

Closing the Achievement Gap: Identifying Social, Societal, Familial and Psychological Factors Affecting Black Students' Academic Performance

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Abstract

This analysis seeks to identify key factors that continue to affect academic achievement among black students. Several variables from the Education Longitudinal Study of 2002 (ELS, 2002) are used in two regression analyses to test the impact of 1) parental involvement, 2) students confidence and aspirations for postsecondary education, 3) participation in extracurricular activities, 4) gender, and 5) the race of math and English teachers on black tenth grade students performance on the Math and Reading Item Response Theory (IRT) standardized tests. The results of this analysis suggest the following:

1. Parental involvement among black families has a positive effect on black student performance on both the Reading and Math IRT scores. Those students who discussed some aspects of their lives with their parents did better on the tests than those who did not.
2. On the Reading IRT test, students who aspire to at least graduate from a four-year college or university scored at least six points higher on average than those who did not have aspirations for higher education. Additionally, those who aspired to obtain a master's degree or a Ph.D. scored on average 11 points higher than those who did not believe they would graduate high school.
3. Black students who participate in extracurricular activities scored higher on both the Reading and Math IRT Standardized tests compared to those who did not participate.
4. Black girls on average scored lower than black boys on the Math IRT Standardized test, while results were inconclusive on the Reading IRT Standardized test.
5. Black students who are taught by black educators on average scored lower on both tests than those who were taught the same subjects by a white educator.

Although there are limitations and validity issues with this study, the findings do have several policy implications and at minimum express the need for more research in this area.

Introduction

The achievement gap between white and black students in the U.S. is prevalent and has been well-documented for the past few decades. According to the National Center for Educational Statistics, white students scored an average of 26 points higher than black students in every subject on the National Assessment of Educational Progress (NAEP) tests.¹ In the wake of President Obama's call to overhaul 2001's No Child Left Behind Act and Secretary of Education Arne Duncan's innovative statewide "Race to the Top" competition, understanding why there is a racial and economic achievement gap and identifying ways to close it has become increasingly important to educators and policy makers. Understanding this is important because the persistent and disproportionately lower levels of academic achievement can have a lasting and oftentimes debilitating effect on black children as they mature into adulthood.

The inability to perform well in primary and secondary school can limit black children's options for higher education and other technical studies, essentially cutting off their potential to compete in the increasingly global job market. According to the Bureau of Labor Statistics, "millions of new jobs in the next decade will require a four-year degree; jobs in sectors as varied as education, accounting and computers."² Having a segment of society that is disproportionately undereducated is problematic, as the likelihood of being or becoming underemployed or unemployed, and subsequently living in low-income or poverty status is greatly increased. Current data supports this assertion. In 2009, 25.8 percent of blacks were impoverished, compared to 9.4 percent of whites.³ Perhaps more telling, 61 percent of black children live in low-income households, a significantly higher occurrence than the 27 percent of white children from low-income households.^{4,5} Living in poverty can lead to a number of other negative life outcomes including, food insecurity, higher likelihood of incarceration and limited access to healthcare among other things.⁶ It is because of this, that identifying factors that explain why the academic achievement gap exists is increasingly important.

Instead of analyzing the differences that account for why black and white students fare so differently on standardized tests, this analysis looks at individual factors that affect black students directly. By identifying key indicators that have an effect on black students, policies aimed at closing the achievement gap can be more targeted and effective.

1 *National Report Card: Reading 2011*. Report no. 457. Washington: National Assessment of Educational Progress, 2011.

2 Campbell, M. (2005). Bridging the college graduation gap. *The Hispanic Outlook in Higher Education*, 15(11), 1-19.

3 Devanas-Walt, Carmen, Bernadette Proctor, and Jessica Smith. *Income, Poverty and Health Insurance*. Report. Washington: Census Bureau, 2009

4 Wight, Vanessa. *Basic Facts about Low-income Children, 2008*. Report. National Center for Children in Poverty, 2009.

5 For the purposes on this analysis, "low-income" refers to 300 percent of the federal poverty line.

6 "Effects of Poverty, Hunger, and Homelessness on Children and Youth." American Psychological Association (APA). Accessed March 25, 2012. <http://www.apa.org/pi/families/poverty.aspx>.

