Begin School**

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CHAPTER 1

Social and academic disadvantage as children enter kindergarten

The aim of this chapter is to provide descriptive information about how children from different social backgrounds score on tests of cognitive status in reading and mathematics as they begin kindergarten. We define social background in terms of children's race, ethnicity, and socioeconomic status (SES).

Details of analyses

The data source. The U.S. Department of Education recently undertook a major new data collection effort that allows us to explore these questions in depth. In 1998 the Department of Education began a nationally representative longitudinal study of young children—the Early Childhood Longitudinal Study, Kindergarten Cohort (ECLS-K)—that starts when they entered kindergarten. In a nationally representative sample of about 1,000 U.S. public and private schools that offer kindergarten, the ECLS-K study team randomly selected about 25 kindergartners in each school. Although the ECLS-K sample of children was meant to be random, children whose understanding of English (the language of testing) was below an established cut score on a brief language screener were not tested.³ All children whose native language was English and those who passed the language screening were tested one-on-one by trained professionals, in a non-timed setting, in reading (or literacy) and mathematics near the beginning of their kindergarten year.

One of each child's parents (typically the mother) also completed an extensive survey, as did his or her kindergarten teacher and an administrator (usually the principal) in the child's school. However, because this study's focus is on children as they begin school, the information used in this report is mostly drawn from over 16,000 children with test scores and whose parents provided full information about race, ethnicity, and socioeconomic status.

In Chapter 4 we explore how children's social background is associated with the quality of the elementary schools they attend. We drew much of our information about school quality from the surveys completed by school administrators and teachers. Although the study is longitudinal, meaning that the same children are tested (and their parents and teachers interviewed) at several timepoints, this report's focus is on "the educational starting gate," that is, when children begin kindergarten. Many of the analyses make use of composite variables that we have constructed from individual items included in the first-wave ECLS-K data file. For readers interested in this level of detail, or those who may wish to make use of these valuable data to replicate or expand on our results, we provide information about the construction of all variables used in this report, including the actual ECLS-K items from which composite measures were constructed, in the Appendix. ECLS-K data are available from the National Center for Education Statistics (NCES) free of charge.⁴

The tests. The ECLS-K reading test in kindergarten assesses children's basic literacy skills, which include recognizing printed words, identifying sounds, vocabulary, word reading, and reading comprehension (NCES 2000a). This test of reading skills administered to kindergartners refers to children's emergent literacy, phonemic knowledge, and language development. These skills include understandings that print has meaning, as well as children's oral language and receptive vocabulary (Snow et al. 1998). The ECLS-K test of mathematical knowledge assesses the operations and processes needed for problem solving and reasoning with numbers. The skills on the ECLS-K battery "include, but are not limited to, the understanding of the properties of numbers, mathematical operations (e.g., addition), and problem solving. They also include understanding the patterns and relationships of numbers, formulating conjectures, and identifying solutions" (NCES 2000a, 11).

The test scores in both reading and mathematics were equated with Item Response Theory (IRT) scaling methods. "IRT uses the pattern of right, wrong, and omitted responses to items actually administered in a test and the difficulty, discriminating ability, and the 'guess-ability' of each item to place each child on a continuous ability scale" (NCES 2000b, 3-2). There is a substantial advantage of using IRT-scaled scores: they estimate the score a child *would have achieved* if all of the items on all forms of the test had been administered. Although not directly relevant to this report, the use of IRT scoring also makes possible the longitudinal measurement of achievement gain over time. This is extremely important in a longitudinal study such as ECLS-K.

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Analysis strategy. The ECLS-K dataset follows a nested structure, with children sampled from the schools they entered. Normally, any multivariate analyses using data with such a structure need to make use of statistical methods that take nesting into account.⁵ However, because our focus is not on what happens to children in school but rather on their status as they present themselves at school entry, we argue that our analyses need not take this multilevel data structure into account. This allows us to use, as our major multivariate analysis method, ordinary least-squares (OLS) regression. Throughout the report our focus is on differences by race, ethnicity, and SES in children's cognitive achievement in reading and mathematics at kindergarten entry. Analyses in Chapters 1 and 2 are descriptive. We make use of multivariate methods (mostly OLS regression) in Chapters 3 and 4.

