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The Relationships Among Achievement, Low Income, and Ethnicity In Washington State – A Second Look

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The Relationships Among Achievement, Low Income, and Ethnicity In Washington State – A Second Look

A Technical Report For
The Washington School Research Center

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INTRODUCTION

The purpose of this report is to discuss the continuing difficulties school leaders and students face as they grapple with the "achievement gap" among students of different ethnic and socio-economic backgrounds. Several years ago, researchers at the Washington School Research Center sought to evaluate the "unique contribution of low income and ethnicity to academic achievement" (Abbott & Joireman, 2001) in Washington State. This current report is a replication of the 2001 study, which used data from the 2000 school year. We analyzed 2008 data to note any changes in the relationships among ethnicity, low income and achievement Washington.

The 2001 report concluded that the percentage of low-income students by schools was much more predictive of achievement than school-level ethnic proportion. The researchers noted the following:

> This is not to say that ethnicity is unrelated to academic achievement. Indeed, it is. The question is whether ethnicity influences academic achievement over and above the effects of low income. In response to that question, our results indicate that ethnicity explains between 0 to 6% of the variance in academic achievement, after the contribution of low income has been statistically controlled. Low income, by contrast, explains between 12 and 29% of the variance in academic achievement. Combined with the finding that ethnicity explains approximately 32.7% of the variance in low income, our results suggest that the relationship between ethnicity and academic achievement is mostly indirect: ethnicity relates to low income, and low income in turn relates to academic achievement.

In the present study, we included school-level reading and math achievement as the outcome measures to parallel the 2001 report. Our analyses focused on the impact of ethnicity and low income on achievement, as well as the relationship all study variables.

CURRENT RESEARCH LITERATURE

At the time of the last report, much of the research examining the unique effects of low income and ethnicity on student achievement was either directed toward other targets or confounded the effects of the variables rather than working to disentangle them. However, the studies looking at the unique effects of each when both variables are present suggested that low income was generally a better predictor of student achievement than ethnicity, a finding that has been supported by subsequent studies.

Recent research has tended to support economic factors over and above ethnic or racial factors as predictors of school achievement. Byrnes (2003), performing a secondary

analysis of the National Assessment of Educational Progress, found that the effects of ethnicity, race, and gender on math proficiency are largely explained by differences in opportunities to learn, motivation, and skill levels. Economic factors played an obvious role in these variables, but because there was no direct measure of home income in the database used, income was only indirectly measured through the number of parents at home and parent education levels.

More compelling evidence for the greater impact of income over ethnicity on achievement has come from studies that are specifically focused on the interrelationships between these two independent variables. Research on education in the U.S. South found that when entered separately, the percentage of ethnic minority children and the percentage of children receiving free lunch were both significantly correlated with achievement. However, when ethnicity and percentage receiving free lunch were included together, analysis revealed that "the observed race difference appears to be an artifact of the overlapping of race with other dimensions of disadvantage," specifically rural location and income (Fram, Miller-Cribbs, & Horn., 2007).

Additional studies have, since the last report, highlighted the importance of the concentration of poverty in schools as related to achievement. Olson and Jerald (1998) asserted that "concentrated school poverty is consistently related to lower performance on every educational outcome measured." A study of achievement and special education by Skiba, Poloni-Staudinger, Simmons, Feggins-Azziz, and Chung. (2005) also supported this claim. Results from this study found the rate of students receiving free lunch to be a much higher predictor of early and late achievement in a school district than the percent African American enrollment, and the correlation between ethnicity and special education rates was essentially zero. Thus, we expect that when both percentage of students receiving free- and reduced-price lunch and percentage of ethnic minorities are included, economic factors will outweigh ethnic ones in their impact on achievement.

