

To: Elizabeth Green

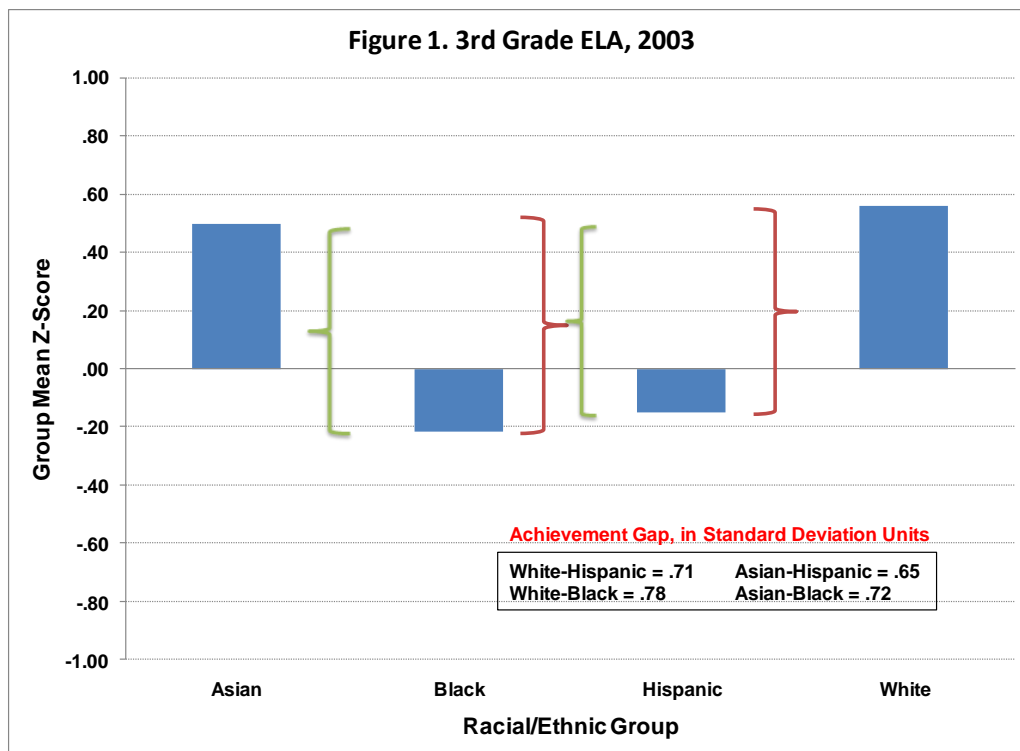
From: Aaron M. Pallas

Date: August 4, 2008

Thank you for sharing the NYC Citywide ELA and Math scale score data for the years 2002-2008 with me. I have analyzed the data and come to some tentative conclusions, which I share in this memo.