A major advantage of ECLS-K is that it is nationally representative. However, the sampling design of ECLS-K included intentional over-sampling of children in private schools and Asian/Pacific Islanders. To adjust for this over-sampling and for non-response, our analyses throughout this report make use of the child-level design weights supplied by ECLS-K.⁶ Using these weights allows us to generalize our results to the U.S. population of children who entered kindergarten in fall 1998.

Results in effect sizes. We have chosen to present many of the results throughout the report in effect-size (or standard deviation [SD]) units—using z-scored versions of these tests (mean=0, pooled standard deviation=1)—for three reasons. First, effect-size units facilitate comparisons across tests and social groups. Second, these units allow readers to consider what is important beyond the rather arbitrary standards of statistical significance (which are influenced by sample sizes). Third, this way of presenting results has become increasingly common in the worlds of social policy and program evaluation. In most instances we focus on magnitudes of effect sizes rather than their statistical significance. With large sample sizes, such as those in ECLS-K, even very small differences or effects are often statistically significant.

How would readers know whether a particular effect size were big or small? A commonly used set of standards is presented by Rosenthal and Rosnow (1984), who describe effect sizes at or above .5 SD as "large," .3-.5 SD as "moderate," .1-.3 SD as "small," and those below .1 SD as "trivial." Results of federally mandated impact evaluations that assess program effects of social and educational intervention are now quite commonly presented in effect-size units (GAO 2001). In a meta-analysis of studies assessing the impact of Head Start (called The Head Start Synthesis Project)

published almost two decades earlier, when effect sizes were less commonly used than now, the authors provided another and perhaps more substantive interpretation of effect sizes:

Educators and researchers in early childhood education commonly consider an effect size in the range of 0.25 or greater (either positive or negative) to be educational meaningful. Differences of this size accompany noticeable improvements in classroom performance (McKey et al. 1985, 5).

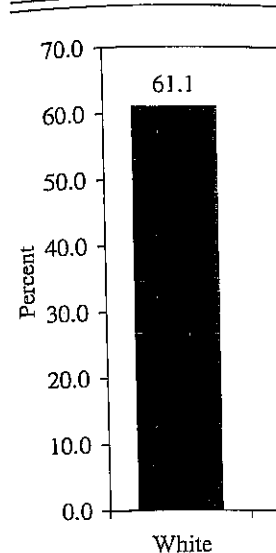
However, both the GAO report (2001) and the Head Start Synthesis Project (McKey et al. 1985) were using these units to quantify effects of children's participation in some social intervention, compared to a reasonable standard. This study is not an evaluation of any particular educational intervention, but rather describes social differences in the population of U.S. children who began kindergarten in 1998. Thus, a standard of "educational significance" may not apply here. We remind readers that all the differences we present in this report are comparisons (for race/ethnicity, comparisons are with white children; for SES, we present our results in quintiles in comparison to the middle quintile). We hope that the standards we provide for judging whether effects are small or large may be useful in interpreting the results presented here. We present many of our results in graphic form, so the patterns of associations are clearer than they often are in tables.

Were we considering gains in achievement over a single school year (such as kindergarten), we would be in a good position to discuss a more meaningful standard: learning. In other research we have conducted using ECLS-K (Lee, Burkam, Honigman, and Meisels 2001), we evaluated the effects of a social intervention in terms of "months of learning" (i.e., how much achievement the average kindergarten child in the U.S. would be expected to gain in one month in the school year). However, because in this report our focus is on children's scores on these tests at a single time point (i.e., our research is cross-sectional rather than longitudinal), we believe that effect size is the most appropriate metric to consider.