METHOD

The analyses we present in this study are based on aggregated school-level data in 2008 available from the Office of the Superintendent of Public Instruction in Washington State. As with the 2001 study, it was necessary to aggregate individual student responses within schools on measures of achievement, ethnicity, and family income. We used data from 5,323 schools in this analysis. The grades tested were third, fourth, fifth, sixth, seventh, eighth and tenth grade. The OSPI data did not include schools with less than 10 students to respond to FERPA regulations. Thus, the schools used in our analysis had at least 10 students tested in either math or reading. We limited our analysis to alternative ("A"), public

("P") and tribal ("T") schools.[1] Figure 1 shows the number of schools in the study by grade level.

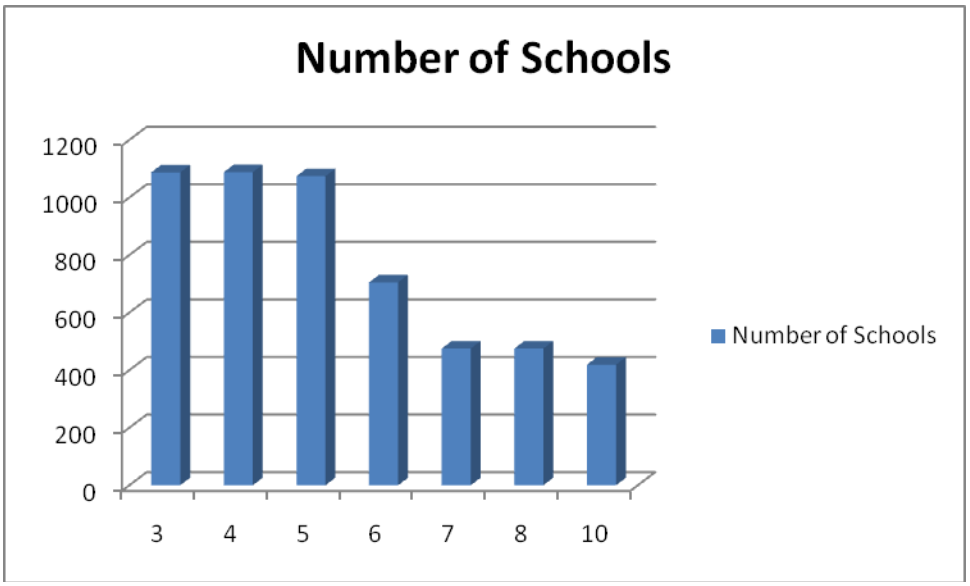

Figure 1. Number of study schools.

Measures of Low income, Academic Achievement, and Ethnicity

We defined low income as the percentage of students in a school who are eligible for free or reduced lunch. This percentage of students is not a direct measure of low income, yet it is the best (and often, only) measure that exists and it is often used thus by researchers in similar studies.

We used results from the statewide Washington Assessment of Student Learning (WASL) test as the outcome measures for math and reading achievement. The 2001 report included these measures as well as the additional ITBS scores available at the time. Therefore, we retained the same academic achievement outcomes in this study. Students must reach either level three or four (of four levels) in order to "pass" the assessment on the WASL. The achievement outcome scores we used for school comparisons are the aggregated percent of students passing the assessments in reading and math.

We used the same six categories of ethnicity as in the 2001 study: Native/American Indian, Asian/Pacific Islander, African American/Black, Hispanic, and White. For our analyses, we operationally defined ethnicity using the percentage of White students in a school rather than

[1] We did not include some school types that were not heavily represented in the state and/or specialized such as institutional/juvenile detention schools (72 of 6536) and special education schools (130 of 6536).

separate measures of each ethnic group. This was the same procedure the researchers used in the 2001 study. To ensure that we did not overlook statistical contributions of separate ethnic categories, we conducted a series of preliminary analyses, which incorporated the percentage of students in ethnic categories other than percent White in separate regression analyses. Our results showed that including additional ethnic categories in the analyses did not add significantly to the prediction of achievement. Therefore, as with the 2001 report, we do not include separate ethnic groups in the primary findings of this report.[2]

Relationship of Low income and Ethnicity to Achievement

As noted earlier, the primary goal of the current report was to determine the relative contribution of low income and ethnicity to academic achievement, as in the 2001 study, and to evaluate the relationships among low income, ethnicity, and academic achievement through a series of hierarchical regression analyses that predicted math and reading outcomes.

