

ILLUSTRATION BY KEVIN GHIGLIONE

research

As children
move through
school,
the black-white
achievement
gap
expands

On average, black students typically score one standard deviation below white students on standardized tests—roughly the difference in performance between the average 4th grader and the average 8th grader. Historically, what has come to be known as the black-white test-score gap has emerged before children enter kindergarten and has tended to widen over time.

What are the causes of this persistent gap in achievement? In study after study, scholars have investigated the effects of differences among white and black students in their socioeconomic status, family structure, and neighborhood characteristics and in the quality of their schools.

Behind To be sure, socioeconomic status and the trappings of poverty are important factors in explaining racial differences in educational achievement. Yet a substantial gap remains even after these crucial influences are accounted for.

Gaining a better understanding of what causes the test-score gap is of great importance because eliminating the gap could yield great advances in the well-being of African-Americans. In separate studies, Derek Neal and William Johnson in 1996 and June O'Neill in 1990 found that most of the wage gap between black and white adults disappears once the data are adjusted to reflect their scores on the Armed Forces Qualifying Test; in other words, those adults with similar scores earned similar wages. Thus closing the test-score gaps that emerge in high school may be a critical prerequisite to reducing wage inequality between the races. As scholars

BY ROLAND G. FRYER AND STEVEN D. LEVITT

Christopher Jencks and Meredith Phillips write, “Reducing the black-white test score gap would do more to promote racial equality than any other strategy that commands broad political support.”

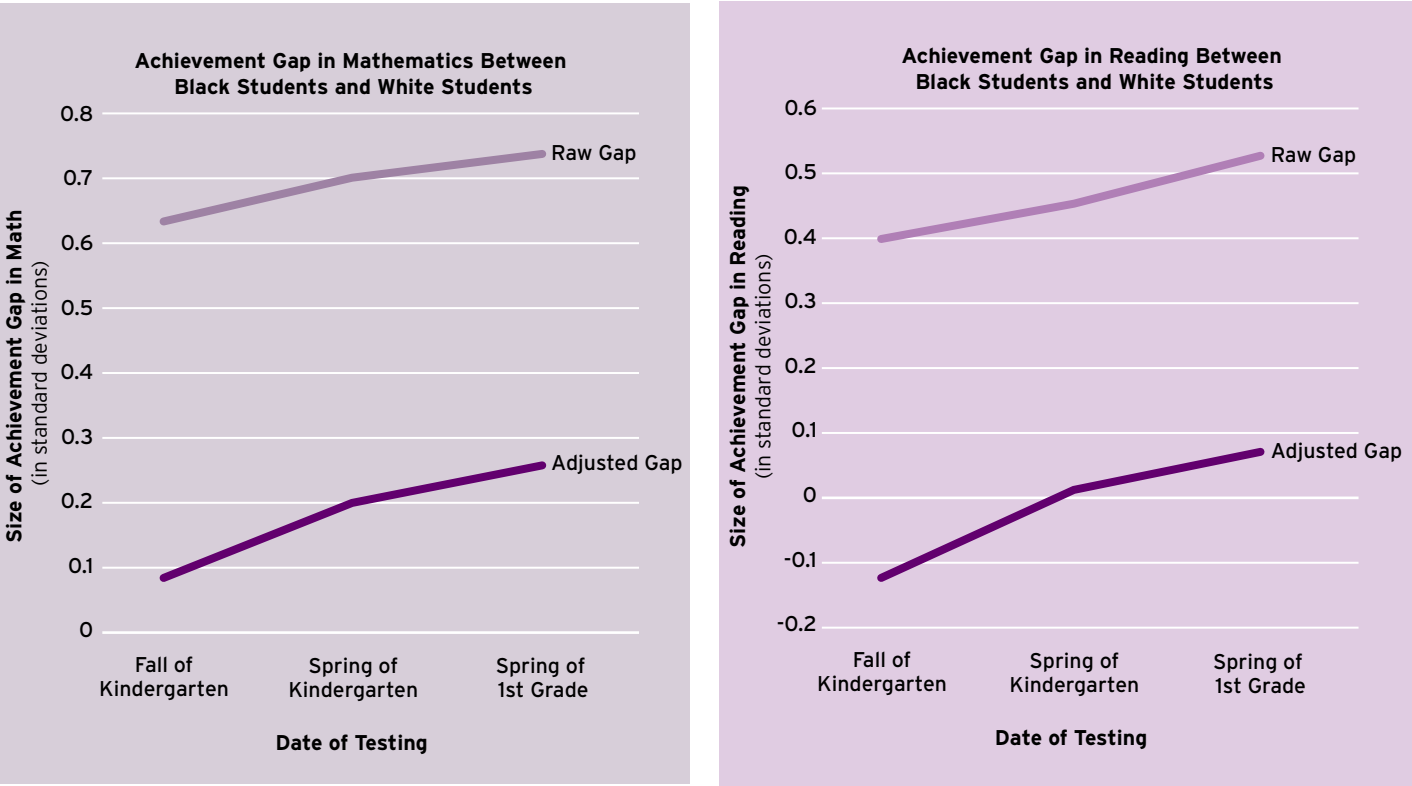
To take a fresh look at the gap and its sources, we examined a new data set, the Early Childhood Longitudinal Study Kindergarten Cohort, compiled by the U.S. Department of Education. The results are quite surprising: after adjusting the data for the effects of only a few observable characteristics, the black-white test-score gap in math and reading for students entering kindergarten essentially disappeared. Put simply, white and black children with similar personal and family background characteristics achieved similar test scores (see Figure 1).