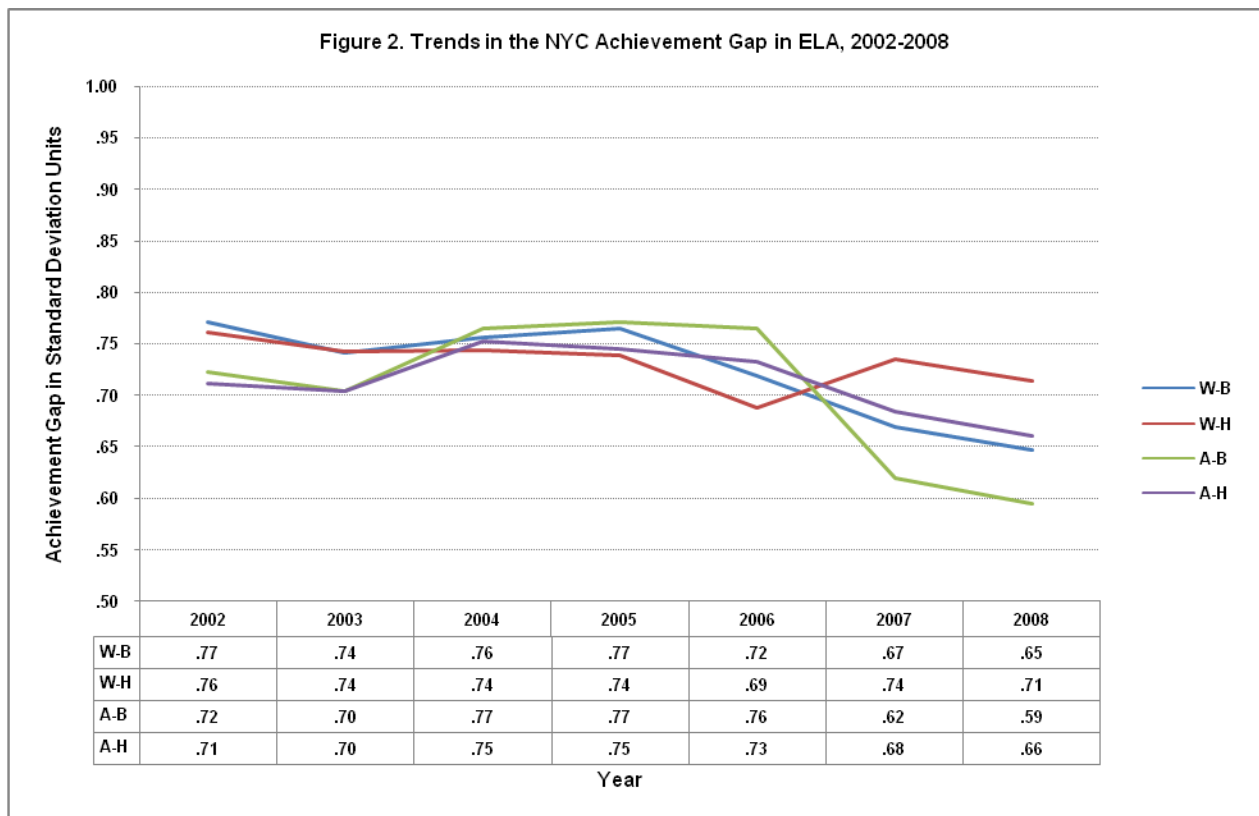
The data are reported as citywide group scale score means by grade for Asian, Black, Hispanic and white ethnic groups, along with the citywide means and standard deviations, for the ELA and Math exams. For each grade and year combination, I first calculated the relative position of each ethnic group in relation to the citywide mean. Computationally, this involves subtracting the citywide mean from the ethnic group mean, and dividing by the citywide standard deviation. The resulting value represents the distance of the ethnic group mean from the citywide mean in standard deviation units, which is commonly referred to as a z-score.