Literature Review and Corresponding Hypotheses

In the wake of President Obama's "responsible fatherhood" initiative—a distant relative to the more controversial marriage promotion policies that were championed by President Bush—parental involvement, especially in low income and minority households, has become central in the national dialogue regarding student academic success. In their meta-analysis of existing parental involvement literature, Xitao Fan and Michael Chen conclude that parents' expectations and aspirations for their child have a "strong correlation" to the academic success or failure for their child.⁷ The authors preface their findings with the admission that the significance of parental involvement varies depending on how academic achievement is measured.⁸ Similarly, Wenfan Yan found that "parents of successful African American students were more likely to discuss school experiences and future plans with their teens" than the parents of black teens who were unsuccessful academically.⁹ James Heckman takes an economic approach yet reaches the same conclusion as Yan, Fan and Chen asserting that a parent's early "investment" in the development in their child's "cognitive and non-cognitive development" leads to success in "formal academic institutions."¹⁰ While these studies offer insight to this theory, none of the studies defined academic success using the Math and Reading IRT scores. This information informs the first hypothesis in this analysis:

H1: Black students whose parents are involved and engaged in their academic lives will score higher on both the Math and Reading IRT tests.

In the 2002 study "*Student attitudes, aspirations, and academic achievement*," Irma Avila argues that students who see themselves as smart and academically competent are far more likely to have higher postsecondary aspirations.¹¹ She goes on to claim those who do not have these sentiments, mostly black and Latino students, tend to be less successful.¹² Similarly, Gary Miron, Jeffery Jones, and Allison Young found that "students with higher grade point averages were more likely to have higher levels of aspirations."¹³ While Avila only focused on the link between student confidence and postsecondary education aspirations, Miron, Jones, and Young focus on the relationship between aspiration and grade point average; this analysis will focus on how confidence and aspirations affect academic performance on standardized test.

7 Fan, Xitao, and Michael Chen. "Parental Involvement and Students' Academic Achievement: A Meta-Analysis." *Educational Psychology Review* 13, no. 1 (2001).

8 Ibid.

9 Yan, Wenfan. "Successful African American Students: The Role of Parental Involvement." *Journal of Negro Education* 68, no. 1 (Winter 1999): 5-22.

10 Heckman, James J. *Policies to Foster Human Capital*. Working paper no. 7288. Cambridge: National Bureau of Economic Research, 1999.

11 Avila, I. R. "Student Attitudes, Aspirations, and Academic Achievement." Diss., University of Texas at El Paso, 2002.

12 Ibid.

13 Miron, Gary, Jefferey N. Jones, and Allison J. Kelaher Young. *The Impact of the Kalamazoo Promise on Student Attitudes, Goals, and Aspirations*. Working paper no. 9. Kalamazoo: Western Michigan University: College of Education, 2009.

H2: Students who aspire to receive higher education will score higher on both the Math and Reading IRT Tests.

In January 2011, Secretary of Education Arne Duncan began a tour of historically black colleges and universities in effort to recruit more black male teachers. According to Duncan and the Obama administration, by 2015 they hope to recruit, train and place 80,000 black male teachers.¹⁴ This initiative stems from drastic success seen in urban charter schools, such as Chicago's Urban Prep Academy, that are headed by African American men. While many qualitative reports suggest that the absence of black teachers in the classroom has a lasting negative effect on black students' performance,^{15,16} other reports such as Roselinda Johnson's "The Ratio of the Percentage of Black Teachers to the Percentage of Black Students as it Affects Achievement" fail to find statistically significant results.¹⁷ This analysis will seek to find statistically significant results for the relationship between black student achievement and black male and female teachers.

H3: Black students who are taught by black teachers will score higher on both the Math and Reading IRT Tests.

Numerous studies, including Jason Branch's Extracurricular Activities and Academic Achievement argue that students who are actively involved in extracurricular activities are more successful in school.¹⁸ This study claims that extracurricular clubs, athletic teams, arts organizations, and volunteer groups not only score higher on the SAT and ACT tests, they have higher attendance rates, take more courses, and tend to be enrolled in academic and college tracks more often.¹⁹ There are many local organizations, nonprofits, and religious institutions focused on keeping youth—especially urban, minority, and economically disadvantaged students—in structured afterschool activities.²⁰ The primary reason for this is these children have been identified as being the most vulnerable to risky behaviors. This analysis will seek to find if these results apply to black students as well as to performance on standardized tests that are not college entrance exams.

14 "U.S. Secretary of Education Duncan and Film Producer Spike Lee to Call on Morehouse Students to Pursue Teaching Careers." U.S. Department of Education. Accessed March 24, 2012. <http://www.ed.gov/news/media-advisories/us-secretary-education-duncan-and-film-producer-spike-lee-call-morehouse-stude>.

15 Milner, H. Richard. "The Promise of Black Teachers' Success with Black Students." *Educational Foundations*, Summer 2006, 89-104.

16 Hudson, M. J., and B. J. Holmes. "Missing Teachers, Impaired Communities: The Unanticipated Consequences of Brown v. Board of Education on the African American Teaching Force at the Precollegiate Level." *Journal of Negro Education* 63 (1994): 388-93.

