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Parental Education Level Predicts Differences

Between High and Low Performing States

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Abstract

This study examined the correlation between the percentage of college graduate parents of eight-grade students and NAEP reading and math scores for fifty states for 2003, 2005, 2007, 2009, and 2011. For reading, the five correlations were .74, .74, .74, .72, and .77. For math, the five correlations were .74, .70, .70, .74, and .72. Similar analyses were conducted with large city (TUDA) districts. The evidence of the past eight years supports the conclusion that the state NAEP Reading and Math scores change very little year to year. Thus, state rankings have changed very little over the past eight years. The factors which in large part determined a given state's ranking in 2003 determined the rankings in 2011. This research identifies one highly reliable variable which partially explains the state rankings, namely, the percentage of eighth-grade students who have at least one parent with a college degree. Educational implications of these findings are discussed.

Keywords: parental level of education, NAEP reading scores, NAEP math scores, correlations

Parental Education Level Predicts Differences Between
High and Low Performing States

In 1995 Hart and Risley published *Meaningful Differences in Everyday Experiences of Young American Children*. The authors reported large differences in the language competencies of children from three groups of families; “professional”, “working-class” and “welfare.” Hart and Risley’s (2003) insightful work, "The Early Catastrophe: The 30 Million Word Gap by Age 3" was published in the *American Educator*. It contained a devastatingly pessimistic conclusion.

Estimating, as we did, the magnitude of the differences in children’s cumulative experience before the age of 3 gives an indication of how big the problem is. Estimating the hours of intervention needed to equalize children’s early experience makes clear the enormity of the effort that would be required to change children’s lives. And the longer the effort is put off, the less possible the change becomes. We see why our brief, intense efforts during the War on Poverty did not succeed. But we also see the risk to our nation and its children that make intervention more urgent than ever (pp. 4 and 5).

In *Inequality at the Starting Gate: Social Background Differences in Achievement as Children Begin School* (Lee & Burkham, 2002), the authors reported on their study of relationships between social class and achievement in young children. They found that of the several variables they used, social class was the most important predictor of early childhood achievement. One of Lee and Burkham’s findings was that lower socioeconomic class children typically are enrolled in our nation’s poorest quality schools. They say:

Considering almost every way we measured school quality, children who belong to racial minority groups begin their formal schooling in lower quality schools than their white counterparts...The least advantaged of America’s children, who also begin their formal schooling at a substantial cognitive disadvantage, are systematically mapped into our nation’s worst schools (pp. 76 and 77).

In 2009 a short book was published about New Jersey's efforts to improve achievement in its higher-poverty cities. The book's title, *In Plain Sight: Simple, Difficult Lessons from New Jersey's Expensive Effort to Close the Achievement Gap* (MacInnes, 2009) captures quite nicely the book's message. The emphasis of the book is on New Jersey's efforts to narrow the achievement gap between the state's 31 most impoverished urban districts with students in grades K-3, and the rest of the state's students. MacInnes, in some unusually straightforward words, says this about the early language gap:

A five year old from a lower-class family starts kindergarten without enough vocabulary and general knowledge to be ready to begin reading and writing in the first grade. Most schools do not know how to close this Kindergarten gap, and if they do not, most of their Kindergarten graduates will never be strong readers (p. 2).

MacInnes asserts that "students who are not confident readers by the end of third grade – certainly by fourth grade – are pretty much doomed" (p. 2).

The National Center for Education Statistics (NCES) publishes test results in many subjects at grades 4, 8 and 12 every other year, referring to these reports as the *Nation's Report Card*. The *Nation's Report Card: Mathematics 2003* presented data pertaining to the level of education of the parents (at least one) of eighth-grade students. Four categories of parent's educational level were presented: (1) Less than high school, (2) Graduated from high school, (3) Some education after high school, and (4) Graduated from college. An inspection of the figures revealed that, for the nation, average mathematics scores increased by level of parent's education. The mean score for students whose parents did not finish high school was 256 average score points compared to a mean of 287 average score points for students with a college graduate parent; a difference of 31 average score points.

In 2010 in a special report, NCES published the 2009 reading and math scores for twelfth-grade students in eleven states (NCES, 2010). Level of parental education figures were presented in three tables of this special twelfth-grade report. We computed the correlation between the percentage of twelfth-grade students who had a least one college graduate parent (reported in 2009) and 2009 twelfth-

grade reading scores for the 11 states. Comparable correlations were calculated for the math scores. Both correlations were spectacularly high; each correlation was above 0.90.