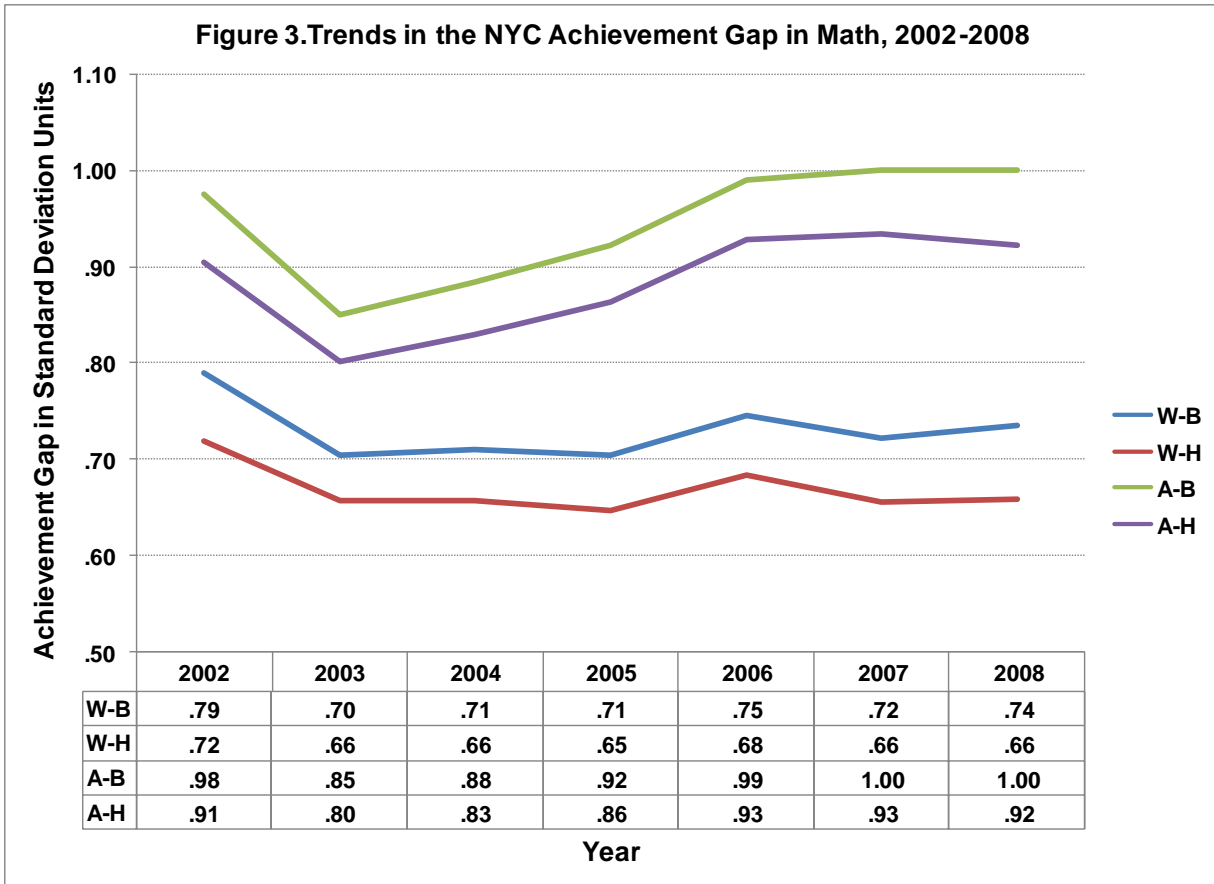
Figure 1 below shows this for third-grade ELA scores in 2003. By locating each racial/ethnic group in relation to the citywide average, we can calculate how far apart each group mean is in standard deviation units. The figure shows that on the 3<sup>rd</sup>-grade ELA in 2003, the Black-white achievement gap was .78 standard deviations, and the Hispanic-white achievement gap was .71 standard deviations. Similarly, the Asian-Black achievement gap was .72 standard deviations, and the Asian-Hispanic achievement gap was .65 standard deviations.



Because the ELA and Math tests are not vertically equated, it is not possible to average scale scores across grades to obtain a total average performance by racial/ethnic group for Math or ELA across grades 3 through 8 in a given year. To generate a summary estimate of the magnitude of the achievement gap for a given year, I averaged the relevant group-specific achievement gaps across grades 3 through 8. For example, to calculate the Black-white achievement gap in ELA scores for 2003, I averaged the gaps estimated separately (as in Figure 1) for grades 3, 4, 5, 6, 7 and 8. This approach does not take account of differences in the size of the racial/ethnic groups across grades; nor does it take account of possible differences in the precision of the estimates of the achievement gaps across grades. But it does yield a summary of each of the four relevant achievement gaps separately for ELA and Math for each year.

Figures 2 and 3 display the trends in the magnitude of the achievement gaps from 2002 to 2008, for ELA and Math respectively. There are separate lines for each of the four major racial/ethnic comparisons: White-Black, White-Hispanic, Asian-Black and Asian-Hispanic. The figures also include a data table that shows the magnitude of each gap in standard deviation units for each year during this period. For example, Figure 2 shows that in 2002, the White and Black means on the ELA were .77 standard deviations apart; by 2008, that gap had shrunk to .65 standard deviations, which is reflected in the blue line in the figure.



