Research Report

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Evaluating High School GPA and Demographics as Predictors of ACT® Composite Scores: A Dominance Analysis

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Conclusions

The current research study demonstrates the robustness of the predictive validity of high school grade point average (HSGPA) and its position as the primary predictor of ACT® Composite scores, unreservedly surpassing other variables considered such as socioeconomic and demographic characteristics, indicators of advanced coursework, and school-level characteristics. This dominance is consistent across all combinations of models, indicating the strength of the predictive relationship over both student-level and school-level factors. Specifically, HSGPA is superior in predicting ACT Composite scores over family income, race/ethnicity, gender, and advanced coursework taking across the core subjects of English, math, social studies, and science.

So What?

This study confirms the preeminence of HSGPA as the most significant predictor of ACT Composite scores, substantially more influential than students' family income, demographic factors, or school characteristics. This reaffirms the connection between students' academic achievement in high school and their ACT scores. While HSGPA was the predominant predictor, advanced coursework, especially in mathematics, stands out as a strong predictor of ACT Composite scores.

Now What?

The findings indicate the importance of students taking a rigorous high school curriculum, especially advanced coursework. These two factors are critical for students' college readiness, showcasing the importance of academic preparation over family income and demographic background. High schools are encouraged to increase the rigor of their academic programs, especially in core subjects like English, math, social studies, and science. Schools can strive to ensure that all students, regardless of their background, have access to advanced coursework to help students master the content that will be needed in college and the workforce.

About the Author

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Dr. Sanchez is a lead research scientist at ACT where he studies postsecondary admissions, national testing programs, test preparation efficacy, and intervention effectiveness. Throughout his career, Dr. Sanchez has focused on studying the transition between high school and college and supporting the decision-making capacity of college administrators, students, and their families. His research has been widely cited in academic literature and by the media, including *The Wall Street Journal*, *The Washington Post*, *USA Today*, and the education trade press.

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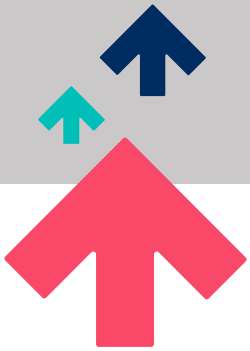


Introduction

While some authors argue for a de-emphasis of standardized test scores such as the ACT® in favor of using high school GPA (HSGPA; Kohn, 2000; FairTest, 2007a; FairTest, 2007b), such an argument fails to account for considerable empirical research which demonstrates the validity of standardized test scores for predicting college outcomes (Allen, 2013; Allen & Sconing, 2005; Camara et al., 2019; Kobrin et al., 2008; Mattern & Patterson, 2014; Radunzel & Mattern, 2020; Radunzel & Noble, 2013; Radunzel & Noble, 2012; Sanchez, 2013; University of California Academic Senate, 2020; Westrick et al., 2015). These studies consistently found that students who earn higher ACT and/or SAT scores tend to earn higher first-year GPAs and higher cumulative GPAs in addition to having better retention and graduating at higher rates compared to students with lower grades and ACT/SAT scores.

Sanchez (In Press-a) demonstrates that between the graduating cohorts of 2017 and 2021, HSGPA has become a less consistent predictor of first-year GPA. In contrast, ACT Composite score showed relative stability in its predictive validity of first-year GPA. Additionally, the study found that HSGPA does not differentiate high-achieving students due to the skewed distribution of HSGPA. Sanchez (In Press-b) illustrates that the probability of placement in developmental courses in college changes substantially across cohorts between 2017 and 2020 when HSGPA is used alone as a predictor. This was not the case for ACT Composite score, however. In fact, across cohorts, there was very little difference in the probability of developmental course placement for students with the same ACT Composite score. These studies demonstrate the shift in validity of both HSGPA and ACT Composite scores over time and demonstrates the utility of using both measures combined rather than either measure alone.

In addition to the array of predictive validity evidence between ACT scores and college outcomes, there are strong relationships between college entrance exam scores and HSGPA. Marchant and Paulson (2005), for example, investigated the relationship between high school graduation exams and SAT total scores. As part of that study, they determined that HSGPA explained 14% of the variance in individual student SAT scores. Among all the predictors examined, HSGPA explained the most variance in SAT scores. McNeish et al. (2015) documented that HSGPA was the primary explanatory factor in ACT Composite scores, explaining between 20% to 31% of the variance in ACT subject and Composite scores in comparison to socioeconomic and demographic factors, which only explained 4% or less of the variance after adjusting for other student and school characteristics. Finally, Sanchez (In Press-c) shows that math and science GPA, along with indicators for having taken advanced coursework in math and science, accounted for 41.8% of the variance in ACT STEM scores; socioeconomic and demographic factors only explained an additional 8.6% of the variance in ACT STEM scores. Additionally, high school GPA in English and social studies and indicators of having taken advanced coursework in English and social studies accounted for 41.3% of the variance in ACT ELA scores, while socioeconomic and demographic factors only explained an additional 6.2%.

Much research has been conducted on the predictive validity of high school coursework and grades for college outcomes. Adelman (2006) highlights the importance of rigorous high school coursework for student degree completion. This study found that students who completed

advanced math and science courses, including AP/IB courses, were more likely to graduate from college. Similarly, Sadler and Tai (2007) found that students who took biology, chemistry, and physics were better prepared for college science courses. Geiser and Santelices (2007) note that HSGPA, and particularly college preparatory courses in high school, were found to be the strongest predictor of first-year GPA as well as longer term college outcomes such as cumulative GPA and graduation. In the present study, I look at an analog for this type of advanced coursework taking through a self-reported indicator of advanced coursework taking.