However, our results show that the achievement gap, while negligible among black and non-Hispanic white children with similar characteristics when they enter kindergarten, expands

as they grow older. From the beginning of kindergarten to the end of first grade, black students lose 20 percent of a standard deviation (approximately 10 percent of a standard deviation each year) relative to white students with similar characteristics. If the gap were to continue to grow at this rate, by 5th grade the average black student would be half a standard deviation behind his white counterpart—a residual gap similar in magnitude to that found in previous analyses. Hispanic children do not experience this widening test-score gap relative to otherwise similar white students; indeed, they systematically close the gap, perhaps because their initial scores are artificially low due to the relative inexperience with the English language among some immigrants and their children (see Figure 2).

Here we present our findings and explore possible reasons why they diverge from those of previous studies. We also consider various explanations for the expanding gap between black and white students as they move through school.

The Growing Gap (Figure 1)
Black kindergartners and white kindergartners with similar socioeconomic backgrounds now achieve at similar levels. However, the raw gap in test scores remains large and both the raw and adjusted gaps grow as students move through school.



NOTE: In the figures above, the Raw Gap represents the actual difference in test scores between black students and white students. The Adjusted Gap represents the remaining inter-ethnic test-score gap after adjusting the data for the influence of students' background characteristics. Adjusted results control for socioeconomic status, number of books in the home, gender, age, birth weight, WIC participation, and mother's age at birth of first child. All adjusted gaps are statistically significant at the .05 level. Where the results indicate that the gap is negative, black children with similar characteristics actually score higher than their white counterparts.

SOURCE: Authors' calculations based on data from the Early Childhood Longitudinal Study Kindergarten Cohort (1998), U.S. Department of Education

