School District Socioeconomic Status, Race, and Academic Achievement

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How much does academic performance vary among school districts and communities in the U.S.? How much of that variation is due to the socioeconomic context of the schools and the socioeconomic background of the students? How do test scores vary by race within and between districts?

This short report uses new data from the Stanford Education Data Archive to investigate these questions. It is a working draft that will be updated in the next few weeks. The intended purpose is to highlight key patterns of academic achievement across the country; in future papers I will add additional more detailed analyses.

Test Score Data

The test score data used here come from the Stanford Education Data Archive (SEDA), which includes estimates of the average test scores of students in almost every public school district in the United States (seda.stanford.edu). These estimates are based on roughly 215 million state accountability test scores (representing more than 40 million students) on math and English Language Arts (ELA) tests in grades 3-8 in the years 2009-2013 in every public school district in the United States. Details on the source and construction of the estimates is available on the SEDA website.

The scores are placed on a common scale across states, grades, and years, so that performance can be meaningfully compared across places. The scale I use here is one in which test scores are standardized in relation to the average national performance for each grade level. Although scores are available for each school district in each year from 2009 to 2013 and each grade from 3 to 8, I use a version of the SEDA data that averages these scores across grades and years to create a single average score for each district; I also pool the scores across math and ELA for presentational simplicity, since the two are very highly correlated at the district level. The resulting measure is scaled so that a value of 0

indicates that students in a district score, on average, at the national average of students at their grade level; a unit difference in the scale corresponds to the national average difference in scores between students in adjacent grades.

I also estimate the average within-grade (across cohort) change in scores for each district and the average within-cohort (across grades) change in scores within each district. The measure of the rate of change across grades has a mean of 1 by construction (students' scores increase by one grade-level on average each year); larger values indicate students in a district make faster than average growth (so a growth rate of 1.1 would indicate that student scores in that district grow 10% faster than average, or about a half grade more than average from 3rd to 8th grade).

Measuring Average Socioeconomic Status Among Students Enrolled in a School District

In order to measure the socioeconomic characteristics of the families of children, I use data from the American Community Survey (ACS). The ACS includes detailed socio-demographic data for families living in each school district in the U.S.; these tabulations are available through the School District Demographic System (SDDS). I use data from the 2006-10 SDDS tabulations because they include tabulations of family characteristics among families with school-age children enrolled in public schools.

In particular, I use six measures of the socioeconomic composition of families living in a district with children enrolled in public schools: 1) median family income; 2) percent of adults with a bachelor's degree or higher degree; 3) poverty rate; 4) unemployment rate; 5) SNAP eligibility rate; 6) the percent of families headed by a single parent. Each of these is available separately by race/ethnicity (for racial/ethnic groups of sufficient local population size).

I construct a measure of each district's average socioeconomic status as the first principal component of the six measures above. This measure is standardized to have a mean of zero and a

standard deviation of 1. To give a sense of how this measure is scaled, Table 1 describes the average characteristics of school districts at various values of the SES composite.

Table 1:

Average Family Socioeconomic Characteristics, at Various District SES Composite Values

	SES Composite					
	-3	-2	-1	0	1	2
Median Family Income	$24,038	$31,026	$39,634	$53,029	$78,644	$136,804
% With BA or Higher	13.5%	14.9%	14.6%	18.3%	32.3%	62.4%
Poverty Rate	48.0%	37.6%	25.9%	14.7%	6.0%	1.6%
SNAP Eligibility Rate	50.0%	39.9%	27.6%	15.5%	5.6%	0.2%
Unemployment Rate	10.5%	8.0%	6.0%	4.5%	3.4%	2.6%
Single Parent Family Rate	51.9%	41.9%	31.7%	22.2%	14.6%	10.0%

I also construct the same socioeconomic status composite separately by race. I do this by applying the same scoring equation to the race-specific socioeconomic district characteristics. This means that the scale of socioeconomic status is directly comparable across race/ethnic groups. I compute race-specific SES only where the SDDS tabulations of ACS data include race-specific measures for all 6 of the variables in the composite (when a given racial group is too small within a school district, the SDDS tabulations are not available).