RESULTS

School Achievement Levels

Figure 2 shows the average school-level achievement according for the grades included in the study. The 2001 study reported only the results for 4th and 7th grade WASL scores. However, since that time, the State added additional grade level tests. Where the 2001 study analyzed achievement as the mean scale scores for reading and math, this current report used "percent passing" the levels based on the scale scores. It would be preferable to have used scale scores, but they were not available for the study. Several observations can be made about the data shown in Figure 2:

- Math gradually decreased across grade levels
- Math was lower than reading at each grade level
- Reading increased at grade 10, whereas math decreased slightly in the same grade
- The greatest discrepancy between math and reading was in 10th grade results
- Percent Passing in math across grade levels ranged between 42.97% to 68.41%
- Percent Passing in reading across grade levels ranged between 61.77% to 78.82%

[2] We report on the specific findings of these analyses in the Appendix.

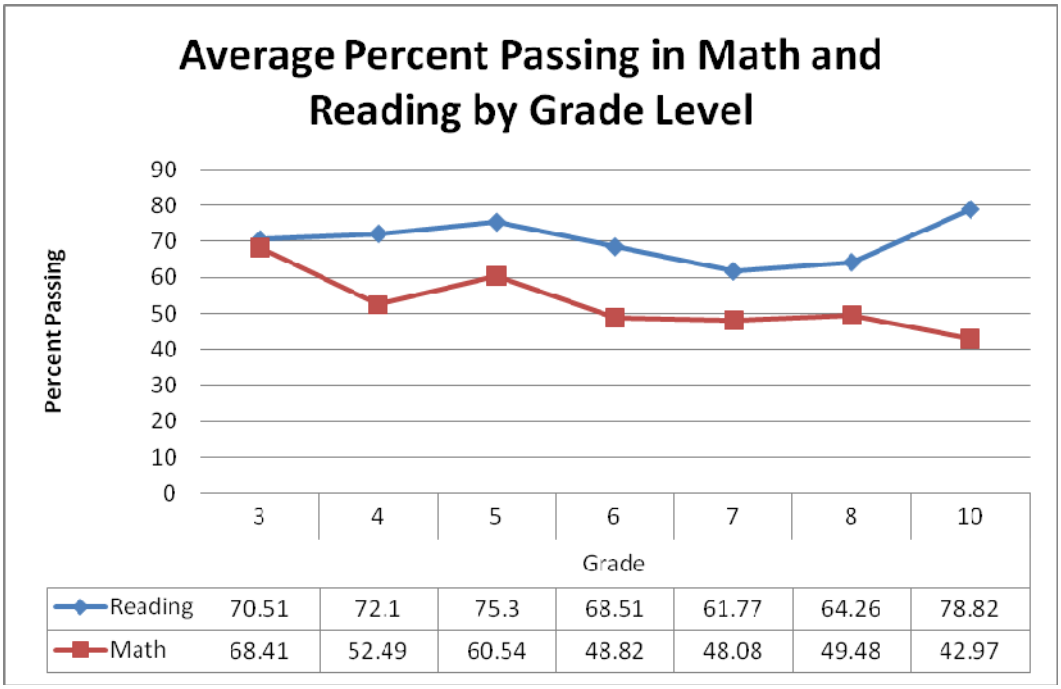

Figure 2. Reading and math achievement by grade level in study schools.