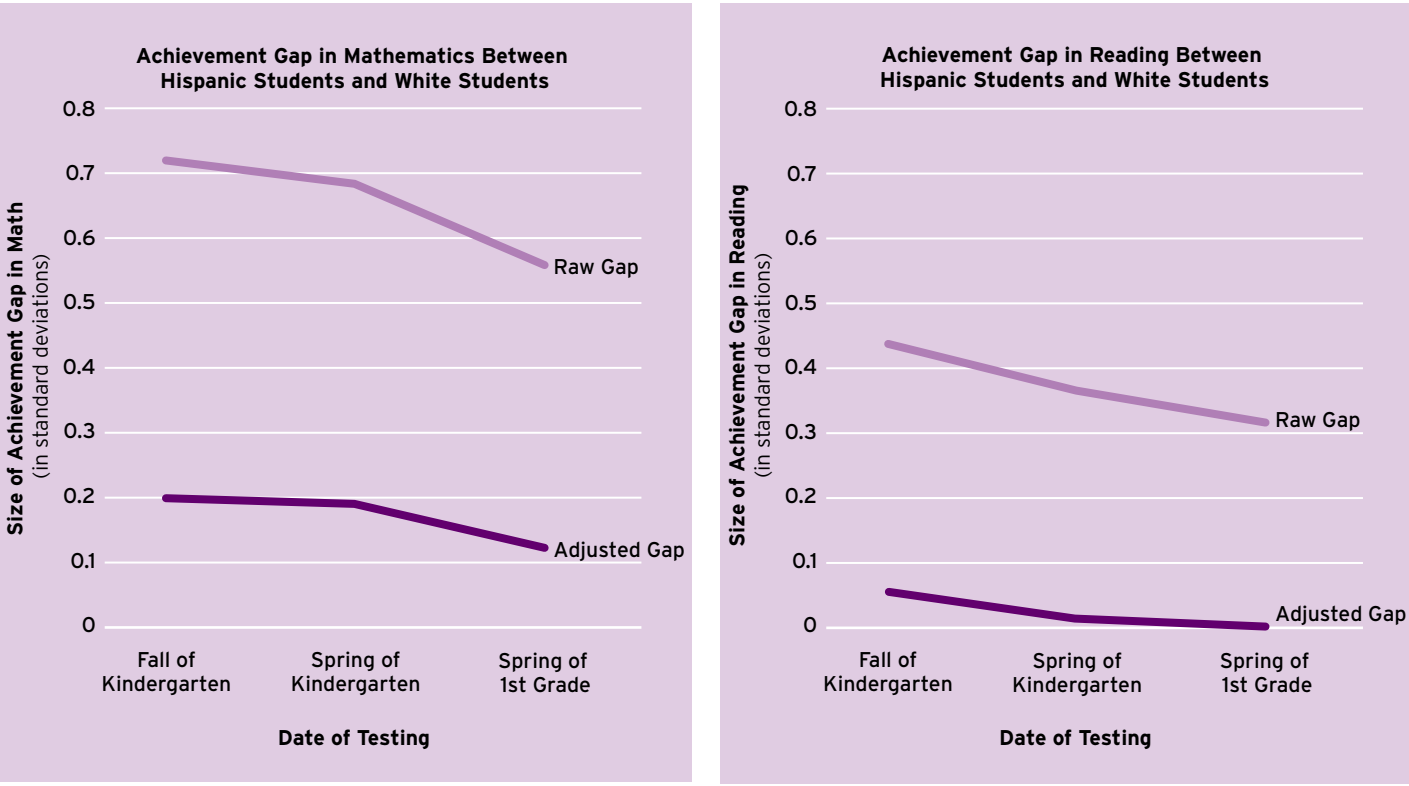
The raw black-white achievement gaps, while sizable, are substantially smaller than those observed in earlier data sets for children of the same age.

The Survey

The Early Childhood Longitudinal Study includes a nationally representative survey of more than 20,000 children who entered kindergarten in 1998. The full sample was interviewed in the fall and spring of kindergarten and in the spring of 1st grade. Moreover, a random sample of a quarter of the respondents was also interviewed in the fall of 1st grade. The full sample included an average of more than 20 children per school in each of the roughly 1,000 schools participating in the study, making it possible to conduct within-school analyses.

Students took standardized tests in the fall of kindergarten and in the spring of 1st grade. They were initially given oral tests, since most of them did not know how to read. Overall, non-Hispanic white students scored 0.27 standard deviations above the average on the math exam in the fall of kindergarten, while black students fell 0.36 standard deviations below the average, yielding a raw black-white gap of 0.63 standard deviations. By the spring of 1st grade, the raw gap in mathematics increased to 0.73 standard deviations. The initial black-white gap in reading was smaller (0.4 standard deviations). As in math,

Hispanic Children Close the Gap (Figure 2)
There remains a substantial gap between the test scores of Hispanic children and white children, but it shrinks as Hispanic students move through school.