The data I use here includes 11,280 school districts for which I am able to compute a socioeconomic status variable and for which the SEDA data include measures of academic achievement. Districts not included in the sample are predominantly very small districts for which samples are too small for SDDS to report socioeconomic characteristics or that have fewer than 20 students total per grade (in which case the SEDA data do not include estimates of average test scores). The 11,280 districts collectively enroll 3.7 million students per grade (over 90% of all public school students in the U.S.)

When reporting race-specific average test scores, I limit the sample to district-by-race combinations for which there were at least 200 students per grade and at least 100 students of a given race per grade in the district. This restriction ensures that the race specific means are highly reliable. The

sample includes 1,514 districts for which SEDA includes average test scores for white students; 946 with scores for black students; and 1,115 with scores for Hispanic students. These districts include 46% of all white students; 78% of all black students; and 74% of all Hispanic students.

Table 2 below describes the average socioeconomic composite values among districts, weighted by each race/ethnic group's enrollment. The top row indicates the average SES among all 11,280 districts in our sample, weighted by racial/ethnic enrollment. The average white student is enrolled in a district with SES levels 0.94 standard deviations higher than the average black student; and 0.63 standard deviations higher than the average Hispanic student. Among the 1,514 districts for which I have white mean scores, the average white student is in a district where the average SES is 0.17, but where the average SES among white students is 0.56. In other words, white students typically attend school districts where their white peers are from more advantaged families than their non-white peers. The pattern is the opposite for black and Hispanic students. The average black student attends school in a district where her black peers are far poorer than her non-black peers; the same holds for Hispanics though the discrepancy is not as large.

These between- and within-district discrepancies are important for understanding between- and within-district racial disparities in academic achievement, as we shall see below.

Table 2:

Average District Socioeconomic Characteristics, by Race/Ethnic Group

| | Group | | |
	White	Black	Hispanic
Average District SES (in all Districts)	0.30	-0.64	-0.33
Average District SES (in Race Sample Districts	0.17	-0.63	-0.28
Average SES of Same-Race in District	0.56	-1.99	-0.96
N (districts)	1514	946	1115

Note: Means are weighted by race-specific district enrollment.

Average Academic Performance, by School District Socioeconomic Status

I begin by examining the pattern of association between district socioeconomic status and average academic achievement. Before doing so, it is important to note that average test scores in a district should not be interpreted as a measure of school quality. Test scores and academic performance more generally are shaped by many factors other than schools. They are shaped by children's families, their home environments, their neighborhood contexts, their child care and pre-school experiences, afterschool experiences, and by their schools. Knowing that children in a particular community scored higher, on average, than those in another community does not tell us that the schools were better in that community. Average test scores are more appropriately interpreted as a measure of the educational opportunities available to children living within a district. Moreover, while math and ELA test scores are a proxy for the desired outcomes of schooling; they do not measure all aspects of child development that students, parents, and society value.