17 Johnson, Roselinda S. "The Ratio of the Percentage of Black Teachers to the Percentage of Black Students as It Affects Achievement." Diss., University of Arkansas, Fayetteville, 1992.

18 Branch, J. L. "Extracurricular Activities and Academic Achievement." Diss., The University of Southern Mississippi, 2003.

19 Ibid.

20 Gray, Kyle, Barbara Roole, and Gordon Whitaker. "How After-School Programs Help Students Do Better." *Popular Government*, Summer 1999, 39-48.

H4: As extracurricular activity hours increase, black students will see more success on the Math and Reading IRT Tests.

Many psychologists cite the “disidentification hypothesis” to explain gender differences in black student academic achievement.^{21,22} The hypothesis claims that black boys are not as successful in school as black girls because they have less personal investment in doing well academically. In the *Journal of Black Psychology* article, “Do Gender Differences Exist in the Academic Identification of African American Elementary School-Aged Children,” McMillian, Frierson, and Campbell fail to find a statistically significant relationship between gender and academic achievement.²³ Instead of looking at elementary school-aged children, this analysis will look at the black tenth graders and seek to find a statistically significant relationship between the genders

H5: Black girls will score higher in the proficiency tests of both the Math and Reading IRT Tests compared to black boys.

Data

This analysis relies on data from the Education Longitudinal Study (ELS) of 2002, which is conducted on behalf of the National Center for Education Statistics (NCES) of the United States Department of Education by the Research Triangle Institute (RTI)—nonprofit university-affiliated research organization with headquarters in North Carolina.²⁴ The ELS: 2002 is a nationally representative study that monitors students as they progress from tenth grade through high school and on to postsecondary education and/or the workforce. Although for the purposes of this paper, this analysis will only be looking at information gathered from initial responses by the tenth grade class and their parents, teachers, and administrators in base year 2002. The data collected in 2002 measured student academic achievement through standardized tests and gathered information about their attitudes, familiar structure, and experiences. Additionally, the ELS: 2002 gathers information from the students’ teachers, parents, and the administrators of their high schools through separate questionnaires.

The survey is based on a sample size of 750 randomly selected schools. After the schools were selected, more than 15,000 students and their parents were randomly selected within the schools. Non-public schools (specifically Catholic and other private schools) were sampled at a higher rate to ensure that their sample was large enough for substantive comparisons to the public schools. Similarly, Asian students were also sampled at a higher rate than white, black, and Hispanic students to ensure that their sample was large enough for

21 Cokley, Kevin O. “Ethnicity, Gender and Academic Self-concept: A Preliminary Examination of Academic Disidentification and Implications for Psychologists.” *Cultural Diversity & Ethnic Minority Psychology*. Vol. 8, no. 4 (2002): 378-88.

22 Williamson, Ernest W. “How and Why Three Potential Causes of Academic Disidentification May Affect Interests in Academic Work at the Secondary Level Among Inner-City Black Males.” Diss., Seton Hall University, 2011.

23 McMillian, M.M., Frierson H.T. and Frances A. Campbell. (2011). “Do gender differences exist in the academic identification of African American elementary school-aged children?” *Journal of Black Psychology*, 37(1), 78.

24 “Education Longitudinal Study of 2002 (ELS:2002) - Survey Design and Sample Sizes.” National Center for Education Statistics (NCES) Home Page, a Part of the U.S. Department of Education. Accessed March 25, 2012. <http://nces.ed.gov/surveys/els2002/surveydesign.asp>.

substantive comparisons. The final number of observations recorded in the ELS: 2002 was 16,197 respondents. To prepare for the variable selection, all other races in the dataset except for “black” were dropped. Additionally all black children whose families had an income greater than 300 percent of the federal poverty line were dropped. This was done as a means to control for income bias. After all other variables were dropped, the final number of observations was 2,020.

Variables and Descriptive Statistics

Outcome Variables

In order to analyze the five hypotheses, the following variables were used. Two outcome variables, “math score” and “reading score,” were used in the regression. The math score refers to the raw math standardized score that the black tenth graders received in their second semester. The lowest recorded score is 19.94, while the highest recorded score was 76.32 points. While the mean score of 44.35 points seems to fall closer to the highest recorded score, the standard deviation of 8.946 suggests that there are wide disparities in score distribution. Similarly, the reading score variable follows the same distributive qualities as the math standardized score with a range of 23.55 to 72.97 points, with a corresponding mean of 45.36 and a standard deviation of 8.69. (See Table 1)

Indicator Variables

The first independent variable used is student gender. As the name suggests, it refers to the gender of the tenth graders, with an option of 0 for boys and 1 for girls. The distribution for this variable is equal, with a roughly 1-to-1 male-to-female ratio. The next independent variable—total years student took math—refers to all formal math classes the student has taken since kindergarten. The lowest number of years is 4, while the highest recorded number was 7 years, with a mean number of years at 6.11 years. The “total years student took English” variable has a much smaller range than the math variable, with a minimum of 6 years and a maximum of 7 years. With a mean number of years at 6.98, apparently the majority of black tenth graders took formal English class at the maximum of 7 years.