NOTE: In the figures above, the Raw Gap represents the actual difference in test scores between Hispanic students and white students. The Adjusted Gap represents the remaining inter-ethnic test-score gap after adjusting the data for the influence of students' background characteristics. Adjusted results control for socioeconomic status, number of books in the home, gender, age, birth weight, WIC participation, and mother's age at birth of first child. Adjusted gap in reading is statistically insignificant for Spring kindergarten and 1st Grade test results.

SOURCE: Authors' calculations based on data from the Early Childhood Longitudinal Study Kindergarten Cohort (1998), U.S. Department of Education

however, the raw test-score gap in reading widened substantially, to 0.53 standard deviations, by the end of 1st grade.

Note that these raw black-white gaps, while sizable, are substantially smaller than those observed in earlier data sets for children of the same age. For instance, in a study published in 1998, Meredith Phillips and her colleagues reported a raw black-white test-score gap of more than one standard deviation in vocabulary using data sets collected between 1980 and 1987.

The initial test-score gaps for Hispanic students in the Early Childhood Longitudinal Study data were even greater than for

the economic condition of students' households is a strong predictor of their incoming test scores: an improvement in socioeconomic status of one standard deviation is associated with an increase of 0.45 standard deviations in both math and reading test scores. Thus adjusting the data for the effects of socioeconomic status reduces the estimated racial gaps in test scores by more than 40 percent in math and more than 66 percent in reading.

The number of books in the household is a useful proxy for the home environment's contribution to academic success.

After two years in school, Hispanic students were performing better relative to whites than were their black counterparts.

blacks—0.72 standard deviations in math and 0.43 standard deviations in reading. However, these gaps narrowed somewhat by the end of 1st grade, reaching 0.56 and 0.31 standard deviations, respectively. After two years in school, then, Hispanic students were performing better relative to whites than were their black counterparts.

We also analyzed teachers' subjective assessments of each child's math and reading achievement. Teachers were asked to answer 20 questions about each child's academic performance. The patterns in the teacher assessments mirror those in the test-score data: black and Hispanic students start out substantially below whites, and black students lose ground over the first two years of school, whereas Hispanics maintain their position relative to whites.



Most of the available data on students' background characteristics were collected only once or changed little over time for individual students. The most important of these characteristics is a composite measure of socioeconomic status developed by the survey's researchers. The components of the socioeconomic status measure are parents' level of education, parents' occupational status, and household income. On the whole, black children were being reared in circumstances less likely to be conducive to academic achievement than those experienced by white children; in general they have lower socioeconomic status and fewer children's books in the home, to name just two disadvantages. Hispanics were also worse off than whites on average.

Results

Adjusting the test scores for these characteristics one at a time allows us to isolate the effects of each one. First consider socioeconomic status. As expected, the summary measure of

Adjusting the test-score data for this factor reduces the gap even more. On average, black students in the sample had 39 children's books in their home, compared with an average of 93 books among white students. Taking this difference into account cuts the black-white test-score gap to less than a fourth of a standard deviation in math and completely eliminates the gap in reading. The gap between white and Hispanic students also shrinks.

We next adjust the data for the effects of gender, age, birth weight, the age at which the mother had her first child, and participation in the WIC program (a supplemental food program for women, infants and children restricted to low-income families). As expected, the results indicate that older children, those with higher birth weights, and those with mothers who were older at the time of their first birth all score better. Children participating in the WIC program perform worse, suggesting that this variable is not capturing any benefits the nutrition program might provide, but rather that WIC eligibility is an indicator for growing up poor. All else being equal, female students seem to perform at higher levels than males in reading and at the same level in math.

More important for this analysis, adding these variables to the equation further accounts for the differences between the test scores of whites and those of blacks and Hispanics. In fact, the estimates suggest that black children with characteristics similar to their white peers score slightly better than whites in reading and only slightly worse in math (see Figure 1). Only a small gap persists for Hispanics (see Figure 2).

Of particular interest is the fact that only a few social background characteristics need to be taken into account in order to eliminate the black-white gap. Once we adjusted the data for the effects of socioeconomic status, birth weight,

participation in WIC, and a few other variables, we were able to fully account for the difference in test scores. Adjusting the data for a range of other factors, such as neighborhood characteristics, family size, whether the mother works, whether English is spoken at home, and participation in preschool, does not appreciably change the results. This is not to say that such variables as neighborhood characteristics have no effect, only that the effect of such variables is already captured by the handful of social background characteristics, such as WIC participation, that we incorporated into our analysis.

