Why Comparing NAEP Poverty Achievement Gaps Across States Doesn't Work

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Pundits love to make cross-state comparisons and rank states on a variety of indicators, something I'm guilty of as well.[1] A favorite activity is comparing NAEP test scores across subjects, including comparing which states have the biggest test score gaps between children who qualify for subsidized lunch and children who don't. The simple conclusion is that states with big gaps are bad – inequitable – and states with smaller gaps must being doing something right!

It is generally assumed by those who report these gaps and rank states on achievement gaps that these gaps are appropriately measured – comparably measured – across states. That a low-income child in one state is similar to a low-income child in another. That the average low-income child or the average of low-income children in one state is comparable to the average of low-income children in another, and that the average of non-low income children in one state is comparable to the average of non-low income children in another. Unfortunately, however, this is a deeply flawed assumption.

Let's review the assumption. Here's the basic framing adopted by most who report on this stuff:

Non-Poor Child Test Score – Poor Child Test Score = Poverty Achievement Gap

Non-Poor Child in State A = Non-Poor Child in State B

Poor Child in State A = Poor Child in State B

These conditions have to be met for there to be any validity to rankings of achievement gaps.

Now, here's the problem.

[1] See: www.schoolfundingfairness.org

Poor = child from family falling below 185% income level relative to income cut point for poverty

Therefore, the measurement of an achievement gap between "poor" and "non-poor" is:

Average NAEP of children above 185% poverty threshold – Average NAEP of children below 185% poverty threshold = "Poverty" achievement Gap

But, the income level for poverty is not varied by state or region.[2]

As a result, the distribution of children and their families above and below the specified threshold varies widely from state to state, and comparing the average performance of the groups of children above that threshold and below it is not particularly meaningful. Comparing those gaps across states is really problematic.

Here are graphs of the poverty distributions (using a poverty index where 100 = 100%, or income at the poverty level) for families of 5 to 17 year olds in New Jersey and in Texas. These graphs are based on data from the 2008 American Community Survey (from www.ipums.org). They include children attending either/both public and private school.