Descriptive findings about social background and cognitive status

Racial/ethnic composition of America's kindergarten class of 1998. This report describes a nationally representative sample of U.S. children who

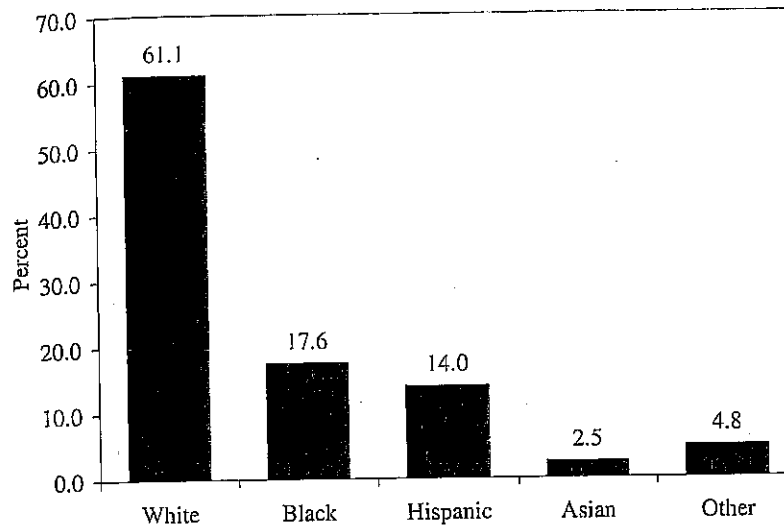
FIGURE 1.1 Kindergarten



Source: Authors' analysis of U

began kindergarten in America's kindergarten class of 1998: 61.1% of income black, 14.0% were Hispanic as "other." About half of those 4.8 Alaskan natives). The four racial/ethnic groups of the analyses in this chapter among racial groups, between racial/ethnic groups in this chapter.

Race and ethnicity—displays test-score averages for different racial/ethnic groups. It indicates group differences in scores on these tests between those for black, Hispanic

FIGURE 1.1 Kindergartners by race

Source: Authors' analysis of U.S. Department of Education ECLS-K data.

began kindergarten in the fall of 1998. The racial/ethnic breakdown of America's kindergartners in that year, displayed in **Figure 1.1**, is as follows: 61.1% of incoming kindergartners in 1998 were white, 17.6% were black, 14.0% were Hispanic, 2.5% were Asian, and 4.8% were classified as "other." About half of the "other" group came from mixed-race families (50.5% of that 4.8%), and 38.8% were Native Americans (including Alaskan natives). The remainder (10.7%) were native Hawaiians. We use the four racial/ethnic groups—black, Hispanic, Asian, and other—for most of the analyses in this report. In analyses where we include comparisons among racial groups, the comparison group is whites.⁷ The association between racial/ethnic group membership and SES is explored later in this chapter.

Race and ethnicity—differences in beginning achievement. **Figure 1.2** displays test-score averages in mathematics and reading for children from different racial/ethnic groups (panel A indicates actual scores, panel B indicates group differences in effect-size units). White and Asian children's scores on these tests are similar (panel A), and consistently higher than those for black, Hispanic, and other children. Recall that most children in