The next four variables—“discuss school activities with parents,” “discuss college with parents,” “discuss what they are studying with parents,” and “discuss grades with parent”—are questions that tenth graders were asked to answer. In all four variables, 0 corresponds with “yes,” while the answer “no” corresponds with 1. All four variables have at least 83 percent of “yes” responses, which would suggest that the majority of students discuss all of these things with their parents.

The “extracurricular activity” variable measures the total hours tenth graders reported they spent on extracurricular activities per week. The range for extracurricular activity hours was from 0 to 21 hours, with the average being 3.84 hours. This variable has a high standard

deviation of 5.37 hours, which suggests there are wide disparities that could explain differences in hours.

The next sets of variables used in this regression are dummy, categorical and ordinal variables. The first dummy variable called “living area” refers to the location type the tenth graders reported. Of the 2,020 black tenth graders, 48.22 percent (974 total) reported living in an urban area, 39.70 percent (802 total) reported living in a suburban area, and 12.08 percent (244 total) live in rural areas. The second set of dummy variables, “math teacher race,” separated the primary race of the tenth graders math teacher into five subcategories. Of math teachers who taught black students, 73.21 percent (1,153 total) were white; 3.11 percent (49 total) were Asian, Hawaiian, or Pacific Islander; 19.24 percent (303) were black or Hispanic non-Hispanic; 2.79 percent (44 total) are Hispanic; and 1.65 percent (26 total) are multi-racial. The “English teacher race” dummy variable is also divided in five subcategories. Of English teachers who taught black tenth graders, 71.97 percent (1,099 total) are white; 0.79 percent (12 total) are Asian, Hawaiian, or Pacific Islander; 22.40 percent (342 total) are black non-Hispanic; 2.82 percent (43 total) are Hispanic; and 2.03 percent (31 total) are multiracial.

The final set of dummy variables refers to the tenth graders “aspirations.” This variable measures how far the tenth graders believe they will get in post-secondary education. Of the 2,020 observations, 1.36 percent (25 total) of tenth graders believe they would not graduate high school, 8.67 percent (160 total) believe they would only graduate from high school, 5.75 percent (106 total) believe they would attend or complete a two-year college or school, and 6.23 percent (115 total) believe they would attend but not graduate a four-year college or university. While 39.73 percent (733 total) of black tenth graders believed they would graduate from college, 17.29 percent (319 total) believed they would obtain a master’s degree, and 20.98 percent (387 total) believe they would obtain a Ph.D., M.D., or other advanced degree. (See Table 2)

Table 1: Descriptive Statistics for Dependent and Non-Dummy Independent Variables:

Variables (Number of Observations)	Mean	S.D.	Min.	Max.
Math score* (2,020)	44.25	8.46	19.94	76.32
Reading score* (2,020)	45.36	8.69	23.55	72.97
Total years student took math (1,246)**	6.11	0.57	4	7
Total years student took English (1,246)**	6.98	0.14	6	7
Hours of extracurricular activities per week (1,811)**	3.82	5.38	0	21

* Denotes that these are the dependent/outcome variable

** A total of five different regression analyses with different indicator variables were run to answer each of the corresponding hypotheses. Each regression had different missing variables, which explains why the numbers are different here.

Table 2: Descriptive Statistics for Binary, Categorical, Ordinal, and Dummy Variables:

Variables (Number of Observations)	Frequency	Percent
Student gender (2,020)	Male - 1,016 Female - 1,004	Male - 50.30% Female - 49.70%
Discuss school activities with parents? (2,020)	Yes - 1,730 No - 290	Yes - 85.64% No - 14.36%
Discuss college with parents? (1,406)	Yes - 1,269 No - 137	Yes - 90.26% No - 9.74%
Discuss what they are studying with parents? (1,415)	Yes - 1,175 No - 240	Yes - 83.04% No - 16.96%
Discuss grades with parents? (2,020)	Yes - 1,903 No - 117	Yes - 94.21% No - 5.79%
Living Area (2,020)	Urban - 974 Suburban - 802 Rural - 244	Urban - 48.22% Suburban - 38.70% Rural - 12.08%
Math Teacher Race (1,575)	White - 1,153 Asian - 49 Black - 303 Hispanic - 44 Multiracial - 26	White-73.21% Asian-3.11% Black-19.24% Hispanic-2.79% Multiracial-1.65%
English Teacher Race (1,527)	White - 1,099 Asian - 12 Black - 342 Hispanic - 43 Multiracial - 31	White-71.97% Asian-0.79% Black-22.40% Hispanic-2.82% Multiracial-2.03%