[2] See: http://schoolfinance101.files.wordpress.com/2011/03/slide1.jpg

Figure 1

Poverty Distribution (Poverty Index) and Reduced Price Lunch Cut-Point

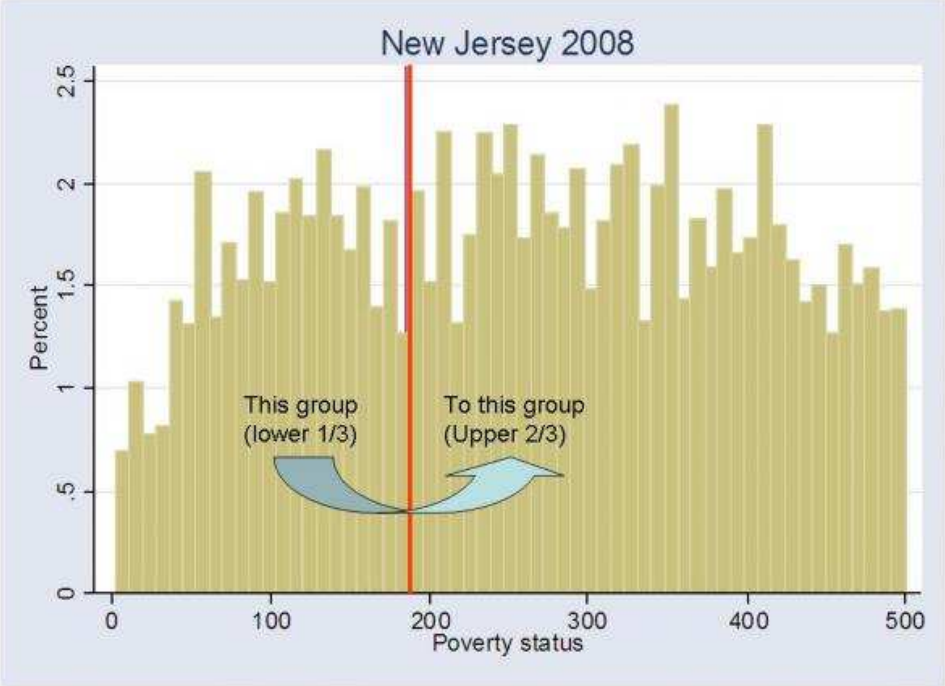
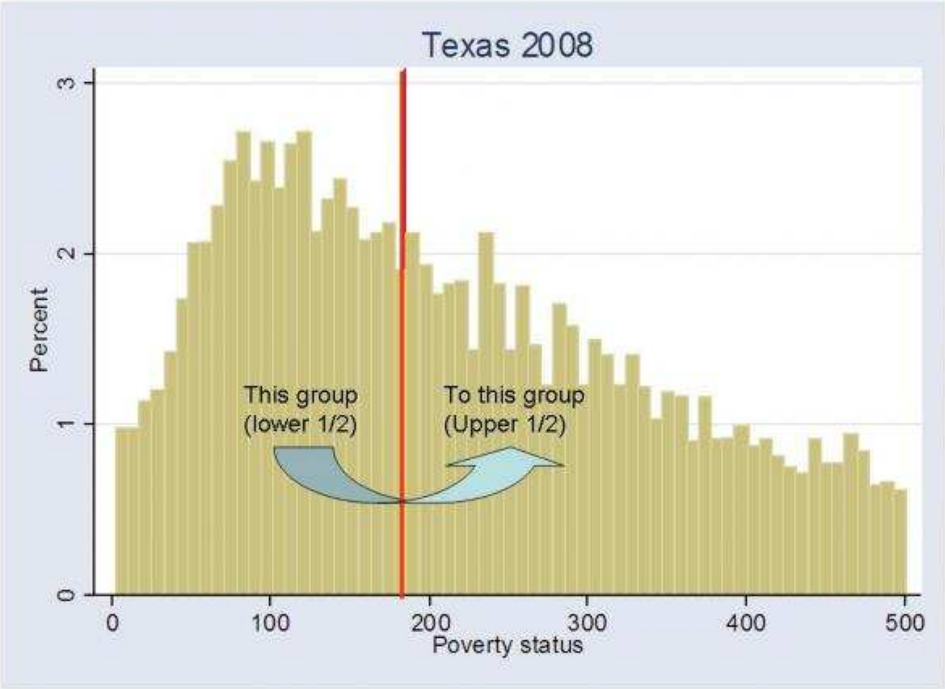


Figure 2

Poverty Distribution (Poverty Index) and Reduced Price Lunch Cut-Point



To put it really simply, comparing the groups to the right and to the left of the 185% line in New Jersey means something quite different from comparing the groups to the right and left of that 185% line in Texas, where the majority are actually under 185%… but where an income above 185% may not by any stretch of the imagination be associated with comparable economic deprivation. Further, in New Jersey, much larger shares of the population are distributed toward the right hand end of the distribution – the distribution is overall "flatter." These distributional differences undoubtedly have significant influence on the estimation of achievement gaps. As I often point out, the size of an achievement gap is as much a function of the height of the highs as it is a function of the depth of the lows.[3]

[3] For further explanation of the problems with poverty measurement across states, using constant thresholds, and proposed solutions see: Renwick, Trudi (2009, August). Alternative Geographic Adjustments of U.S. Poverty Thresholds: Impact on State Poverty Rates. U.S. Census Bureau. https://xteam.brookings.edu/ipm/Documents/Trudi_Renwick_Alternative_Geographic_Adjustments.pdf

How does this matter when comparing poverty achievement gaps?

While they show how different the poverty and income distributions were in Texas and New Jersey as an example, the charts above don't explain how or why these distribution differences thwart comparisons of low-income vs. non-low income achievement gaps. Yet, it should be clear enough that in comparing any states, we can't assume that the groups on either side of the 185% line are similar.