In addition to the sample of 50 states, the relationship between the percentage of college graduate parents and NAEP reading and math scores for a group of large urban school districts was examined. These urban districts are identified by NCES as TUDA districts – Trial Urban District Assessments. The large majority of these urban districts are characterized by high poverty student enrollments. Almost all of the urban school districts had higher child poverty rates than the poorest of the 50 states.

No research has been reported which examines the relationship between the percentage of college graduate parents and NAEP reading and math scores. In this regard, it was encouraging to learn, in the early stages of this study, that the NCES had found that the level of parent education variable was a “persistent predictor of NAEP scores.” (Personal Communication, 2013)

Finally, it needs to be clearly stated that the correlations in this study are between the percentage of eighth-grade students who had at least one college graduate parent, by state, and NAEP reading and math scores, by state. These are not correlations between socioeconomic status and test scores.

Objectives

The first objective of the study was to determine the relationship between level of parent education and the reading and math scores for eighth grade students from the 50 states from NAEP reports for the years 2003, 2005, 2007, 2009, and 2011. The second objective was to determine the relationship between the level of parental education and reading and math scores for eighth grade students in a sample of 11 large city TUDA districts in 2005, 2007, 2009, and 2011. A second sample of 18 large city school districts was utilized in 2009 and 2011.

Method

The source of the data pertaining to the first objective was the *Nation's Report Card* series for reading and math for the years 2003, 2005, 2007, 2009, and 2011. The correlations are based on results for 50 states as reported in the above Report Cards.

For the second objective, the data sources were the Trial Urban Districts Assessments (TUDA) for the years 2005, 2007, 2009, and 2011 in reading and math. The NAEP average scores for these eighth-grade students on reading and math tests for the large cities for these four years were correlated with the 2005 percentage of college graduates. The data for the second objective parallels that for the first objective.

Results

The results pertaining to the first objective are presented in Table 1 and Table 2. In Table 1 the percentage of students with college graduate parent(s) reported in 2003 is the predictor variable and five years of test scores are the criterion variables. The correlations for reading in Table 1 are .74, .74, .74, .72 and .77 respectively, for the years 2003, 2005, 2007, 2009, and 2011. The comparable correlations for math are .74, .70, .70, .74 and .72.

Table 1

Correlations between the 2003 percentage of college graduate parents and average scores on the NAEP reading and math tests for fifty states for five years

Test	2003	2005	2007	2009	2011
Reading	0.74	0.74	0.74	0.72	0.77
Math	0.74	0.70	0.70	0.74	0.72

Source: NCES: Reading, 2003 and 2011; Math 2003 and 2011.

The percentages of students with college graduate parents were from NCES 2003.

Table 2

Correlations between the 2009 percentages of eighth-grade students with at least one college graduate parent and NAEP reading and math average score for 50 states

NAEP Test	2009	2011
Reading	0.77	0.78
Math	0.75	0.72

Note: The percentages of students with college graduate parents were from the 2009 NAEP assessment. The percentages were obtained via the NAEP Data Explorer system.

Source: NCES: Reading 2009 and 2011;

NCES: Math 2003 and 2011.

In Table 3 and Table 4 the results pertaining to the second objective are shown. The correlations for reading are .69, .70, .63, and .64 and for math the correlations are .62, .59, .58, and .59. The correlations are based on 11 TUDA city districts. The eight correlations are only slightly smaller than the comparable correlations for the 50 states as shown in Table 1. It should be noted that in Table 3 only one predictor was used; the percentage of college graduate parents reported by eighth grade student in 2005. That one predictor was correlated with TUDA average reading and math scores for 2005, 2007, 2009 and 2011.

Table 3

Correlations between the 2005 percentage of college graduate parents and average scores of eighth-grade students on NAEP reading and math tests for 11 TUDA districts.

Test	2005	2007	2009	2011
Reading	0.69	0.70	0.63	0.64
Math	0.62	0.59	0.58	0.59

Source: Percentages of college graduate parents from NCES: TUDA Reading 2005.

Average scores from NCES: TUDA Reading 2009 and 2011; TUDA Math 2009 and 2011.

Table 4

Correlations between the 2009 percentages of students with at least one college graduate parent and average scores on NAEP eighth-grade reading and math tests for 18 TUDA districts for 2009 and 2011.

Test	2009	2011
Reading	0.59	0.61
Math	0.42	0.45

Source: The 2009 percentages of students with at least one college graduate parent are from the NAEP Data Explorer. The reading and math scores are from NCES: TUDA Reading 2009 and 2011; TUDA Math, 2009 and 2011.