Multiple Regression Results

To aid in the discussion of our findings, we present a brief summary of our results before discussing the detailed analyses. In all the analyses, we discuss the proportions of the variance in the outcome (achievement) accounted for by the predictor variables (low income and ethnicity). We base these calculations on the squared part correlations of each predictor variable with the outcome, the procedure used in the 2001 report. Part correlations are available from hierarchical regression models that focus on changes in R^2 by adding successive predictor variables. [3]

Of the two predictors, low income is clearly stronger than ethnicity, uniquely explaining a greater proportion of the variance in achievement (8%-25%), depending on the grade level. By comparison, ethnicity uniquely explains a much smaller percentage of the variance in achievement (0% to 4%), again depending on the grade level. Ethnicity explains, on average, 32% to 40% of the variance in low income. In summary, our results match those of the 2001 report, which concluded:

> The relationship between ethnicity and academic achievement is mostly indirect: ethnicity is related to low income, which in turn is related to academic achievement,

[3] Using hierarchical regression in this matter precludes the problems of interpreting the results based on other entry schemes, such as stepwise regression.

though ethnicity does show a small direct relationship with academic achievement, over and above the effect of low income. (Abbott & Joireman, 2001, p.13)

These patterns are shown in Figures 3 and 4. In each figure, the results of each part of the model represent the range of scores across all the grades in the study. Taken together, the unique variance explained by low income is greater in math achievement (17.1% - 24.7%) than in reading (8.4% - 20.7%). However, the findings in both models mirror the 2001 study, which pointed to low income as the more powerful predictor of achievement than ethnicity, as noted above.

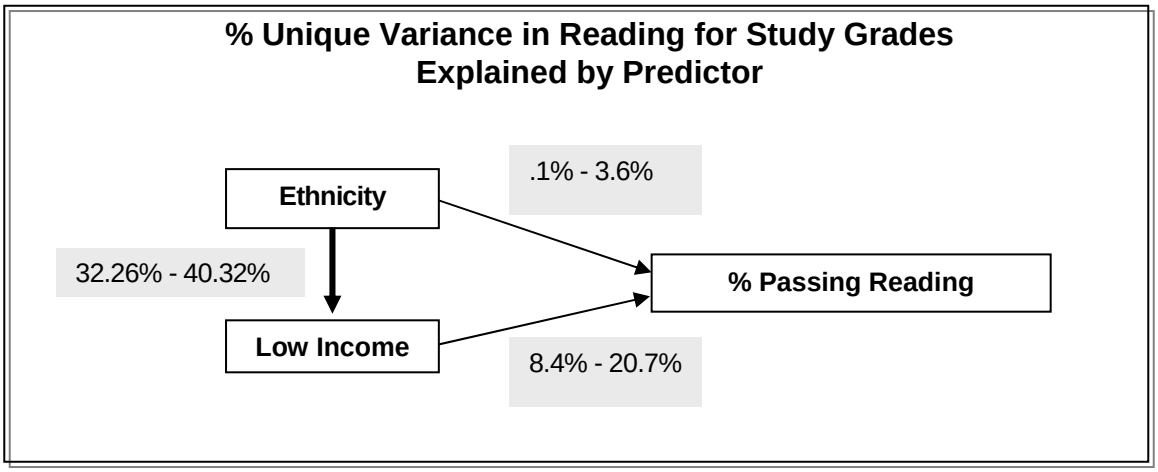

Figure 3. Reading model.