A logical extension of the analysis above would be to look at the relationship between:

Gap in average family total income between those above and below the free or reduced price lunch cut-off

AND

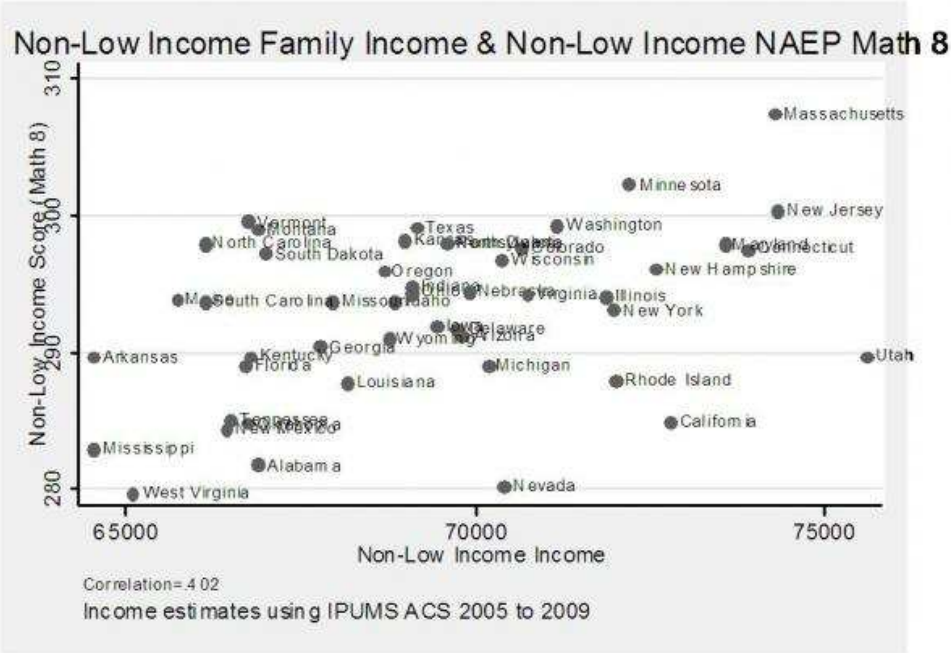
Gap in average NAEP scores between children from families above and below the free or reduced price lunch cut-off

If there is much (or any) of a relationship between the income gaps and the NAEP gaps – that is, states with larger income gaps between the poor and non-poor groups also have larger achievement gaps – such a finding would call into question the usefulness of state comparisons of these gaps.

So, let's walk through this step by step.

First, Figure 3 shows the relationship across states between the NAEP Math Grade 8 scores and family total income levels for children in families ABOVE the free or reduced cutoff:

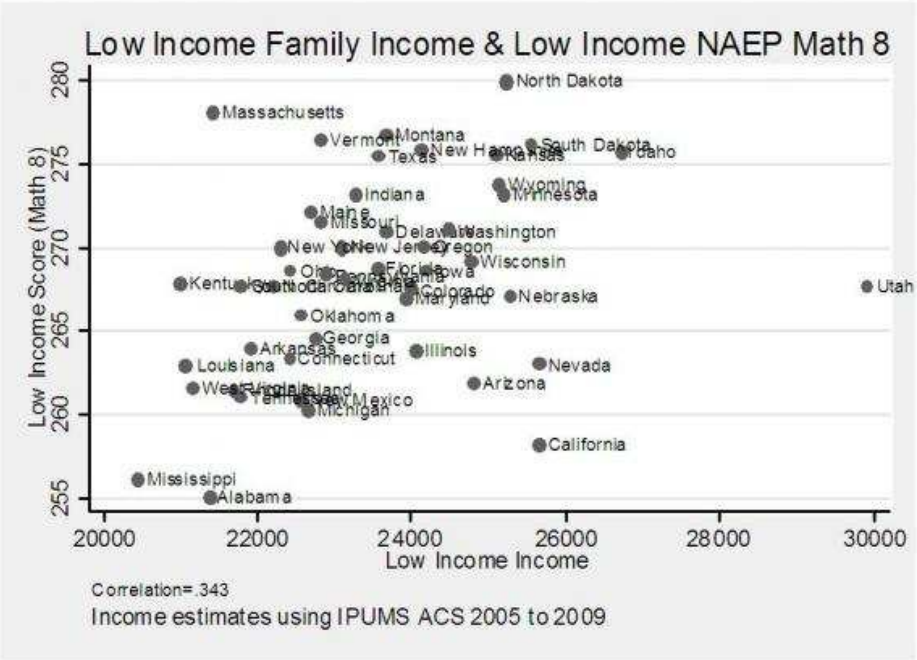
Figure 3



There is a modest relationship between income levels of non-low income children and NAEP scores. Higher income states generally have higher NAEP scores. No adjustments are applied in this analysis to the value of income from one location to another, mainly because no adjustments are applied in the setting of the poverty thresholds. Therein lies at least some of the problem. The rest lies in using a simple ABOVE vs. BELOW a single cut point approach.

Second, Figure 4 shows the relationship between the average income of families below the free or reduced lunch cut point and the average NAEP scores on 8th Grade Math (2009).

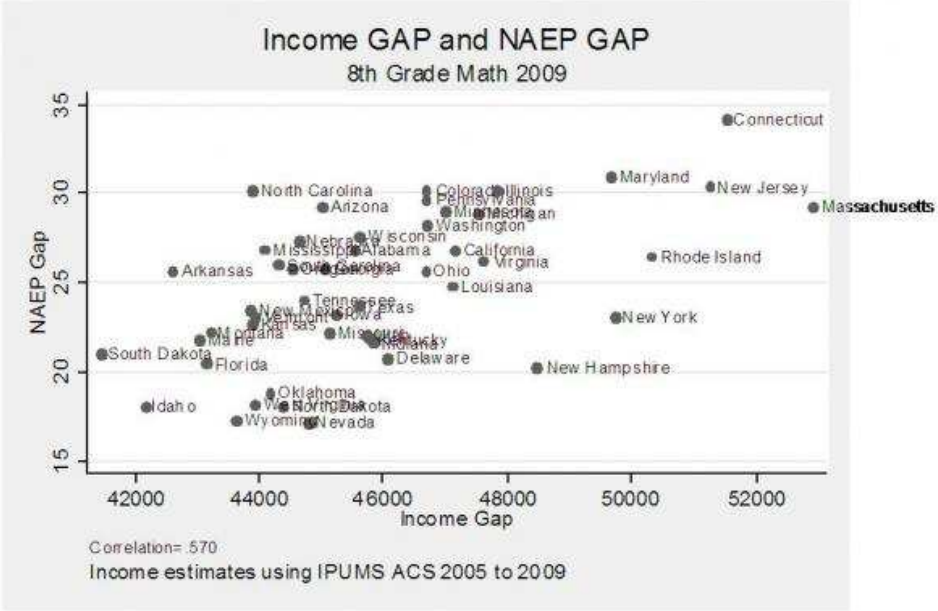
Figure 4



This relationship is somewhat looser than the previous relationship and for logical reasons – mainly that we have applied a single low-income threshold to every state and the average income of individuals below that single income threshold does not vary as widely across states as the average income of individuals above that threshold. Further, the income threshold is arbitrary and not sensitive do the differences in the value of any given income level across states. But still, there is some variation, with some stats have much larger clusters of very low-income families below the free or reduced price lunch threshold (Mississippi).

But, here's the most important part. Figure 5 shows the relationship between income gaps estimated using the American Community Survey data (www.ipums.org) from 2005 to 2009 and NAEP Gaps. This graph addresses directly the question posed above: whether states with larger gaps in income between families above and below the arbitrary low-income threshold also have larger gaps in NAEP scores between children from families above and below the arbitrary threshold.

Figure 5



In fact, they do. And this relationship is stronger than either of the two previous relationships. As a result, it is somewhat foolish to try to make any comparisons between achievement gaps in states like Connecticut, New Jersey and Massachusetts versus states like South Dakota, Idaho or Wyoming. It is, for example, more reasonable to compare New Jersey and Massachusetts to Connecticut, but even then, other factors may complicate the analysis.