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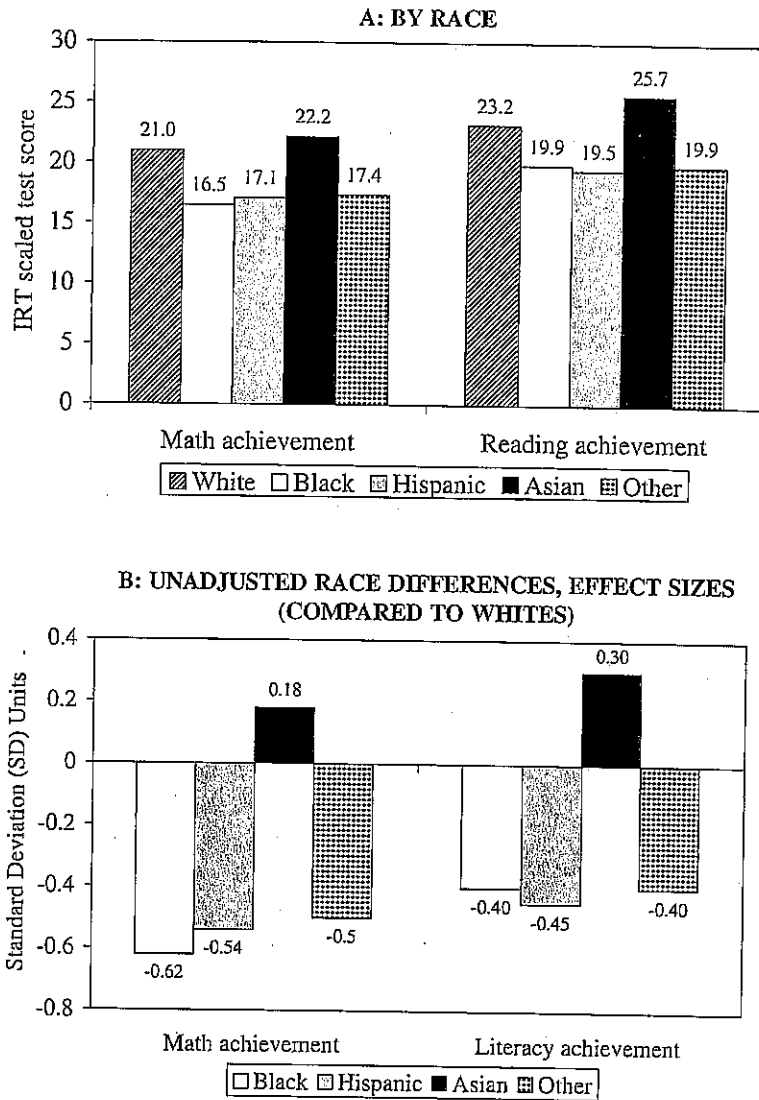
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FIGURE 1.2 Math and reading achievement at the beginning of kindergarten



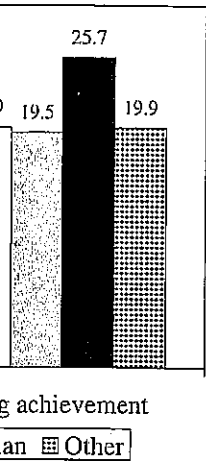
Source: Authors' analysis of U.S. Department of Education ECLS-K data.

the "other" category parents indicated Asian children of five points on the among black, Hispanic children.