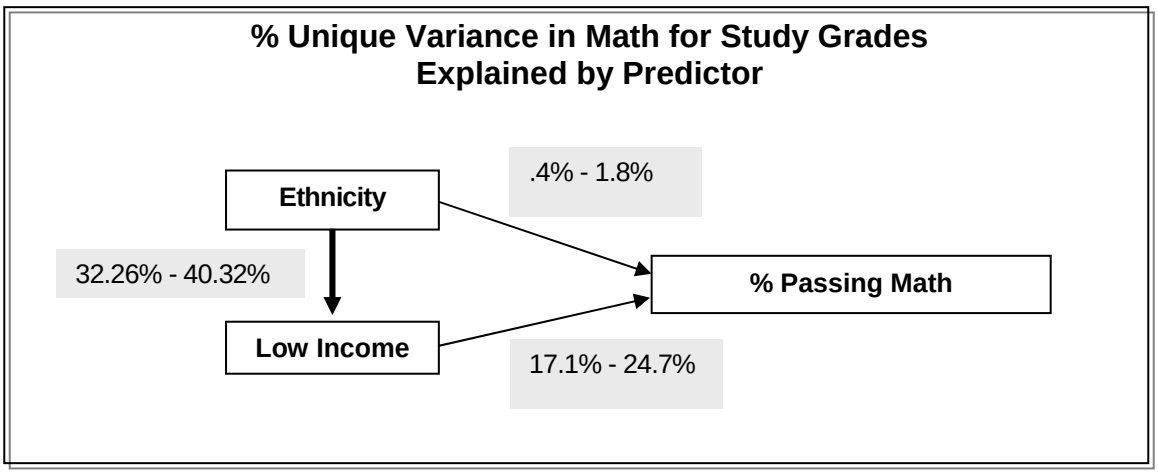

Figure 4. Math model.

Hierarchical Regression Analyses: Detailed Findings

We conducted a series of hierarchical regression analyses to evaluate the relationships among low income, ethnicity, and academic achievement within the seven grade levels. For each analysis, low income (% of students in a school eligible for free/reduced lunch) and ethnicity (% of white students in a school) were entered as a set of predictors for reading and math achievement in schools. Table 1 shows the results of these analyses for each grade and subject. The figures in Table 1 are squared part-correlations, which express the unique variance of achievement by each predictor. For example, in grade 3, ethnicity explains 2% of the variance for reading when low income is held constant. The same is true for math. In the same analyses for 3rd grade, low income uniquely explains 18% and 17% of the variance in reading and math, respectively. The table shows the same general pattern with the other grade levels. The remainder of the grades is similar, although the relative differences of low income and ethnicity are weaker among 7th, 8th, and 10th grade results.

These findings mirror those of the Abbott and Joireman 2001 report in that:

> It is clear across a variety of grade levels… that low income explains the bulk of the variance in academic achievement when compared to ethnicity… That is to say, the relationship between ethnicity and academic achievement appears to be mostly indirect: ethnicity is related to low income, which in turn is related to academic achievement, though ethnicity does show a small direct relationship with academic achievement, over and above the effect of low income.

Table 1

Multiple Regression Results by Grade and Subject

	Reading	Reading	Math	Math
3rd Grade				
Constant	49.61	77.49	47.84	75.66
Percent White	0.28	0.02	0.25	0.02
Percent Free/Reduced Lunch	-----	0.18	-----	0.17
R^2	0.28	0.46	0.25	0.42
4th Grade				
Constant	52.79	79.65	29.14	65.48
Percent White	0.25	0.02	0.22	0.01
Percent Free/Reduced Lunch	-----	0.18	-----	0.20
R^2	0.25	0.43	0.22	0.42
5th Grade				
Constant	54.78	80.19	37.07	73.62
Percent White	0.31	0.03	0.25	0.01
Percent Free/Reduced Lunch	-----	0.17	-----	0.22
R^2	0.31	0.47	0.25	0.47
6th Grade				
Constant	51.46	78.34	27.74	63.33
Percent White	0.17	0.01	0.17	0.00
Percent Free/Reduced Lunch	-----	0.21	-----	0.25
R^2	0.17	0.37	0.17	0.42
7th Grade				
Constant	40.31	62.27	26.32	62.31
Percent White	0.23	0.04	0.18	0.00
Percent Free/Reduced Lunch	-----	0.10	-----	0.21
R^2	0.23	0.33	0.18	0.39
8th Grade				
Constant	51.49	73.65	29.28	63.06
Percent White	0.09	0.00	0.17	0.00
Percent Free/Reduced Lunch	-----	0.11	-----	0.25
R^2	0.09	0.20	0.17	0.38
10th Grade				
Constant	61.58	79.28	17.86	56.80
Percent White	0.19	0.03	0.17	0.01
Percent Free/Reduced Lunch	-----	0.08	-----	0.18
R^2	0.19	0.27	0.17	0.35