Variables (Number of Observations)	Frequency	Percent
Student aspiration for higher education (1,845)	Less than H.S. - 25	Less than H.S. - 1.36%
	H.S. Graduation - 160	H.S. Graduation - 8.67%
	Two-year College - 106	Two-year College - 5.75%
	Some Four-year College - 115	Some Four-year College - 6.23%
	College Graduation - 733	College Graduation - 39.73%
	Master's Degree - 319	Master's Degree - 17.29%
	Ph.D. or M.D. - 387	Ph.D. or M.D. - 20.98%

Method

This analysis relies on the use of two OLS regression models, one using the “math score” dependent variable and the other using the “reading score” as the dependent variable. This analysis will employ this method because the dependent variables that it will use are point values and do not require MLE regressions. Using OLS is the simplest method of analysis that is feasible for this analysis.

Following the initial regression results using the “math score” dependent variable, a number of OLS assumption violations are tested. To satisfy possible omitted variable bias, additional variables are included in the regression model that do not directly relate to my five hypotheses. These include the “living area” and “number of years student has taken math” variables. These variables are included to reduce the risk of a Type I error. The functional forms of all variables in the model in linear form are left in the equation, as there is no need to log any variables. To test for near multicollinearity violation, a variance inflation factors (VIF) test was conducted. The results show that there is not a multicollinearity problem for any variables except for the “aspirations” dummy variable. All other variables in the math score regression have VIF values less than five. Despite the fact that there is a violation, nothing was done to correct for it as this “aspirations” variable is not redundant with any other variables in the regression. This decision will not have an effect on the results, as multicollinearity only makes it more difficult to find statistical significance. To test for heteroskedasticity issues, a RVF plot graph was run to look at the variance in the error terms. The plot graph appeared to “fan out,” but to ensure that there was not a heteroskedasticity problem a Breusch-Pagan test was run, resulting in a chi-square of 1.11 and a corresponding p-value of .2921. This indicates that there is not a heteroskedasticity problem.

The same process is followed for the “reading score” dependent variable that was conducted for the “math score” regression. The “living area” and “years student has taken English” variables in this regression were again used to satisfy for omitted variable bias. Similarly, the linear-linear functional form was used for this regression using a theoretical background. The VIF test results also show in this model that there is not a multicollinearity problem for any

variables in the regression except for the “aspirations” dummy variable. After running a RVF plot graph, it is unclear whether there is a heteroskedasticity problem, so the Breusch-Pagan test was run to ensure there is not a violation. The results to the test, chi-square 6.64; p-value .01, show that there is a heteroskedasticity problem, so to correct for this the analysis will include this regression run using robust standard errors.

Results

H1: Black students whose parents are involved and engaged in their academic lives will score higher on both the Math and Reading IRT tests.

To test the first set of hypotheses, the following independent variables are used: “discuss school activities with parents,” “discuss college with parents,” “discuss what they are studying with parents,” and “discuss grades with parents” in both the “math score” and “reading score” regressions. The results show that, for the “discuss school activities with parents” variables, there is a statistically significant relationship ($t=-2.28$, $p\text{-value}=.023$, reject null hypothesis).²⁵ This indicates that black students who discuss school activities with their parents score on average 2.60 points higher on the math standardized tests, holding all other variables constant. The other three variables—“discuss college with parents” ($t=1.60$, $p\text{-value}=.110$, fail to reject null hypothesis), “discuss what they are studying with parents” ($t=-1.04$, $p\text{-value}=.298$, fail to reject null hypothesis), and “student discuss grades with parents” ($t=-1.15$, $p\text{-value}=.252$, fail to reject null hypothesis)—do not have statistically significant results.

The reading test score regression shows that there is a statistically significant relationship between students who discuss what they are studying with their parents and reading test scores ($t=-2.18$, $p\text{-value}=.030$, reject null hypothesis). The regression shows that black students who discuss what they are studying with their parents score an average of 2.20 points higher than those who do not, holding all else equal. The other variables—“discuss college with parents” ($t=-0.15$, $p\text{-value}=.884$, fail to reject null hypothesis), “discuss school activities with parents” ($t=-1.43$, $p\text{-value}=.154$, fail to reject null hypothesis), and “student discuss grades with parents” ($t=-1.26$, $p\text{-value}=.207$, fail to reject null hypothesis)—are all statistically non-significant. (See Table 3 for additional results)

H2: Students who aspire to receive higher education will score higher on both the Math and Reading IRT Tests.