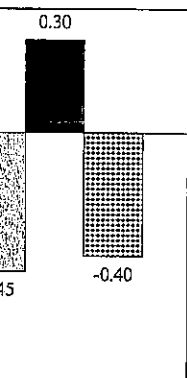
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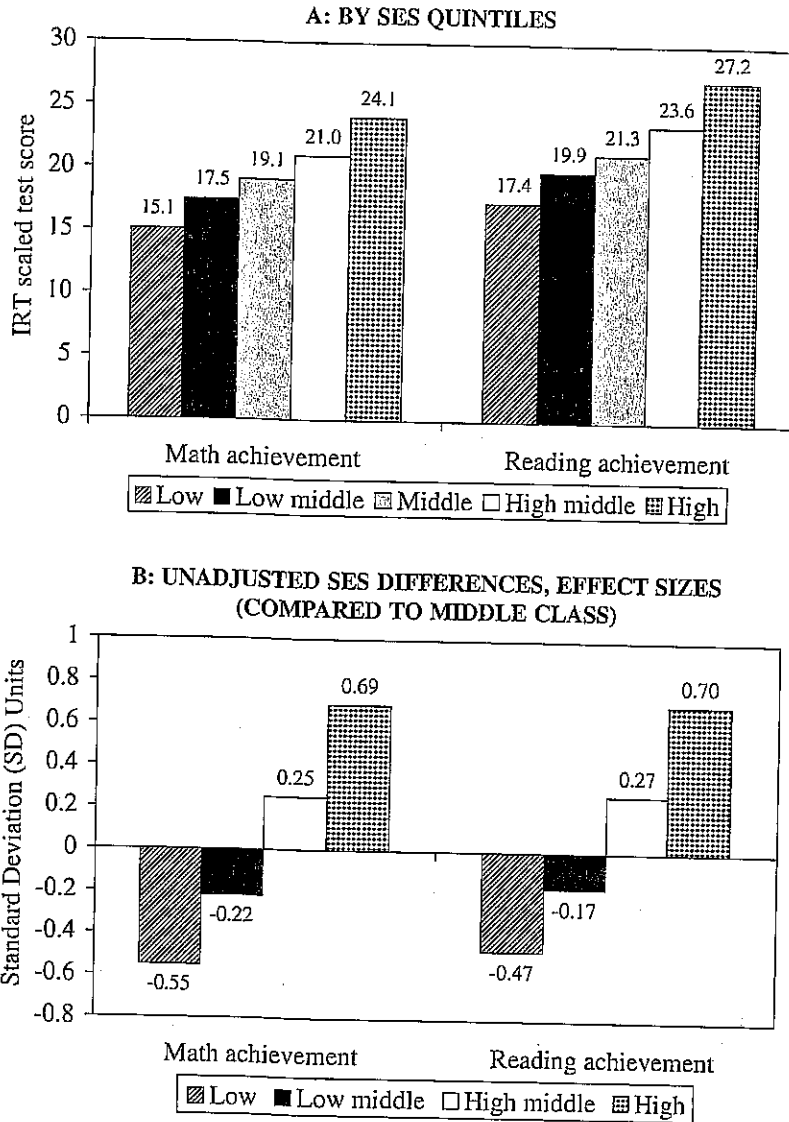
the "other" category are either Native American or biracial (i.e., their parents indicated more than one racial category on the survey). White and Asian children outscore blacks, Hispanics, and other children by four to five points on the tests in both subjects. There are smaller differences among black, Hispanic, and other children, and between white and Asian children.

Another way to display these differences is in effect sizes, shown in panel B of Figure 1.2. The effects displayed here are in score differences (in standard deviation [SD] units), with each racial/ethnic group mean compared to the mean for the largest group, white children. Examined this way, several trends are clear. First, black, Hispanic, and children in the "other" racial group score about one-half SD below their white counterparts, whereas Asian children score somewhat above whites. Second, the effect size differences are generally larger for mathematics (on the left) than for reading (on the right). Racial/ethnic differences are large (.5 SD or more) for mathematics, moderate (.3-.5 SD) for reading (see endnote 1). Third, black/white differences are largest in mathematics (an effect size of -.62 SD), whereas Hispanic/white differences are largest in reading (-.45 SD), even though Hispanic children with very weak English skills were not tested. Fourth, Asian children outscore whites more in reading than in mathematics at entry into kindergarten. This may seem surprising, except that Asian children with limited English skills were not tested (see endnote 3).

Differences in beginning achievement status by SES. Figure 1.3 displays differences on these same tests by socioeconomic status. Readers should keep in mind that it is standard procedure in social science research to measure socioeconomic status as a composite score that includes parents' reports of their household income, mothers' and fathers' education, and mothers' and fathers' occupation (scored on an occupational prestige scale drawn from the 1989 General Social Survey—NCES 2000b). Although it might be useful to explore these issues using each component of SES, we have chosen to use the composite SES measure for the sake of brevity. Here we divided children into five groups (i.e., quintiles) of approximately equal size (20% in each quintile), based on their SES. In panel A of Figure 1.2, a clear linear trend is evident: children's scores on these tests are positively related to their SES.