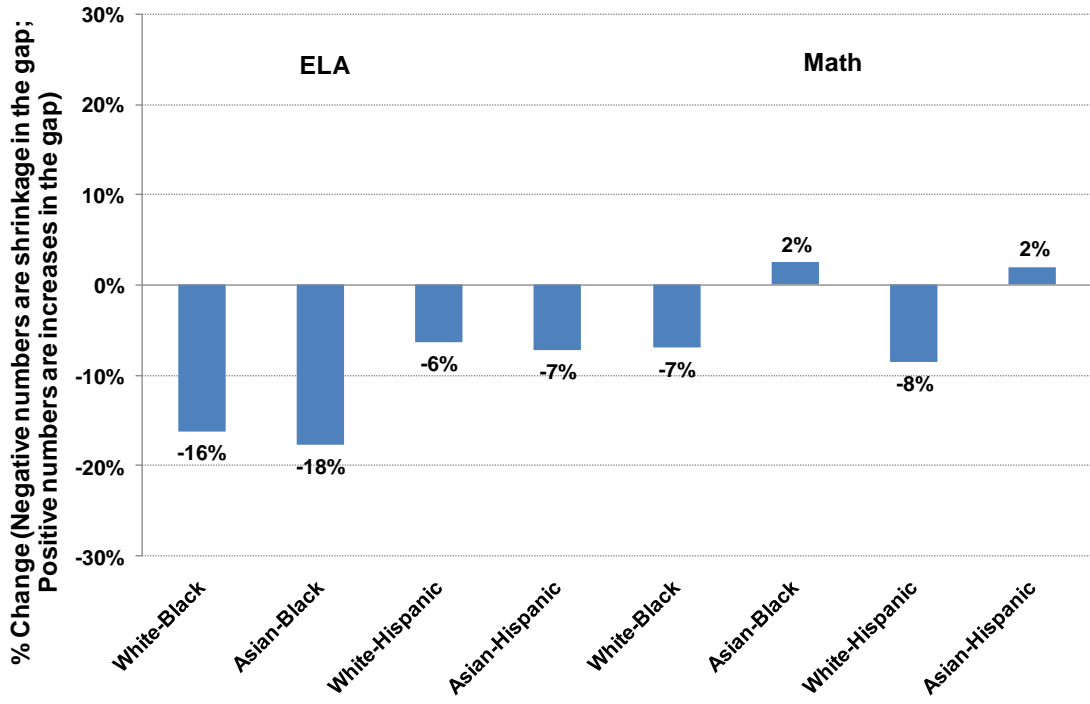


As these figures suggest, the patterning of the achievement gap is different for ELA than for Math. Most of the ELA gaps are in the range of .70 standard deviations, whereas the Math gaps range from .70 standard deviations to a full standard deviation. The trends over time also differ for ELA and Math.

Figures 4 and 5 summarize the overall change in size of the four achievement gaps for ELA and Math, for the periods 2002-2008 and 2003-2008 respectively. These figures use the data from the data tables in Figures 2 and 3 to calculate the amount of shrinkage in the magnitude of the achievement gap during the period represented in the figure. For example, Figure 3 shows that the White-Black achievement gap in Math in 2002 was .79 standard deviations, whereas the same gap in 2008 was .74 standard deviations. The smaller gap in 2008 represented a 7% reduction in the size of the achievement gap from 2002 to 2008.

I report the changes for 2002-2008 and 2003-2008 separately because there are disagreements over what the appropriate period for observing shrinkage in the achievement gap should be, with some analysts locating the appropriate starting point as 2002, and others as 2003. The choice has consequences, because the pattern in 2002 was different than 2003. This is especially evident in Figure 3, which shows a sharp reduction in the magnitude of the achievement gap between 2002 and 2003. Consequently, estimates of the amount of shrinkage in the achievement gap during the current administration will be larger if 2002 is used as the baseline than if 2003 is taken as the starting point.