To address this potential source of bias, we examined the effects of our key control variables for students of each race separately. The effects of most factors on black, white, and Hispanic students were statistically indistinguishable. However, it turns out that the black children in our sample were less responsive to changes in socioeconomic status than the white children: a one-standard-deviation improvement in socioeconomic status for a black child was associated with a 0.18 standard deviation increase in math scores, compared with 0.32 among white children.



Black children and white children with similar family background characteristics start school at similar levels of achievement.

To this point the analysis has assumed that children of different races will respond similarly to changes in their socioeconomic status, home environments, and so on. However, black children tend to live in situations that are less conducive to learning. If they do not derive as much benefit as white children from improvements in their home environments, our results may overstate the degree to which the gap is attributable to these factors.

All told, these race-specific estimates suggest that a black child who had the same characteristics as the average white child in the sample would score 0.21 standard deviations lower than the white child in math and would be almost exactly even in reading. Thus, to the extent that public policies are designed to improve the environments experienced by black children, our initial estimates may slightly overstate the ground that would be gained by blacks. This logic also holds for Hispanics.

Why So Different?

Nevertheless, the fact that the black-white test-score gap essentially disappears when sufficient controls are included is striking. In past research, a substantial gap has always persisted. The 1998 study by Meredith Phillips and her colleagues, mentioned earlier, had the greatest success in explaining racial differences in achievement, yet the unexplained portion of the achievement gap on the vocabulary test used in their study was still so large that it nearly exceeded the raw gap in reading and mathematics we found in the Early Childhood Longitudinal Survey data.

Why do our results differ so sharply from those of previous research? There are three leading explanations: 1) the sample of children included in the data set used by Phillips, the Children of the National Longitudinal Survey of Youth (CNLSY), especially in the early years, may be nonrepresentative; 2) better information on students' background characteristics is available in the Early Childhood survey; and 3) blacks born into recent cohorts have made real gains relative to blacks born a decade earlier.

Although plausible, the first two explanations appear to play only a small role empirically. However, real gains by blacks in recent cohorts do appear to be an important part of the divergence between our results and past research. By limiting the CNLSY data to cohorts born in the same years as the children in our data set, we found raw test-score gaps only half as large as those found in the earlier cohorts of data used by Phillips and remarkably close to those found in our data set.

Real gains among black children in recent years could explain this result. However, even after adjusting the data to account for similar factors, we were still not able to eliminate the achievement gaps among later cohorts in the data set used by Phillips. After introducing the same set of controls we used in the analysis above, the estimated black-white achievement gaps in recent cohorts of the CNLSY were about 0.5 standard deviations in math and 0.4 in vocabulary. Thus, although the raw gaps are similar in the two data sets, larger residual gaps remain in the CNLSY for reasons we cannot explain.

The Growing Gap

Our results suggest that black children and white children with similar characteristics now start school at similar levels of achievement. But what happens as they age?

In raw test scores, black students lose some ground relative to whites between the fall of kindergarten and the spring of 1st grade. But once the data are adjusted for the effects of the key background characteristics identified above, black students appear to lose much more ground than they do in the raw averages, falling 0.16 standard deviations in math and 0.19 standard

deviations in reading relative to white students (see Figure 1). If black students in the sample continue to lose ground through 9th grade at the rate experienced in the first two years of school, they will lag behind white students on average by a full standard deviation in raw math and reading scores and by more than two-thirds of a standard deviation in math even after controlling for observable characteristics (the gap would be substantially smaller in reading). Raw gaps of that magnitude would be similar to those found in previous studies of high-school-age children.

By contrast, Hispanics show gains relative to whites between the beginning of kindergarten and the end of 1st grade (see Figure 2). Thus black students are losing ground not only relative to whites, but even more relative to Hispanics.

Why does the black-white test-score gap grow as children age? Let's consider a few plausible explanations.

♦ Are black students losing ground because they attend worse schools?