With that in mind, Figure 1 plots the average test scores in each of the 11,280 school districts,
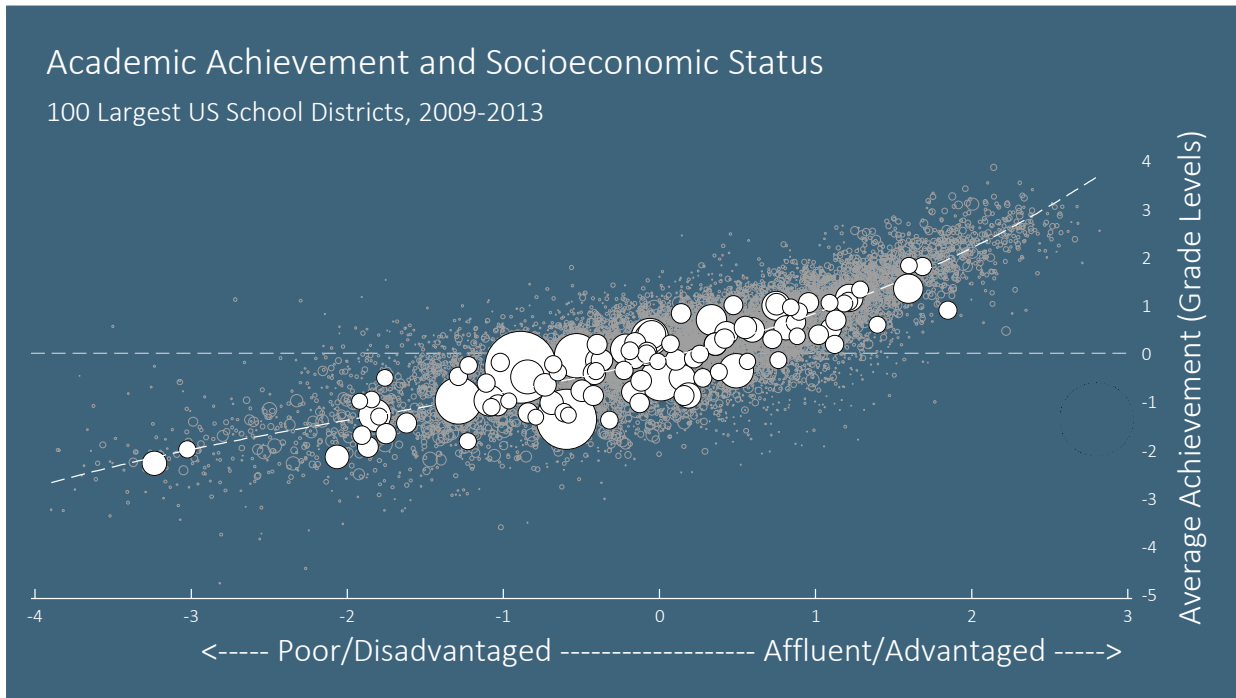
Figure 1
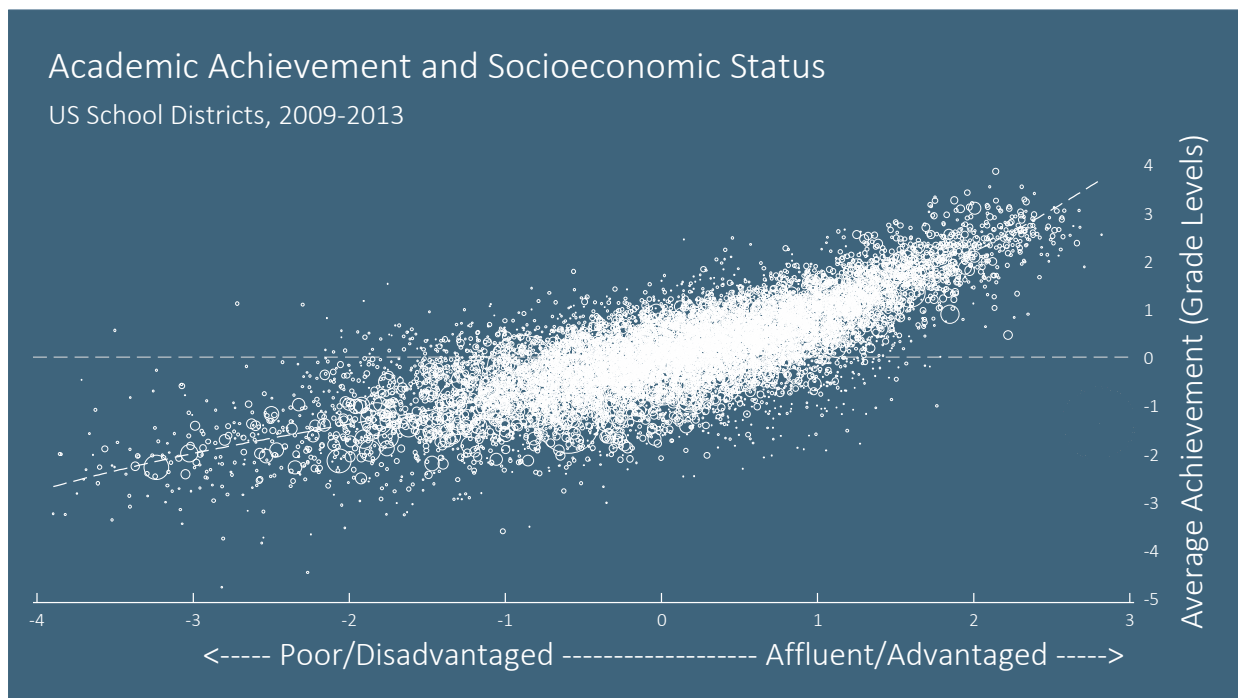
against the average SES level of the students enrolled in the district. The bubbles in the plot are weighted by the size of the district.