For this hypothesis the analysis used the “student aspiration for higher education” dummy variable. In the math test score regression, there appears to be no statistically significant relationships between any level of higher education aspiration and math test scores: “aspire to graduate from a four-year college” ($t=0.74$, $p\text{-value}=.459$, fail to reject null hypothesis), “aspire to get a master’s degree” ($t=1.36$, $p\text{-value}=.176$, fail to reject null hypothesis), and “aspire to get a Ph.D. or M.D.” ($t=1.33$, $p\text{-value}=.185$, fail to reject null hypothesis).

²⁵ Note that in all five hypotheses, the null hypothesis is “no relationship.”

Unlike the results in the math test score regression, the reading test score variable shows statistically significant relationships between student aspiration and reading test scores for three of the seven dummy variables. For black students who aspire to graduate from a four-year college, they can expect to score on average 6.33 points higher on reading test scores, holding all other variables constant ($t=2.46$, $p\text{-value}=.014$, reject null hypothesis). For those who aspire to receive a master's degree, an average of 11.32 additional points on the reading test score is associated, holding all other variables constant ($t=4.22$, $p\text{-value}=.001$, reject null hypothesis). Finally, for those black students who aspire to attain a Ph.D., M.D., or other professional degree, an average of 10.53 additional points on the reading score can be expected, holding all other variables constant ($t=4.00$, $p\text{-value}=.001$, reject null hypothesis). For all three statistically significant variables, they have the potential to be substantively significant because of the large potential gains black students can attain through interest in higher education. In fact, for those students who aspire to at least get their master's degree, their gains are higher than the standard deviation for these variables. While these results show remarkable gains, it is important to note that these results might be skewed due to endogeneity issues, which will be discussed more in the limitations section. (See Table 3 for additional results)

H3: Black students who are taught by black teachers will score higher on both the Math and Reading IRT Tests.

To test this set of hypotheses, the variable, "math teacher is black," is used in both the math and reading score regressions. The math regression shows that there is a statistically significant relationship between a black math teacher and the student's math test score ($t=-3.28$, $p\text{-value}=.001$, reject null hypothesis). The relationship, however, is the opposite of what this analysis' hypothesis suggested; it shows that black students who have a black math teacher scored on average 2.67 points lower than black students who had math teachers who are white, holding constant the other independent variables. Scoring an average of three points lower on the math test based on student race is also substantively significant as well. Similarly, the reading test score regression shows that black students with a black English teacher score an average of 1.76 points lower than black students with a white English teacher ($t=-2.20$, $p\text{-value}=.028$, reject null hypothesis). These results are also substantively significant. (See Table 3 for additional results)

H4: As extracurricular activity hours increase, black students will see more success on the Math and Reading IRT Tests.

Using the "extracurricular activity" independent variable tests this hypothesis. In the math test score regression, there is a statistically significant relationship ($t=4.11$, $p\text{-value}=.001$, reject null hypothesis) which suggests that for every additional hour spent per week on extracurricular activities, black students will score on average 0.23 more points on the math standardized test, holding all other variables constant. Like the results in the math test score regression, black student score on average 0.12 points higher on the reading standardized test for every additional hour they spend on extracurricular activities ($t=2.19$, $p\text{-value}=.03$,

reject null hypothesis). Although this coefficient is even smaller than the one associated with the math test score, the relationship is still substantively significant for the same reason. (See Table 3 for additional results)

H5: Black girls will score higher in the proficiency tests of both the Math and Reading IRT Tests compared to black boys.

The “student gender” independent variable is used to test for significance for this hypothesis. The math score regression shows that there is a statistically significant negative relationship associated with gender and math test scores ($t=-3.76$ $p\text{-value}=.001$, reject null hypothesis). The relationship shows that black girls score on average 2.41 points lower on math tests than black boys, holding all other variables constant. These results are substantively significant not only because 2.41 points is a substantial number for a test with scores ranging from 19 to 76, but also because the results are contradictory to previous studies on gender and black student achievement. There is not a statistically significant relationship between student gender and reading test scores. (See Table 3)