Panel B of Figure 1.3 presents these differences, again, in effect-size units, with low-SES, low-middle-SES, high-middle, and high-SES groups each compared to middle-SES children (the third quintile, which we call "middle class"). Although a general linear trend is still evident, two addi-

FIGURE 1.3 Math and reading achievement at the beginning of kindergarten



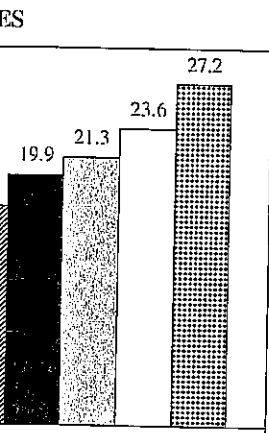
Source: Authors' analysis of U.S. Department of Education ECLS-K data.

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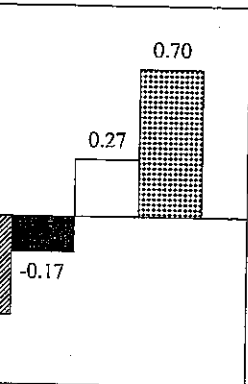
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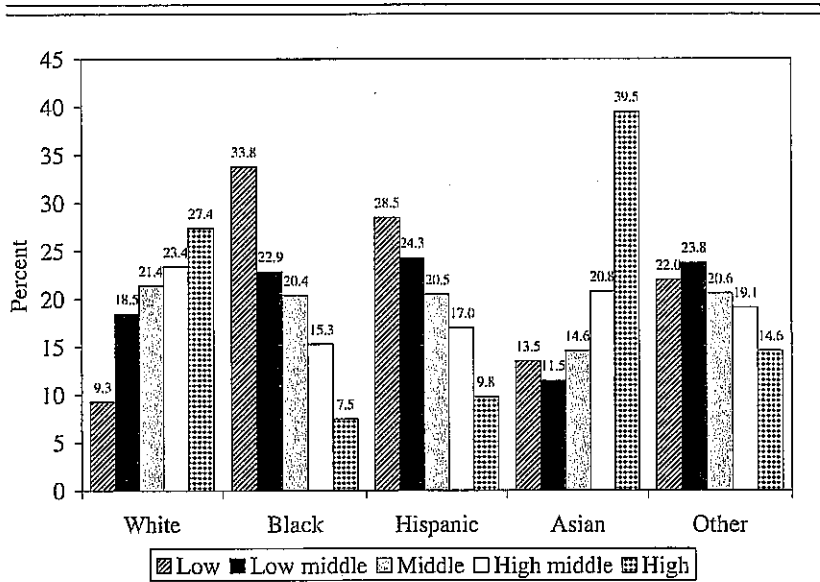
ECLS-K data.

tional findings emerge when results are presented this way. First, young children's SES and cognitive status are strongly related, that is, SES differences in achievement status at kindergarten entry are very large. Recall that comparisons here are with middle-SES children, not between high- and low-SES children (where effect-size comparisons would be considerably larger). Low-SES children score .55 SD below middle-SES children in mathematics, and .47 SD below the same group in reading. Even more striking, high-SES children outscore their middle-SES counterparts by .69 SD in mathematics and .70 SD in reading. Second, the effect sizes of low-SES compared to lower-middle SES children on both achievement tests are more than twice as large, which is also the case in comparing high-middle and high-SES children to their middle-SES counterparts. Logically, effect sizes in test scores by SES are larger for the extreme quintiles than for the middle categories, in comparing them to middle-SES children.