**Figure 4. Summary Shrinkage in the Achievement Gap in NYC, 2002-2008**



**Figure 5. Summary Shrinkage in the Achievement Gap in NYC, 2003-2008**

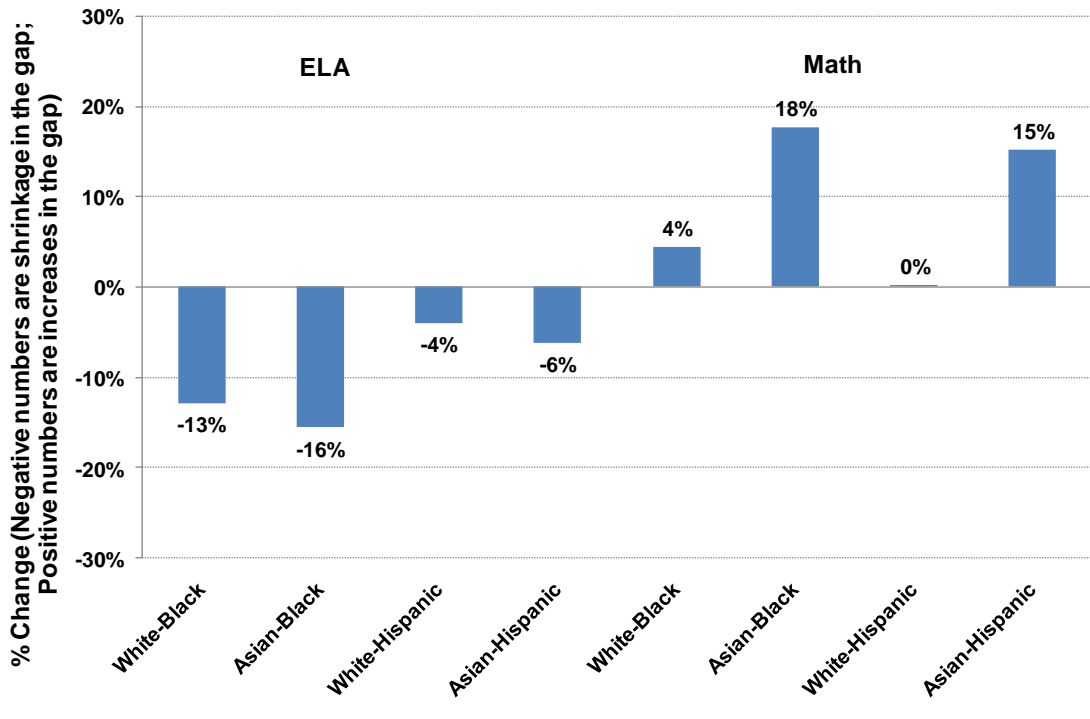


Figure 4 reports shrinkage in the achievement gaps from 2002-2008. For the ELA, both Blacks and Hispanics gained ground on whites and Asians. The achievement gap between whites and Blacks shrank by 16% over this period, and the gap between Asians and Blacks shrank by 18%. The Hispanic-white and Hispanic-Asian achievement gap on the ELA did not shrink as much from 2002-2008, an average of 6% and 7%, respectively.

For Math, both Blacks and Hispanics gained ground in relation to whites from 2002 to 2008. The Black-white achievement gap in Math shrank by 7%, and the Hispanic-white achievement gap by 8%, over the period 2002 to 2008. However, both Blacks and Hispanics lost ground in relation to Asians over the period of 2002 to 2008. The Black-Asian and Hispanic-Asian achievement gap in math both increased by 2% between 2002 and 2008.

Figure 5 reports similar data for 2003 to 2008, the past five years. For the ELA, the pattern looks substantially similar to the 2002 to 2008 pattern reported in Figure 4. The achievement gap between whites and Blacks shrank by 13%, and that between Asians and Blacks by 16%. The Hispanic-white achievement gap in ELA performance shrank by 4% from 2003 to 2008, and the Hispanic-Asian gap in ELA performance declined by 6%.

The patterning of achievement gaps in Math from 2003 to 2008 is not as encouraging. The magnitude of the Black-white achievement gap in Math increased by 4% from 2003 to 2008, and the Hispanic-white achievement gap held steady, showing no decline in magnitude from 2003 to 2008. Most striking, however, is the increase in the magnitude of the math achievement gaps for Blacks and Hispanics in relation to Asian students. The Black-Asian achievement gap in Math increased by 18% from 2003 to 2008, and the Hispanic-Asian achievement gap in Math increased by 15% over this period. Over the past five years, then, there is no evidence of any shrinkage in the math achievement gap in New York City, and in fact considerable evidence of a widening gap between Blacks and Asians and between Hispanics and Asians.