There is substantial racial segregation in U.S. schools. In our data, which sample roughly 20 children in each of approximately 1,000 schools, 35 percent of those schools have not a single black child. The average black student in our sample attends a school that is 59 percent black and 8 percent Hispanic. In contrast, the typical white student attends a school that is only 6 percent black and 5 percent Hispanic. Given that blacks and whites have relatively little overlap in the schools they attend, differences in school quality could well explain why black students are losing ground.

To investigate this question, we compared the progress of white and black students who attended the same school. If the gap between these students remained the same as in the overall sample, this would suggest that the quality of the schools is not playing a major role in the expanding achievement gap.

In fact, black children who attend the same schools as whites lose only a third as much ground as they do relative to whites in the overall sample. These findings are consistent with—but not definitive proof of—the argument that systematic differences in the schools attended by white and black children may explain the divergence in test scores.

If on average blacks attend schools that are worse than those attended by whites, one might expect that this would be reflected in the schools' characteristics. Relative to otherwise similar whites, blacks do attend schools with more students eligible for the federal lunch program and schools in which subjective reports from officials indicated higher levels of gang activity, loitering in front of the school, and litter around the school.

Still, there are significant weaknesses in the argument that differences in school quality explain the divergent trajectories of whites and blacks. For instance, there seems to be little difference between the average class sizes, teachers' levels of education, number of computers in the classroom, and Internet

connections in schools attended by blacks versus those attended by whites. More important, the gap between blacks and whites continues to widen even after the data are adjusted to reflect differences in all of the school characteristics for which data are available. Indeed, the available measures of schools' characteristics as a group explain only a small fraction of the variation in student outcomes. Furthermore, both Hispanic and Asian children also experience worse schools than whites, but neither of those groups is losing ground. All in all, the issue

As compared with earlier generations of students, the current cohort of young, black children has made real gains to whites.

is murky—perhaps because the measures of school quality in the data are inadequate.

♦ Does the importance of parental and environmental inputs grow as children age?

Black children tend to grow up in environments that are less conducive to high achievement. If the importance of parental and environmental inputs grew as children age, black students would be expected to lose ground relative to whites. But if that were true, one would expect to observe a widening of the raw gaps between blacks and whites; to the extent that our control variables adequately captured a child's environment, the residual gap would remain constant. In fact, however, the residual gap increases more than the raw gap. In other words, the data suggest that the relative importance of factors outside of school decreases over time, presumably because schools become such a central part of a child's life.

♦ Do black children suffer worse "summer setbacks" when school is not in session?

Several scholars have argued that black students lose more ground over the summer than white students because of their relatively worse home and neighborhood environments. Our data provide a unique opportunity to test this hypothesis because a subset of the sample was tested both in the spring of kindergarten and early in the fall of 1st grade.

On the raw scores, there is little difference before and after the summer break; to the extent there is any gap, it favors black students. With controls, black students lose ground slightly to whites over the summer in math, but the result is not statistically significant. Black students make slight gains in reading. Thus there is little evidence that differential

learning over the summer can help to explain the growing achievement gap.

♦ Can biased expectations among teachers explain why black students lose ground?

If, as some have argued, white teachers have lower expectations for black children, one would predict that black students with white teachers would lose more ground than black students with black teachers. We found that black children who

have at least one black teacher start out performing somewhat worse than their white peers in math and slightly better in reading, relative to black students who have no black teachers. By the end of 1st grade, however, the black-white test-score gap is greater for students who have at least one black teacher. This is exactly the opposite of what one would predict from a discrimination story.

Conclusion

Compared with the results of previous studies, our findings provide reason for optimism. We find smaller achievement gaps, in both the raw and the adjusted scores, for children born in the early 1990s than others had found for earlier birth cohorts. It could well be that, as compared with earlier generations of students, the current cohort of blacks has made real gains relative to whites. Indeed, recent cohorts show smaller raw black-white gaps across multiple data sets—a truly promising sign.

Once students enter school, however, the gap between white and black children grows, even after controlling for observable influences. We speculate that blacks are losing ground relative to whites because they attend lower-quality schools that are less well maintained and managed as indicated by signs of social discord. Though we recognize that we have not provided definitive proof, this is the only hypothesis that receives any empirical support.

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