Several things are striking in this figure. First is the obvious, and very strong, relationship between district socioeconomic status and average academic achievement. The district-level correlation between the two is 0.78; the student level correlation (that is, the correlation weighted by district enrollment), is 0.84. Students in many of the most advantaged school districts have test scores that are more than four grade levels above those of students in the most disadvantaged districts. The socioeconomic context of a school district is a very powerful predictor of students' academic performance

Of the 1,000 poorest districts in the U.S., only 68 (6.8%) have mean test scores at or above the national average. These are mostly small districts; they collectively enroll about 7,000 students per grade (less than two-tenths of one percent of all students in the U.S.). Likewise, of the 1,000 most affluent districts in the U.S., only 16 (1.6% of districts, collectively enrolling fewer than 1,000 students per grade) have mean test scores at or below the national average. In other words, we have little evidence that we know how to provide adequate educational opportunities for children growing up in low-income communities.

Second is the fact that, despite this strong association between SES and average academic performance, there are school districts with the same level of SES but with meaningfully different average test scores. The residual standard deviation around the fitted regression curve in Figure 1 is 0.64. Roughly 5 percent of districts have average scores more than one grade level above what we would predict based on their socioeconomic status; another 5 percent have average scores more than one grade level below what I would predict. This variation is not confined to small districts; even among large school districts (highlighted in Figure 2), there is substantial variation in average test score among school districts with similar socioeconomic profiles.

Figure 2

Academic Achievement and Socioeconomic Status
100 Largest US School Districts, 2009-2013

<----- Poor/Disadvantaged ------------------ Affluent/Advantaged ----->

Average Achievement (Grade Levels)

Racial/Ethnic Differences in Average Achievement

Figure 1 shows the average performance of all students in each school district. But even within the same district, there are large racial differences in average achievement. In Figure 3, each bubble corresponds to a race/ethnic group within a specific school district. The points are plotted against the average district SES (of all students). So one can think of this figure as taking each point in Figure 1, and breaking it into multiple bubbles, each of which is placed vertically above or below the overall district dot in accordance with that groups' average test scores.

Note that the only points shown here are those cases where there are at least 100 students of a given race per grade in a district, and where there are at least 200 students per grade overall in the district. Many districts are too small to meet this threshold, and even among those with at least 200 students, many do not have more than one group with at least 100 students per grade. Therefore many

districts do not appear at all in Figure 3; some appear only for one race; others appear for two or three groups.

Figure 3 illustrates that the racial achievement gaps are very large, even among students of different race/ethnicities who attend schools with similar socioeconomic conditions. The vertical distance between the three groups is quite large. On average white students score one and half or more grade levels higher than black and Hispanic students enrolled in socioeconomically similar school districts.