Race differences by socioeconomic status. It is a well-known social phenomenon that race/ethnicity and SES are intertwined in the United States. That is, the families of children whose race/ethnicity is black or Hispanic are, in general, lower in terms of SES than are children from white families. **Figure 1.4** displays this relationship among the children in the ECLS-K sample, where we display the proportion of each racial/ethnic group in the SES quintiles. If race/ethnicity and SES were unrelated to one another, quintiles for each racial/ethnic group would contain exactly 20% of the sample. However, distributions by quintile are not at all equivalent for any racial/ethnic group. For example, only 9.3% of white children (the left-hand group in Figure 1.4) are in the low-SES group, whereas 33.8% of blacks, 28.5% of Hispanics, and 22.0% of others are in the low-SES category. It is clear that black and Hispanic children are substantially over-represented in the low-SES category, but white and Asian children are under-represented. Similarly, white (27.4%) and especially Asian children (39.5%) are over-represented in the high-SES category, whereas very few families of black (7.5%) and Hispanic children (9.8%) are in the high-SES quintile. This display makes it clear that the "other" race category more closely resembles black and Hispanic than white and Asian children, at least in terms of their family SES.

The especially damaging combination of race and class for children's achievement. We have seen large race differences in entering achievement regardless of social class (Figure 1.2), large SES differences in entering achievement regardless of race (Figure 1.3), and the strong relationship

FIGURE 1.4 Kindergartner's family social class distribution (quintiles), by race

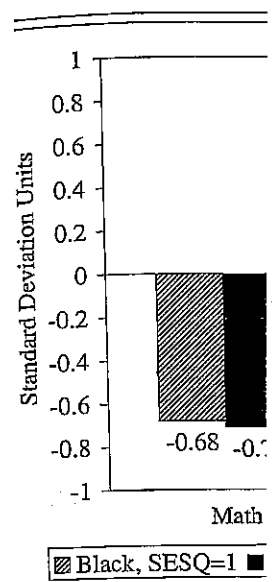


Source: Authors' analysis of U.S. Department of Education ECLS-K data.

between race and SES (Figure 1.4). If we take both into consideration at the same time, achievement differences are very large. **Figure 1.5** compares the achievement of disadvantaged blacks and Hispanics (children in the first SES quintile, which includes a third of all black children and more than a quarter of all Hispanic children) to middle class whites (children in the third SES quintile) and to advantaged whites (children in the fifth SES quintile). In order to facilitate comparisons in this figure, we re-scaled the tests to standard deviation (or effect-size) units, by converting the original IRT scores to z-scores (mean=0, SD=1).

Disadvantaged black children enter kindergarten more than half a standard deviation below the national average (.68 SD below the mean in math, .56 SD below the mean in reading). Low-SES Hispanic children enter at a similar disadvantage (.71 SD below the mean in math, .69 SD below the mean in reading). On the other hand, middle class white children score at or near the national average (.06 SD above the mean in math, .03 SD below the mean in reading), and advantaged white children score far above the national average (.70 SD above the mean in math, .64 SD above the mean in reading). Looked at from this perspective, the overall

FIGURE 1.5 Math and reading in kindergarten: Comparison to middle class and advantaged whites



Source: Authors' analysis of ECLS-K data.

black/white and Hispanic disparity, mainly twined. Entering kindergarten, disadvantaged black children and middle class white children score at or near the national average in reading. Entering kindergarten, disadvantaged black children and high-SES white children score far below the national average in reading.

Summary

The results from this study show that the schoolhouse does not level the playing field. Of great concern are the racial differences in children's reading achievement. Disadvantaged black, Hispanic, and Asian children score significantly below the national average in reading, while middle class and advantaged white children score at or above the national average. The "other" racial group