Table 3: Regression Results: Math and Reading IRT Score

	Math IRT Score Coefficients	Reading IRT Score Coefficients
Student gender	-2.41*** (0.64)	-0.62 (0.66)
Total years student took math	0.77~ (0.50)	2.41 (2.05)
Student discuss college with parent	2.45~ (1.53)	-0.20 (1.39)
Student discuss what they are studying with parent	-1.08 (1.03)	-2.20* (1.01)
Student discuss their school activities with parent	-2.60* (1.14)	-1.54~ (1.08)
Student discuss their grades with parent	-1.70 (1.48)	-1.99 (1.57)
Student lives in suburban area	0.63 (0.66)	0.51 (0.68)
Student lives in rural area	0.90 (0.94)	-1.27 (1.03)
Math teacher is Asian	-0.27 (1.92)	-6.55~ (3.60)
Math teacher is black	-2.67*** (.82)	-1.76* (0.80)
Math teacher is Hispanic	2.54 (1.90)	-1.98 (2.12)
Math teacher is multiracial	1.61 (3.76)	-1.04 (1.70)
Hours of extracurricular activity	0.23*** (0.06)	0.12* (0.05)
High school graduation	-4.96 (4.62)	1.31 (2.86)
Two-year college	-0.45 (4.63)	5.64~ (2.96)
Some four-year college	-0.21 (4.52)	3.99 (2.88)
College graduation	3.22 (4.36)	6.34** (2.58)
Master's degree	5.97 (4.40)	11.32*** (2.68)
Ph.D./ M.D./ professional degree	5.81 (4.38)	10.53*** (2.64)
Constant	39.13	39.13
N of Observations	609	609
R-Squared	0.21	0.21

Standard errors in parenthesis.

~ Marginally significant at the .10 level

* Statistically significant at the .05 level

** Statistically significant at the .01 level

*** Statistically significant at the .001 level

Limitations

There are a number of limitations which, if accounted for, would make this study more comprehensive and increase the internal and external validity of this analysis.

Omitted Variable Biases/Reverse Causality

There are a number of variables that are absent from the five regression analyses that could have an effect on the listed results. Although income was controlled in the initial stages of data cleaning, all black students whose family made more than 300 percent of the federal poverty line were dropped, there are other, perhaps more robust variables that could have been included. These variables include “does the child receive free or reduced lunch” or the self-reported response to “are you impoverished?” Other control variables that, if used, in the regression equations could have reduced the risk of omitted variable bias are: control for location of the school, level of education for the black student parents, number of children in the household, whether or not the student came from a single parent household, and the amount of school resources (access to computers, library books available, etc.). All of these variables could have an effect on a number of the results in this analysis, particularly the relationship between black math and reading teachers and IRT scores for black students.

Lastly, as is the case in all studies analyzing this topic, there is a risk of having reverse causality issues. For example, this analysis asserts that social, societal, psychological, and familial factors are *causes* for academic success or failure among black students; however, it is possible that the relationship is the inverse. It can be argued that a number of the factors analyzed or controlled for in this study—particularly family income, student aspirations, and parental involvement—could be a result of academic failure from the students or the parents (in the case of family income). This potential reverse causality problem could potentially threaten the internal and external validity of this analysis.

Sample Size/ Missing Variables

To ensure that substantive comparisons could be made from their data, the ELS 2002 oversampled the members of underrepresented populations, in this case Asians and students who attend Catholic schools. While this was a sound decision, they overlooked the underrepresentation of both black students and educators. The original sample size of the ELS 2002 was more than 16,000 students; of that number, only 2,020 were black students. When working with an already small sample group, missing data and unbalanced representation within the outcome and indicator variables become significant issues. In some of the variables that were used in this analysis, particularly those involving the black students’ parents’ levels of involvement in their children’s education, there were more than 600 missing values. These missing values—coupled with the fact that these responses were self-reported and thus subject to misremembering or response bias—cause validity concerns for the regression results.

In addition to the issue of missing value problem, other variables particularly the race of math and reading teacher variable were highly unbalanced. Of the 1,575 black students who

reported the race of their math teacher, only 303 teachers were black. Similarly, only 342 of the 1,527 black students who reported their reading teacher's race had black teachers. Having such a small sample of black math and reading teachers to compare with their white counterparts greatly threatens the internal and external validity to the results for that regression. This sampling issue could be a contributing factor to why the results in this regression are contradictory to the results found in other students analyzing this relationship.

Age of Respondents

Using tenth grade students to test the relationship between academic achievement and the social, societal, psychological, and familial factors might not be the best unit of analysis. By the time a child is between the ages of 14 and 16 (the typical age of a tenth grade student), many of his or her cognitive and non-cognitive skills are developed.²⁶ It thus becomes increasingly difficult to make claims with confidence that the factors examined have an effect on the academic achievement at this time. Perhaps a better time to tests the effectiveness of these factors is from the time of early childhood to early-mid teens.

Measurement of Student Achievement

There is a belief that traditional methods used in standardized testing such as the IRT are not the most accurate ways to test the academic success of black students. Fryer and Levitt suggest that traditional tests oftentimes are more of a measurement of a child's environment (i.e. quality of school, expectations of teacher, home and neighborhood environment) than their intellect or acquired knowledge.²⁷ Other measures of academic success such as grade point average, graduation rates, and entry to college or SAT/ACT scores might be more accurate and unbiased measures of the academic achievement for black students.