The correlations in Table 4 are based on 18 TUDA city districts, whereas the correlations in Table 3 are based on 11 TUDA districts. Seven districts were added to the TUDA group in 2009 by NCES. Also for the set of correlations in Table 4, the predictor variable was the percentage of college graduate parents reported by eighth grade students in 2009.

Discussion

The White–Black achievement gap and the White-Hispanic achievement gap have been reported in the various *Nation's Report Card* series since at least 2003, for both reading and math. A second well-reported gap is the income-achievement gap, defined in the NAEP reports as the difference between scores of students eligible for the free-lunch program and scores of students not eligible for free lunch.

This paper focuses on a third gap, the achievement gap between the high scoring states and the low scoring states on the NAEP tests 2003 – 2011. Differences between the highest and lowest scoring states are quite stable over the period 2003 to 2011. The difference between the highest scoring state, Massachusetts, and the lowest scoring state, Mississippi, in 2003 was 18 average score points. In 2011 the difference between Massachusetts and Mississippi was 21 average score points.

The overall picture which is portrayed in the 2011 *Nation's Report Card* on reading (Table 15, page 51) is one of 50 states in virtually unchanged position over a period of eight years. The most effective way to determine the extent to which the scores remain more or less in the same rank order is to compute the correlation between the various pairs of assessments. The correlation was calculated for pairs in the years 2003 versus 2005, 2005 versus 2007, 2007 versus 2009, and 2009 versus 2011. The correlation for the above four pairs of reading assessments were .970, .971, .968, and .967, respectively. These high correlations show that the scores of states remain very nearly in rank order between one assessment and another.

The same picture of small increases in average scores over the eight years (2003 to 2011) prevails for NAEP grade 8 mathematics. For the nation the mean mathematics score in 2003 was 276; in 2011, the mean score was 283. Thus in eight years there was a gain of seven points or approximately one point per year. High scoring states in 2003 continue to be high-scoring states 2011; states in the middle range in 2003 scored in the middle range in 2011 and the lowest scoring states in 2003 were the lowest scoring states in 2011. Thus, analysis of the five NAEP assessments in 2003, 2005, 2007, 2009, and 2011 shows that the state NAEP eighth-grade reading scores are quite predictable.

Hence, to predict a given state's average score in 2011 one could add two points to the state's 2009 score to make a fairly accurate estimate of the state's 2011 score. For Grade 8 reading, the mean average scores for the nation for 2003, 2005, 2007, 2009, and 2011 were 261, 260, 261, 262, and 264, respectively. Thus, there was a gain of three points over eight years, approximately one point every two years. Although the mean national scores indicate considerable stability over time for individual states, individual state changes were examined by determining the score difference between the average score in 2003 and 2011. The largest score increase was eight points; one increase was seven point. Four states had no change, and four states had *lower scores* in 2011 than in 2003. Thus for the most part, the individual state scores mirrored the national scores changes.

To determine to what extent individual states remained in their relative positions in eighth grade from one assessment year to the next, correlations between successive pairs of scores for math were calculated, that is 2003 with 2005, 2005 with 2007, and so forth. The respective correlations were .960, .962, .963, and .965. These very high correlations indicate that individual states remained almost perfectly in their rank order positions over the eight-year period. It is of interest to note that these NAEP eighth-grade math correlations agree very closely with math correlations reported by Grissmer, Flanagan, Kewata and Williamson (2000). They reported correlations of .97 and .947 for two comparisons of grade eight math assessments (1990 vs. 1992, and 1992 vs. 1996).

Thus, the longitudinal NAEP average scores for the eighth-grade reading and math show slow predictable growth for the nation and for the 50 states. States, in general, retain their rank-order position from one assessment to the next.

Table 1 shows that the percentage of eighth-grade students who have at least one college-educated parent is moderately strongly related to state NAEP scores. The correlations between percentage of college graduate parents and, as reported by eighth-grade students in 2003, and state NAEP average scores in eighth-grade reading were .74, .74, .74, .72, and .77 for 2003, 2005, 2007, 2009, and 2011, respectively. The comparable correlations for eighth-grade math were .74, .70, .70, .74, and .72. These moderately high correlations between percentage of college graduate parents and state NAEP scores help explain why high-scoring NAEP states score high and low-scoring states score low.

The primary objective of this study was to determine the correlations between percentages of college graduate parents and state NAEP reading and math scores. As stated in the Introduction, the 2003 NAEP reports for reading and for math included mean scores by classification of parental education. For 2003 eighth-grade reading, the national mean average scores increased from 256 for students who parents did not graduate from high school versus 287 for students who reported that at least one parent was a college

graduate. The 2003 NAEP report did not include any information about correlations with NAEP scores. No other paper or publication has presented correlations between percentage of college graduates and state NAEP scores to the author's knowledge.