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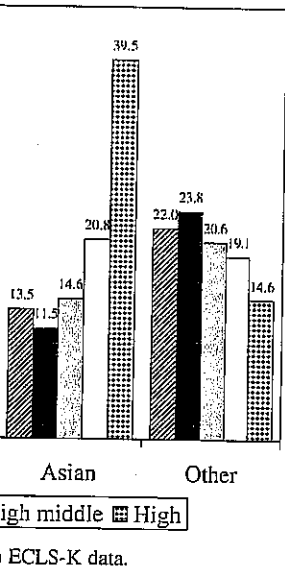
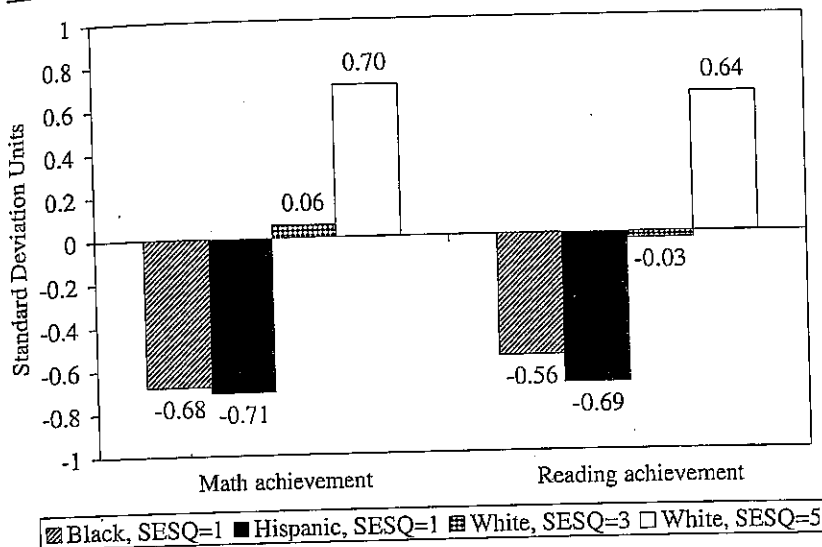


FIGURE 1.5 Math and reading achievement at the beginning of kindergarten: Comparing disadvantaged black and Hispanic children to middle class and advantaged white children



Source: Authors' analysis of U.S. Department of Education ECLS-K data.

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black/white and Hispanic/white gaps in Figure 1.2 underestimate much of the disparity, mainly because SES and race/ethnicity are so closely intertwined. Entering achievement differences between low-SES black children and middle class white children are around .7 SD in math and .6 SD in reading. Entering achievement differences between low-SES black children and high-SES white children are around 1.4 SD in math and 1.2 SD in reading.

Summary

The results from this chapter suggest that children present themselves at the schoolhouse door for the first time with considerable variation in cognitive status. Of great social import but yet unsurprising, there are substantial differences in children's performance on cognitive tests of mathematics and reading administered at the beginning of the kindergarten year by race, ethnicity, and SES. Children who are black, Hispanic, or members of the "other" racial group score considerably below white children as they

begin school, whereas Asian children score somewhat above their white counterparts. There are also large differences in children's cognitive performance as they begin school in terms of social class, with higher-SES children scoring higher and lower-SES children lower on achievement tests in both reading and mathematics. An important finding from this chapter is that disparities in children's cognitive status at school entry by SES are actually larger than those by race/ethnicity. Thus, even at "the starting gate"—when all U.S. children enroll in school for the first time—certain children (particularly those who are black, Hispanic, or lower SES) enter school both cognitively and socially disadvantaged. Thus, inequality by social background at the educational starting gate is substantial, and even more substantial given the combined impact of having a low SES and being black or Hispanic.

Although this picture of inequality is in one sense very clear—children with social disadvantage also enter school with a cognitive disadvantage, there may be more to this picture. Other features of children's home lives are likely to be associated with both their social background and their cognitive status. We pursue these issues in the next two chapters.

CHAPTER 2

Young children disadvantaged

This chapter examines ethnicity and SES. Chapter 1 examined cognitive status of children in the United States. White and Asian children score higher on reading at kindergarten than do children from other groups. This is strongly associated with cognitive status—above and beyond race/ethnicity. In this chapter we examine the extent to which cognitive status is associated with social background at the educational starting gate.

Home disadvantage

Numerous studies have shown that children from economically disadvantaged families have lower cognitive status than do children from more advantaged families. This chapter considers the extent to which cognitive status is associated with social background at the educational starting gate.

1. *Children's cognitive status at school entry: the role of home disadvantage*
2. *The head start program: effects on children's cognitive status and school readiness*