Discussion and Conclusion

The results in this regression analysis lay the foundation for a number of policy implications that can improve black student performance. In both the math and reading score regressions, at least one of the four variables used to test for parental involvement showed statically significant results. This suggests that one way to improve black student academic performance is by encouraging more student-parent interaction within the black community. There are a number of barriers to involvement for some black parents, especially for lower income families, including lack of time, money, knowledge, or resources. With average gains of at least two points on either the math or reading standardized test—where the range of scores is limited to between 19 and 76 points—lessening or eliminated these barriers should be a priority. Similarly, the analysis illustrated the importance of getting black youth engaged and interested in higher education. The results showed that students who aspired to at least obtain a bachelor's degree scored on average seven points higher on the reading test. For those who aspired beyond that, the test gains were even more significant. More government and state

²⁶ Heckman, James J. *Policies to Foster Human Capital*. Working paper no. 7288. Cambridge: National Bureau Of Economic Research, 1999.

²⁷ Fryer, Roland G., and Steven D. Levitt. "Understanding the Black-white Test Score Gap in the First Two Years of School?" *The Review of Economics and Statistics* 86, no. 2 (May 2004): 447-64.

funds should go toward programs like Upward Bound that provide “fundamental support to participants in their preparation for college entrance.”²⁸ Programs like these targeting black, low-income, or future first-generation college students not only have the potential to close the achievement gap but also opportunity and resource gaps that are often present between black and white students.²⁹

One contradictory result of this analysis dealt with teachers’ race and student achievement. It was interesting to see that there was a negative relationship in both the reading and math test scores for those students who had a black teacher compared to those with a white teacher. In addition to the possible explanation listed in the limitations section, other potential reasons for this finding could lie in the assumption that the black math or reading teachers who taught black students were more likely to be in urban schools with fewer resources than their suburban counterparts. Additional research that looks specifically at the training, recruitment, and retention of black math and reading teachers in urban, suburban, and rural schools is needed to understand this relationship. Additionally, the collection of data that oversamples this underrepresented group of the teaching corps would be useful and necessary to strengthen the validity of future studies in this field. Despite the negative relationship, the recruitment of black educators is still an important policy objective, as the percentage of black educators is disproportionately low, especially for black men, who only make up 2 percent of all teachers.³⁰ By increasing the number of black educators, perhaps the relationship between teacher race and black student achievement will shift directions and yield the results found by Milner, Hudson, and Holmes.^{31, 32}

Finally, the regression results show that every additional hour a black student participates in an extracurricular activity is associated with a higher score on both the Reading and Math IRT tests. These results support the notion, as expressed by Branch, Gray, Roole, and Whitaker, that black students staying engaged outside of school is important to their overall academic success.^{33,34} Encouraging more community based and local efforts to increase the number of black children in extracurricular activities is therefore a plausible policy option to improve

28 “Upward Bound Program.” U.S. Department of Education. Accessed March 25, 2012. <http://www2.ed.gov/programs/trioupbound/index.html>.

29 Fryer, Roland G., and Steven D. Levitt. “Understanding the Black-white Test Score Gap in the First Two Years of School.” *The Review of Economics and Statistics* 86, no. 2 (May 2004): 447-64.

30 Huntspon, Allen, and George Howell. “Black Male Teachers Becoming Extinct.” *Cable News Network* (Atlanta), February 23, 2012

31 Milner, H. Richard. “The Promise of Black Teachers’ Success with Black Students.” *Educational Foundations*, Summer 2006, 89-104.

32 Hudson, M. J., and B. J. Holmes. “Missing Teachers, Impaired Communities: The Unanticipated Consequences of *Brown v. Board of Education* on the African American Teaching Force at the Precollegiate Level.” *Journal of Negro Education* 63 (1994): 388-93.

33 Branch, J. L. “Extracurricular Activities and Academic Achievement.” Diss., The University of Southern Mississippi, 2003.

34 Gray, Kyle, Barbara Roole, and Gordon Whitaker. “How After-School Programs Help Students Do Bette.” *Popular Government*, Summer 1999, 39-48.

achievement rates within the black community. For many black students—particularly those living in low income and urban settings—having after school activity options, besides athletic opportunities, are difficult to find. In the instances where alternative opportunities like dance, performing and visual arts, technology, and speech and debate are available, supplying the funds to sponsor these activities is often not an option for these families. Providing subsidies or scholarships to families is therefore one way to increase black students' participation and subsequently improve academic achievement. Another way to increase these efforts could be to provide nonprofits, counties, cities, and towns more grant opportunities for proposing creative ways to increase the number of black students who participate.

Closing the achievement gap among black and white children has proven to be a very difficult task in the United States. While there may not be one solution that will dramatically close the gap overnight, policies encouraging increased parental involvement, more participation in extracurricular activities, and encouragement of black student interest in higher education can be used in conjunction with each other to make a substantive difference for future generations.

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