The National Center for Educational Statistics (NCES) also published results pertaining to the TUDA city districts. TUDA districts were included to determine if the relationships between percentage of college graduate parents and district scores would prevail for large, almost always poor cities.

The Table 4 correlations are based on 18 TUDA city districts. For the most part, the TUDA cities have child poverty levels much higher than most of the states. Thus, aside from the question of whether TUDA reading and math scores can be predicted as with the state NAEP scores, a secondary purpose of this study was to bring attention to the bleak picture which the descriptive statistics display in Table 5.

As can be seen in table 5, for the nation, 43% of eighth-grade students in 2009 were eligible for free lunch compared to 65% of large city students. All of the 18 TUDA districts had free lunch eligible percentages higher than the nation; *nine of the 18 city districts had free lunch percentages of 78% or above*. A second point concerns the size of the city districts in terms of eighth-grade enrollments. The 18 districts vary greatly in their size. New York City has by far the largest enrollment. It is 69,000. New York City is larger than Los Angeles and Chicago combined. The next three largest city districts have enrollments as follows: Los Angeles – 41,000; Chicago – 27,000, and Houston – 12,000. New York City is larger than 28 states. New York City's population comprises about 36% of the population of New York State.

Table 5

Descriptive variables for 18 TUDA school districts for 2009, plus reading scores and percent proficient for 2009 and 2011.

	Number of 8th Grade Students 2009	Percent College Grad Parent 2009	Percent Eligible School Lunch 2009	Rdg Avg Scale Score 2009	Rdg Avg Scale Score 2011	Percent proficient 2009	Percent proficient 2011
Nation	3,504,000	47	43	262	264	30	32
Large city ^a	541,000	37	65	252	255	21	23
Charlotte	9,000	51	46	259	265	28	34
Miami-Dade	23,000	45	62	261	260	28	28
NYC	69,000	42	79	252	254	21	24
Atlanta	3,000	41	78	250	253	17	17
Austin	5,000	41	54	261	261	30	30
Jeff Co. KY	7,000	41	54	259	260	26	27
DC	2,000	40	73	240	237	14	15
San Diego	8,000	38	55	254	256	25	27
Baltimore City	4,000	36	80	245	246	10	12
Milwaukee	5,000	36	77	241	238	12	10
Boston	4,000	35	72	257	255	23	24
Philadelphia	11,000	34	84	247	247	15	16
Detroit	6,000	33	69	232	237	7	7
Chicago	28,000	32	86	249	253	17	21
Cleveland	3,000	29	100	242	240	10	11
Houston	12,000	28	78	252	252	18	18
Fresno	5,000	23	86	240	238	12	12
Los Angeles	48,000	21	82	244	246	15	16

Source: NCES, TUDA Reading 2009 and 2011;

Report generated by NCES Data Explorer.

a. Large city includes students from all cities in the nation with populations of 250,000 or more including the participating districts.

Note: The number of eighth-graders is rounded to the nearest 1,000.

Each of the TUDA city districts exerts, in varying degrees, a negative effect on its home state's scores. Although it is beyond the scope of this paper to examine the downward pull of each of the 18 city districts on its respective state score, it seems clear that for most of the states which contain one or more TUDA districts, the chances of improving their state NAEP rank are quite slim. In other words,

for states with a TUDA city, meaningful improvement in the long term will depend on significant improvement in the state's largest city districts. Based on the eight-year history of TUDA districts it would follow that these TUDA districts will improve their scores very little, and hence the states will improve very little.

The picture displayed in Table 5 is a picture of severe child poverty across the majority of TUDA districts. The assumption is that this measure of poverty – the percentage of students eligible for free lunch - will not decrease for the next five to ten years, and probably will increase. It is also assumed that the other variables such as the percentage of students with a college graduate parent will also remain quite stable over the next five to ten years. If these variables remain stable, what can be done to override the effects? Will these large urban districts be able to employ a much larger proportion of “more effective teachers?” Will attendance rates improve? Without attempting to catalog and evaluate a range of possible interventions, any effective intervention would require enormous increases in the per pupil expenses of these poor city districts. Given the political facts of the last twenty years or so, the large TUDA districts are unlikely to receive substantial increases from state legislatures which typically are located in smaller cities not politically congruent with the large cities in these states. The evidence of the last twenty years, surely the last ten, points to, at best, a continuation of the desperate plight of most of the nation's large urban school districts.