Comparisons: 2001 and 2008 Analyses

Since the 2001 report focused on 4th and 7th grades, we compared the 2001 findings with the same grade and subject findings from 2008. As Table 2 shows, the results from the two studies are quite similar with one exception. The following comparisons are shown in Table 2:

- Taken together, low income explained much more variance in achievement than ethnicity in the grades and years shown.
- In 4th grade over the study years, low income explained at least seven times more variance in math and reading achievement than ethnicity.
- In 7th grade, the findings were not as consistent. Ethnicity explained 0% to 5% of the variance, whereas low income explained 10% to 21% of the variance in achievement.

Table 2
Comparison of 2001 and 2008 Findings by Grade and Subject

Comparison of 4th and 7th Grade Achievement by Study Years					
Achievement	4th - 1999	4th - 2000	4th - 2008	7th - 1999	7th - 2008
	R^2 Ch.	R^2 Ch.	R^2 Ch.	R^2 Ch.	R^2 Ch.
Reading					
Ethnicity	0.03	0.03	0.02	0.05	0.04
Low Income	0.23	0.21	0.18	0.18	0.1
Math					
Ethnicity	0.03	0.02	0.01	0.04	0
Low Income	0.2	0.19	0.2	0.16	0.21

DISCUSSION

The primary goal of this investigation was to replicate the 2001 study that evaluated the unique contribution of low income and ethnicity to academic achievement. As shown in the results above, the data from 2008 grades 3, 4, 5, 6, 7, 8, and 10 support the conclusion that low income explains a much larger percentage of the variance in academic achievement than ethnicity. As noted in the 2001 report, we do not conclude that ethnicity is unrelated to academic achievement; rather it is a much less powerful predictor of achievement when low income is included in the analyses. Specifically, we affirm the 2001 finding that "the relationship between ethnicity and academic achievement is mostly indirect: ethnicity relates to low income, and low income in turn relates to academic achievement" (Abbott & Joireman, 2001).

Another 2001 finding supported by our analyses is that, "while low income and ethnicity together explained a relatively high percentage of the variance in most of the outcome

measures, a sizable percentage of the variance in achievement scores could not be accounted for by these variables" (Abbott & Joireman, 2001). In the present study, 20% to 47% of the variance in reading and math achievement across all the study grades was unexplained by low income and ethnicity as a set. This calls for subsequent analyses that might identify other influences on achievement that might clarify the low income – ethnicity relationships.

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APPENDIX

Using "Percent White" as Ethnicity

As with the 2001 report, we used Percent White to represent ethnicity in this study for the reasons listed above. However, in order not to overlook potentially important information, we conducted separate analyses with each ethnic category as single predictors with low income. Preliminary analyses indicated that the percentage of students in non-white ethnic categories did not aid greatly in the prediction of achievement.

The following table shows the predicted variance in academic achievement of non-white ethnic categories over and above that of low income. The data represent high and low values of the unique impact (squared part correlations) of three non-white ethnic group percentages at the study schools: Asian-Pacific Islander, Hispanic, and Black.[4] Thus, for example, among these three ethnic categories third grade scores, the lowest unique contribution of ethnicity to achievement (both reading and math) was .001 (.1% of the variance), and the highest contribution was .012 (1.2% of the variance). Taken together, the highest contribution of any of the ethnic categories, in any grade, was at most .033 (3.3% of the variance in 8th grade). These levels do not exceed the findings from using percent white, as note in Table 2 in the report.

Table 3
Variance in achievement explained by non-white ethnic categories by grade level

	GRADE LEVELS						
Range	**3**	**4**	**5**	**6**	**7**	**8**	**10**
Low	0.001	0	0	0	0	0	0.001
High	0.012	0.008	0.014	0.016	0.025	0.033	0.031

[4] These categories are used in the OSPI dataset.