The other striking feature of Figure 3 is that there are very few school districts where black students score, on average, at or above the national average. In fact, of the 946 school districts with at least 100 black students per grade, there are only 18 districts, enrolling a total of roughly 3000 black students per grade (one half of one percent of all black students in the U.S.) in which black students' average test scores are at or above the national average.
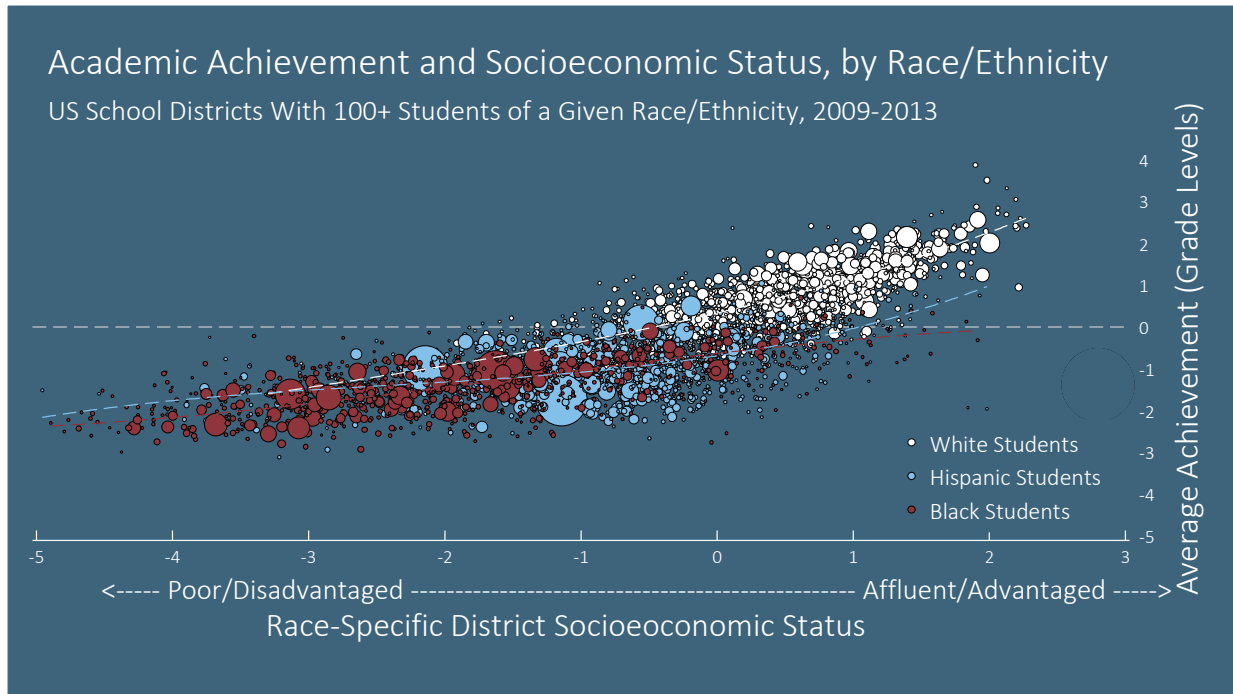
Figure 3
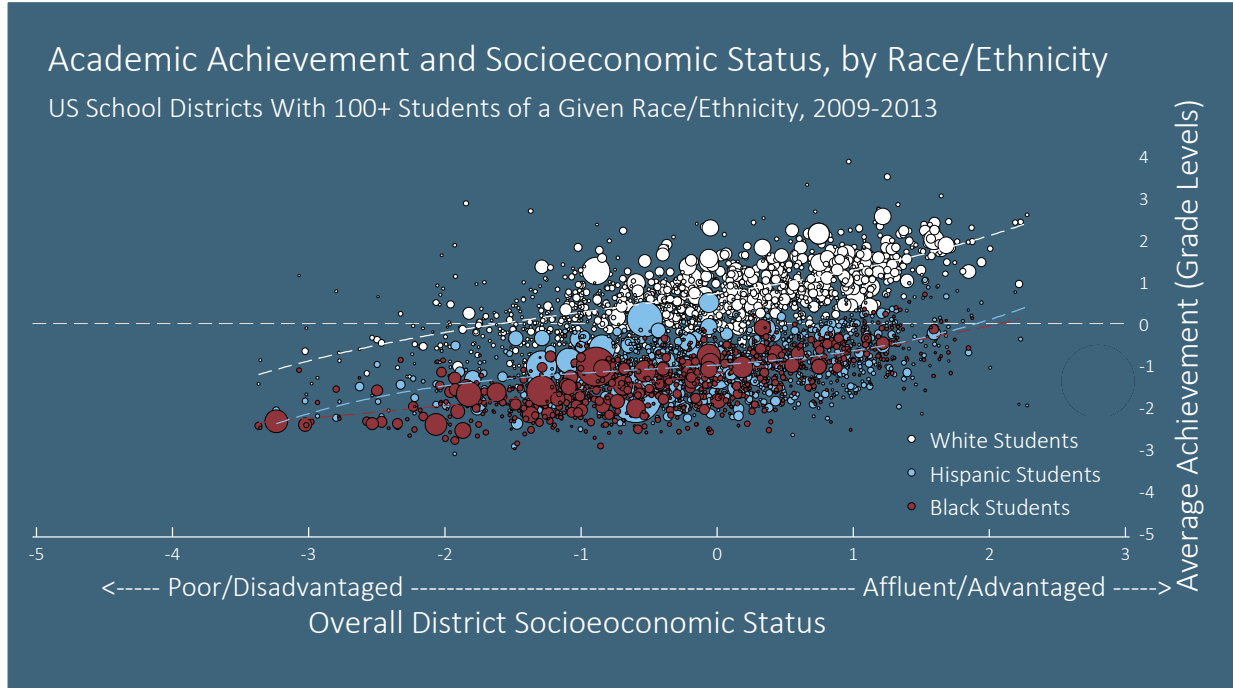
One reason for the large racial/ethnic disparities in achievement may be that even among those who live in districts with similar socioeconomic conditions, black and Hispanic students are poorer, on