It is difficult to judge what an “appropriate” rate of decline in the magnitude of these achievement gaps might be, as the gaps reflect a wide range of forces both inside and outside of school. They are all still quite large in 2008, but the signs of progress over the past five or six years, however slow, for the ELA are encouraging. But whatever a realistic pace for closing the gap might be, evidence of increases over time, which are reflected in the gaps in mathematics, are clearly not what we are hoping to see.

### **Why the Achievement Gap Matters**

The progress towards closing the proficiency gap between Blacks and Hispanics, on the one hand, and whites and Asians, on the other, is an accomplishment that New Yorkers can be proud of. For the most part, it reflects rising student performance on the state Math and ELA tests. However, the proficiency gap is just a part of the achievement gap, and the lack of progress on closing the achievement gap is an ongoing concern.

This last section provides an example of why the achievement gap is important even if the scores of whites, Blacks, Hispanics and Asians are all increasing at the same time. I draw on a hypothetical example of the admission of Black and white applicants to a selective college.

Suppose that Sycamore College has 100 spaces in its freshman class. The college admits students solely on the basis of test scores – the top 100 scorers are admitted, and the other students are rejected. 100 white students and 100 Black students apply.

*Scenario #1:* The average score for white students on the test is 550, with a standard deviation of 100, and the average score for Black students is 480, with a standard deviation of 100. The achievement gap between Black and white students is  $(550-480)/100 = .70$ . (This is about the size of the Black-white achievement gap on tests in NYC.)

I generated 100 Black students and 100 white students with these characteristics, and ranked the students on their test scores from high to low. Of the top 100 scorers, 64 (64%) were white, and 36 (36%) were Black. With an achievement gap of .70, then, Blacks are considerably less likely to be admitted to Sycamore.

*Scenario #2:* The average score for white students and black students has increased by 20 points over Scenario #1. Now, the average score for white students on the test is 570, with a standard deviation of 100, and the average score for Black students is 500, with a standard deviation of 100. Even though scores for both groups have increased substantially, the achievement gap hasn't changed: it's  $(570-500)/100=.70$ .

I generated 100 Black students and 100 white students with these characteristics, and ranked the students on their test scores from high to low. Of the top 100 scorers, 63 (63%) were white, and 37 (37%) were Black. Even though both groups increased their scores, since the achievement gap stayed the same, Blacks were still much less likely to be admitted to Sycamore – with essentially the same chance of admission as before the score increase.

*Scenario #3:* The average score for white students has increased by 20 points over Scenario #1, and the average score for Black students has increased by 60 points. Now, the average score for white students on the test is 570, with a standard deviation of 100, and the average score for Black students is 540, with a standard deviation of 100. Both groups have increased their scores, but the achievement gap has shrunk considerably—from .70 to  $(570-540)/100=.30$ .

I generated 100 Black students and 100 white students with these characteristics, and ranked the students on their test scores from high to low. Of the top 100 scorers, 54 (54%) were white, and 46 (46%) were Black. The shrinkage of the achievement gap from .70 to .30 has substantially increased the likelihood that Black students will be admitted to Sycamore—from 36% of the entering class to 46% of the entering class.

This is of course a simplified example, but it illustrates a more general phenomenon. There are a great many social institutions that sort and rank individuals on the basis of test scores and the competencies they represent. Most of these institutions don't have an unlimited number of positions or slots—rather, individuals are competing against one another for access. When these institutions rely on test scores, and there is an achievement gap among racial/ethnic groups on these tests, the lower-scoring group will be underrepresented. Raising everybody's scores doesn't change the rankings of individuals, which is the only way to change the representation of minority groups among those who are selected. Only by reducing the achievement gap can we increase the chances that members of racial/ethnic minority groups can get ahead in society via selective social institutions.