The evidence of the past eight years supports the conclusion that state NAEP Reading and Math scores change very little year to year. Thus, their rankings have changed very little over the past eight years, even over the past 20 years. The factors which in large part determined a given state's ranking in 2003 determined the rankings in 2011. This study identified one variable which partially explains differences in state rankings, namely, the percentage of eighth-grade students who have at least one parent with a college degree. This variable is highly reliable, that is, the college graduate percentages have changed hardly at all over the past six years.

The “percent of students with at least one parent who is a college graduate” is a NAEP generated variable. The information about parent’s educational level comes from eighth-grade student responses to an NAEP inventory. There exists another source of information about parental education level. Since 2007, *Education Week*, in a special issue called “Quality Counts,” has reported similar data regarding the percentage of children with at least one college graduate parent for the 50 states. These data are generated by the American Community Survey, a division of the U.S. Bureau of the Census. We calculated the correlation between the data presented in “Quality Counts” (January 14, 2010, p.36) and the 2009 NAEP (Reading) percentages for the 50 states. The correlation between the two measures of parental education level was 0.915. This high correlation between the two measures indicates that both variables are measuring virtually the same construct.

Conclusions

Child poverty rates and the percentage of students who have college graduate parents determine in large part which states score high and which states score low on the NAEP tests. The states have very little control over these two variables. Several critics have observed the No Child Left Behind Act (NCLB) places the burden of improving schools almost solely on the schools themselves. Unless low scoring states commit vastly greater resources to their public schools, the gap between the lowest performing states and the highest performing states will not narrow in the next ten years.

Low scoring NAEP states are characterized by low percentages of college graduate parents and high percentages of students eligible for free lunch. Large city school districts almost without exception are characterized by low percentage of college graduate parents and very high percentages of free lunch eligible students. Almost all of the TUDA large city districts are poorer than the poorest states. Based on these statistics, it is suggested that Washington’s current effort to raise the achievement level of the nation, and poor states in particular, by a program of individual school turn-around will not in any

meaningful way succeed. Thus the low scoring states and the low-scoring large city districts of 2003 and 2011 will most likely not improve their performance in 2015 and 2017.

Educational Implications

The major educational story of the 2003 – 2011 period is that high-achieving states in 2003 continued to be high-achieving states in 2011; that middle-achieving states in 2003 continued to be middle-achieving states in 2011; that low-achieving states in 2003 continued to be low-achieving states in 2011. This study shows that *high-achieving states have higher percentages of college graduate parents than low-scoring states. High-scoring states have lower percentages of students eligible for free lunch.*

Another aspect of the lack of change over time is the persistence of the large income-achievement gap. For the nation the income gap for eighth-grade reading narrowed by three points in eight years. The White-Black eighth grade reading gap narrowed by three points in eight years. For math, the changes were very similar.

What level of intervention would be needed to move Mississippi and New Mexico up to the national mean in 10 years? How can states with low percentages of college graduates, or with high percentages of students eligible for free lunch improve their achievement, relative to the nation?

In 2010, the Annie E. Casey Foundation released *Early Warning!: Why Reading by the End of Third Grade Matters*. This publication set out some optimistic goals. The Foundation, joining with philanthropic partners, proposed a ten-year campaign to increase grade level reading proficiency in a dozen or so states representing every region of the country. The Casey Foundation specified "... at least in these cooperating states our 10-year goals are: 1) to close the gap between the children of low income rural and urban families and their higher-income counterparts..." (Annie E. Casey Foundation, 2010, p. 41).

This 10-year goal is highlighted because it is in essence quite similar to the goal of the No Child Left Behind Act (NCLB). The Casey Foundation's goal focuses on third grade reading not on fourth-grade reading and is restricted to reading not math. But it shares one of the NCLB's goals - "closing the income-achievement gap". If the goal is literally to close the income- achievement gap in 10 years, it could be viewed as irrational optimism, unless directed toward some small population of affluent states.

It is doubtful that the goal of "closing the income-achievement gap in 10 years" will be met. For many of the reasons set forth in *Early Warning* (Annie E. Casey Foundation, 2010), the income-achievement gap for the nation will narrow only by a few points by 2020. The income-achievement gap in 2003 was 27 average score points for eighth-graders on the NAEP reading test; in 2011, the gap was 25 points. Thus, as has been repeatedly stated above, the gap decreased 2 points in eight years, or about one fourth of a point per year.

Probably the most sobering aspect of this study is that it reveals the magnitude and persistence of the problems facing the nation's largest city school districts. It is difficult to envision any intervention in the next 10 years on a scale large enough to meaningfully narrow (let alone close) this gap between the largest cities and the rest of the nation. For innumerable of poor children the failure to narrow this urban-achievement gap translates into lives without hope.

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