average, than white students (see Table 2 above). Figure 4 presents the same sample of districts as Figure 3, but now each race/ethnic group is placed horizontally in relation to its own group's average socioeconomic status within the district. Black students have, on average, lower levels of SES than Hispanic students, who in turn have lower SES than white students. Figure 4 shows that these differences explain some, but not all of the differences in academic achievement between white and non-white students. Even in school districts where black students have relatively high SES, they score far below (more than a grade level below) white students in districts where white students the same socioeconomic status. Clearly racial differences in socioeconomic context and conditions are part of the reason for black and Hispanic students' lower achievement than white students, but they are not the whole reason.

Figure 4

Academic Achievement and Socioeconomic Status, by Race/Ethnicity
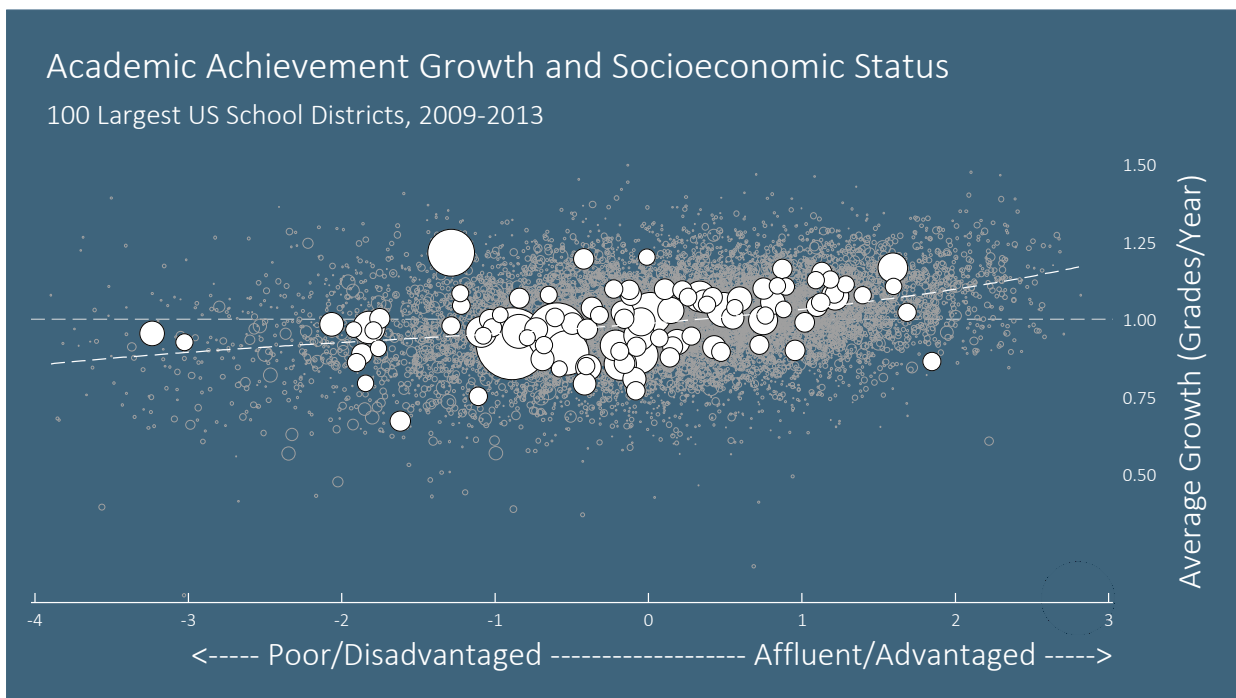US School Districts With 100+ Students of a Given Race/Ethnicity, 2009-2013

Growth in Academic Performance Across Grades

The SEDA data include at least one year of test scores for 10 cohorts of students, those who entered kindergarten from Fall 2000 through Fall 2009 (the earliest of these cohorts would be expected to be in 8th grade in 2009, the first year of the SEDA data; the latest of these would be expected to be in 3rd grade in 2013, the last year of the SEDA data). Most of these cohorts are observed for 2 or more years, so we can estimate the average change in test scores, within cohorts. These estimates are plotted in Figure 5 in relation to socioeconomic status.

Notable here is the SES-growth rate gradient. Average test scores grow moderately faster in higher-SES school districts than in low-SES districts. The slope of the fitted line is about 0.04, meaning that districts that differ by 1 standard deviation in SES differ by about 4% in the annual growth rate of their students' performance. This means that students in the most affluent school districts gain almost 1 year more of academic performance growth between third and eighth grade than do the poorest school districts.

Figure 5

Academic Achievement Growth and Socioeconomic Status
100 Largest US School Districts, 2009-2013

<----- Poor/Disadvantaged ------------------ Affluent/Advantaged ----->

Average Growth (Grades/Year)