How does this affect state ranking gaps? Re-ranking New Jersey

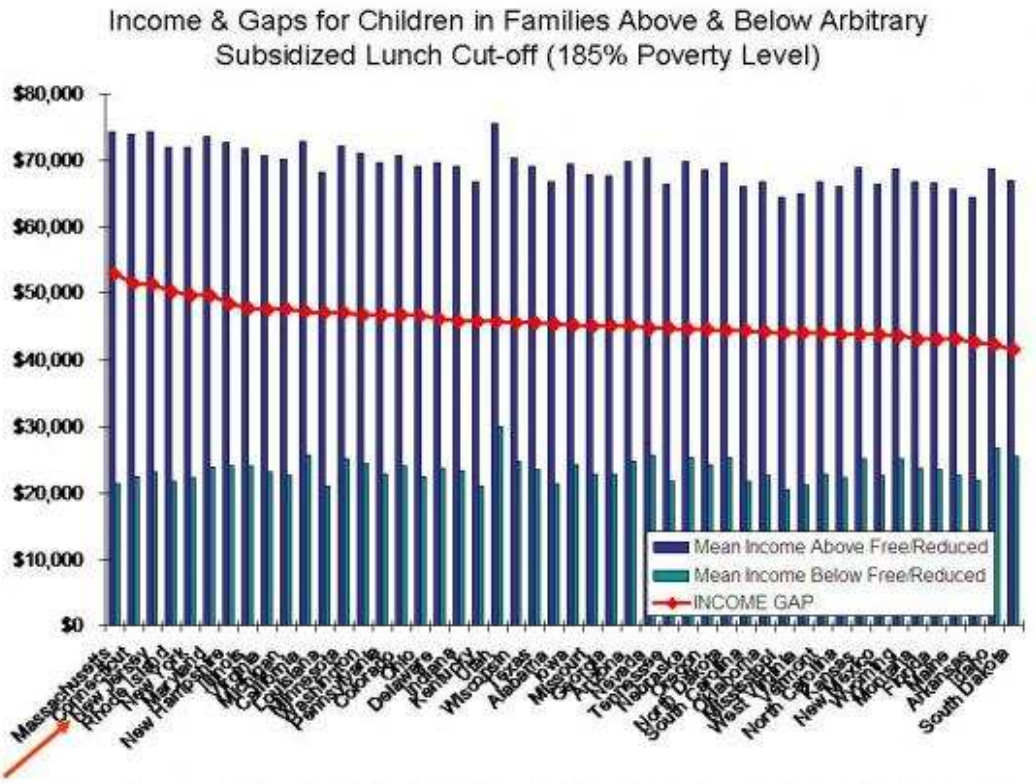
New Jersey's current commissioner of education seems to stake much of his case for the urgency of implementing reform strategies on the argument that while New Jersey ranks high on average performance, New Jersey ranks 47th in achievement gap between low-income and non-low income children (video here: http://livestre.am/M3YZ). To be fair, this is classic political rhetoric with few or no partisan boundaries.

To review, comparisons of achievement gaps across states between children in families above the arbitrary 185% income level and below that income level are very problematic. Above we see that in states where there is a larger gap in income between these two groups, there is also a larger gap in achievement. That is, the size of the achievement gap is largely a function of the income distribution in each state.

Let's take this all one more step and ask, if we correct for the differences in income between low and higher income families, how do the achievement gap rankings change? And, let's do this with an average achievement gap for 2009 across NAEP Reading and Math for Grades 4 and 8.

Figure 6 shows the differences in income for lower and higher income children, with states ranked by the income gap between these groups:

Figure 6

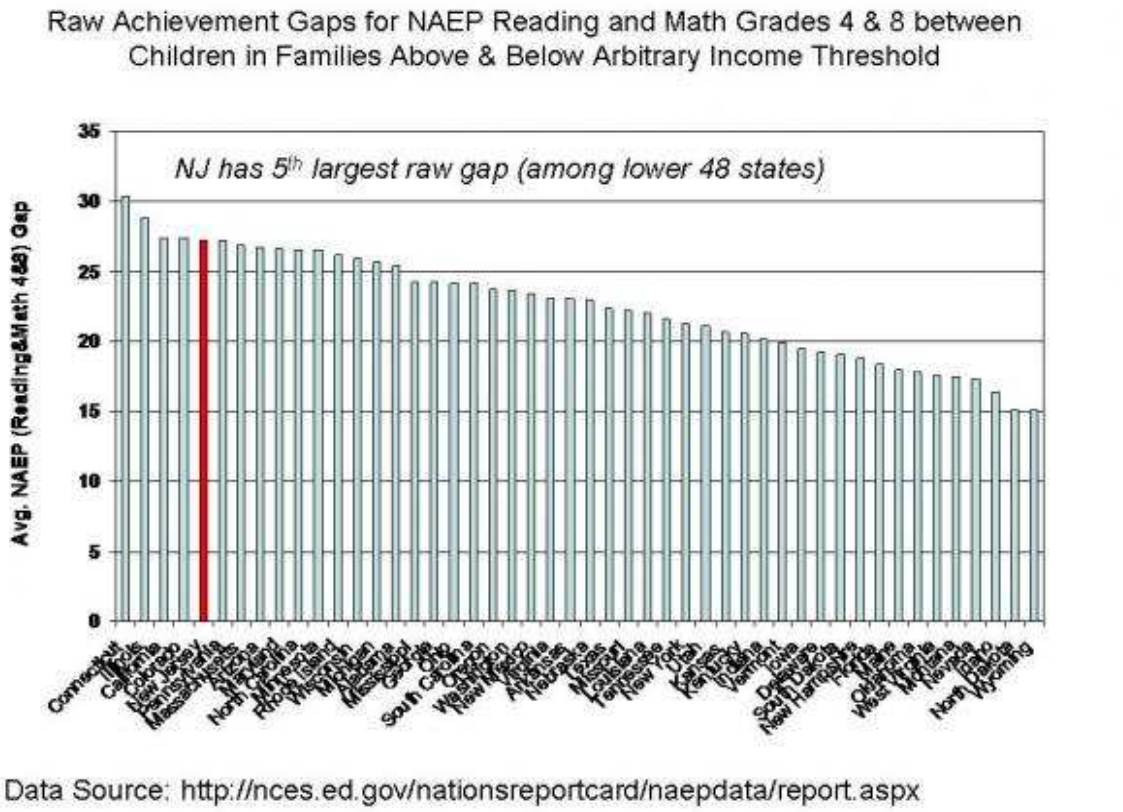


Data source: Steven Ruggles, J. Trent Alexander, Katie Genadek, Ronald Goeken, Matthew B. Schroeder, and Matthew Sobek. *Integrated Public Use Microdata Series: Version 5.0* [Machine-readable database]. Minneapolis: University of Minnesota, 2010.

Massachusetts, Connecticut and New Jersey have the largest income gaps between families above and below the arbitrary Free or Reduced Price Lunch income cut off.

Now, let's take a look (Figure 7) at the raw achievement gaps averaged across the four tests:

Figure 7

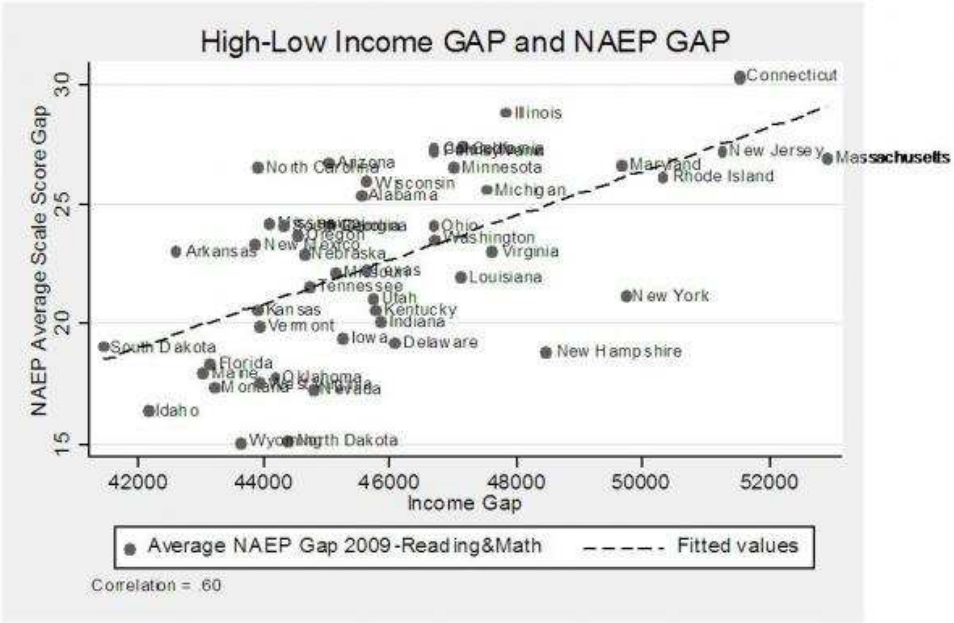


New Jersey has a pretty large raw gap, coming in 5th among the lower 48 states (note there are other difficulties in comparing the income distributions in Alaska and Hawaii, in relation to free/reduced lunch cut points). Connecticut and Massachusetts also have very large achievement gaps.

One can see here, anecdotally, that states with larger income gaps in the first figure are generally those with larger achievement gaps.

Here, in Figure 8, is the relationship between the two:

Figure 8

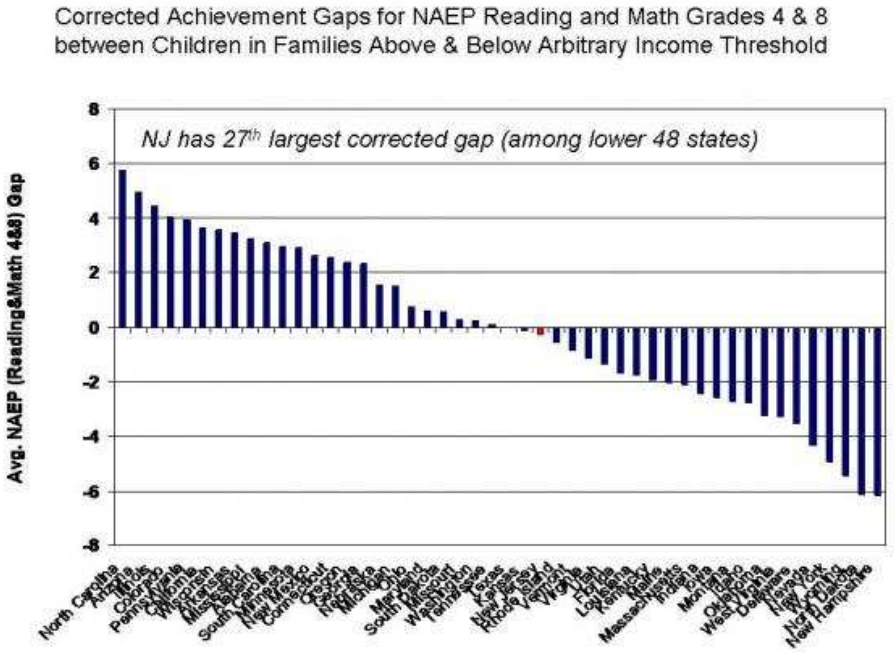


In this graph, a state that falls on the diagonal line, is a state where the achievement gap is right on target for the expected achievement gap, given the difference in income for those above and below the arbitrary free or reduced price lunch cut-off. New Jersey falls right on that line. States falling on the line have relatively "average" (or expected) achievement gaps.

One can take this the next step to rank the "adjusted" achievement gaps based on how far above or below the line a state falls. States below the line have achievement gaps smaller than expected and above the line have achievement gaps larger than expected. At this point, I'm not totally convinced that this adjustment is capturing enough about the differences in income distributions and their effects on achievement gaps. But it makes for some fun adjustments/comparisons nonetheless. In any case, the raw achievement gap comparisons typically used in political debate are pretty meaningless because they do not correct for the size of the income gap between the students.

Here are adjusted achievement gap rankings (Figure 9):

Figure 9



Here, NJ comes in 27th in achievement gap. That is 27th from largest. That is, New Jersey's adjusted achievement gap between higher- and lower-income students, when correcting for the size of the income gap between those students, is smaller than the gap in the average state.