This means that performance disparity between high- and low-SES districts is larger in 8th grade than in 3rd grade. Figure 6 displays this; it shows the fitted regression line of the association between school district average test scores and SES for each grade from 3-8. The line is roughly 20% steeper by 8th grade.
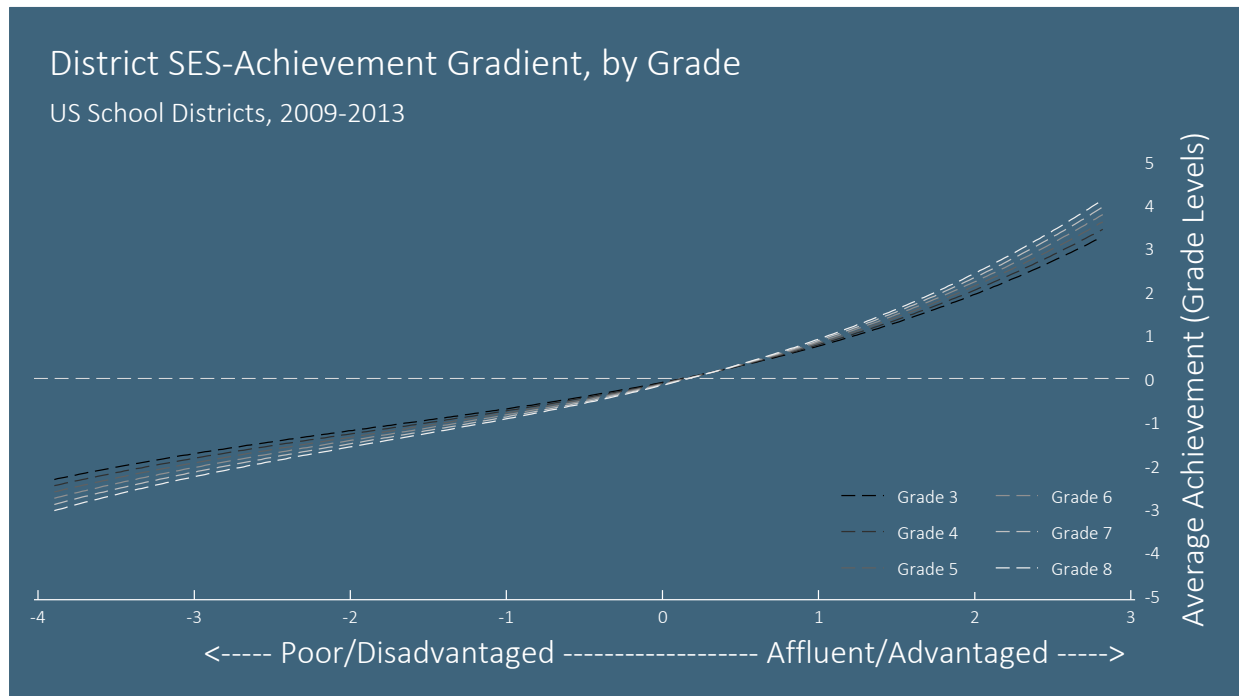
Conclusion

The data here provide a look, unprecedented in detail, at the patterns of academic achievement across school districts in the U.S. They show several key things:

1. The variation in academic achievement among school districts is very large; students in some districts have scores more than 4 grade levels higher than others.

2. This variation is very highly correlated with the socioeconomic characteristics of families in the local community. It is not clear, however, how much of the association is due to differences in the quality of schooling, or in the opportunities children have to learn and develop outside of school, in their homes and neighborhoods.

3. The association between community socioeconomic status and academic performance grows steeper as children progress through school. Again, it is not clear whether this results from differences in the quality of schools in high- and low-income communities, or because of differences in children's outside of school opportunities to learn.

4. Racial/ethnic disparities in academic performance are large, both overall and within individual school districts. The average within-district white-black and white-Hispanic achievement gaps are roughly 2.0 and 1.5 grade levels, respectively. Moreover, extremely few black and Hispanic students live in school districts where average achievement is at the national average for grade level.

5. Part of the within-district racial achievement gaps are the result of racial/ethnic disparities in family socioeconomic background. But even in places where white and black or white and Hispanic students come from families with the same socioeconomic characteristics, racial/ethnic achievement gaps are present, and substantial.

Together, these findings suggest that socioeconomic context is a powerful force shaping children's educational opportunities and success. But poverty is not destiny; inequality is not inevitable. There are places where children of a given socioeconomic background perform much better on tests than children in other places with the same background. It is essential that we learn from such places so that we can improve educational opportunities for children who do not have the opportunity to grow up in an affluent community.