Given the established relationship between HSGPA and ACT scores, as well as the relationship that has been documented between ACT scores and college outcomes, the present study seeks to further analyze the link between HSGPA, socioeconomic status, and demographics with ACT Composite scores. While the studies previously cited provide a foundation for understanding the sources of variance in ACT scores, in the present study, I focus on assessing the relative importance of student characteristics along with key school-level characteristics. I will use methods for partitioning the explained variance in ACT scores from individual predictors and combinations of predictors. This analysis will also provide a ranking of predictors based on their relative importance.

A key differentiator between the present research study and prior research studies that examined sources of variance in ACT Composite scores is that the present study will make use of dominance analysis, which will provide an understanding of the importance of predictors of ACT Composite scores while not being dependent upon the specific model implemented.

The following research questions will be addressed:

1. Is HSGPA a more dominant predictor of ACT Composite score in comparison to advanced coursework indicators, students' socioeconomic and demographic characteristics, and school-level characteristics?
2. Are advanced coursework indicators more dominant predictors of ACT Composite score in comparison to students' socioeconomic and demographic characteristics as well as school-level characteristics?

Methods

Analytical Sample

The study consisted of 576,783 students from the ACT-tested graduating class of 2022. Students were required to have the following data to be included in the study: non-missing ACT Composite scores, HSGPA, advanced coursework indicators, and percentage of ACT-tested students at a school taking advanced coursework. This sample was then matched to school-level characteristics collected from the U.S. Department of Education National Center on Education Statistics (NCES, 2024). Students from private schools and other schools that could not be matched to NCES data were excluded. Table 1 describes the sample of students and summarizes the variables used in the analysis. The sample was predominantly White, female, students from families with over $100,000 family income, and students who had taken the ACT once. The sample was approximately evenly split on students who did or did not take advanced coursework in English, math, social studies, and science.

Table 1. Study Sample Characteristics

Characteristic		N (%)
Race/Ethnicity	Asian	30,550 (5.3)
	Black	62,705 (10.9)
	Hispanic	84,754 (14.7)
	American Indian	5,109 (0.9)
	White	349,281 (60.6)
	Native Hawaiian/Pacific Islander	1,283 (0.2)
	Two or More Races	28,927 (5.0)
	Prefer Not to Respond	13,833 (2.4)
	Missing	361 (0.1)
Family Income	<$36K	99,377 (17.2)
	$36K–$60K	74,637 (12.9)
	$60K–$100K	100,383 (17.4)
	>$100K	190,507 (33.0)
	Missing	111,899 (19.4)
Gender	Female	311,726 (54.0)
	Male	257,811 (44.7)
	Another Gender	1,845 (0.3)
	Prefer Not to Respond	5,202 (0.9)
	Missing	219 (0.0)
Taken Advanced Coursework	English	292,619 (50.7)
	Math	263,162 (45.6)
	Social Studies	268,466 (46.5)
	Science	272,700 (47.3)
Test Type	State/District	262,565 (45.5)
Times Tested	1	326,846 (56.7)
	2	140,249 (24.3)
	3	61,156 (10.6)
	4	26,948 (4.7)
	5+	21,604 (3.7)
Mean (SD)	ACT Composite Score	20.86 (5.77)
	HSGPA	3.39 (0.61)
	School Average HSGPA	3.39 (0.27)
	2022 Percent Students of Color	32.55 (26.18)
	2022 Percent Free/Reduced-Priced Lunch Eligible	38.25 (25.82)
	2022 Percent at School Taking Advanced Coursework	64.74 (20.59)
N		576,803

Measures

ACT Composite. The ACT Composite score for the analysis reflects most recent ACT test taken before graduation. This score could have been achieved through either a school-day State and District testing program or during a National test session.

Cumulative High School GPA. Grades from up to 23 courses in English, math, social studies, and science were used to calculate high school GPA (HSGPA) for each student based on their own grade reports. Sanchez and Buddin (2015) found a strong link between the self-reported GPA and the GPAs recorded on transcripts. Additional studies (Camara et al., 2003; Kuncel et al., 2005; Shaw & Mattern, 2009) have also validated the reliability of using self-reported data for academic research.

Advanced Coursework Taken. A self-reported indicator of having taken advanced coursework in English, mathematics, natural science, and social studies was included in the analysis. This included having taken AP, accelerated, and/or honors courses for each subject.

Demographic Characteristics. Student self-reported demographic information included family income, gender, and racial/ethnic background and was collected at the time students registered for the ACT. Family income was categorized into one of four categories: below $36,000, $36,000–$60,000, $60,000–$100,000, above $100,000, and missing response. Students identified their gender from four choices: male, female, another gender, and prefer not to respond. Racial/ethnic identification included: Asian, Black, Hispanic, American Indian, Native Hawaiian/Pacific Islander, White, two or more races, prefer not to respond, or no response provided.

School Characteristics. School-level characteristics were collected from the U.S. Department of Education National Center on Education Statistics (NCES, 2024). The percentage of students classified as students of color included those who identified as American Indian or Alaska Native, Hispanic, Black, and Native Hawaiian or other Pacific Islander. The percentage of students eligible for free and reduced-price lunch was also included in the study. Lastly, the percentage of ACT-tested students at a school taking advanced coursework was assessed using the ACT-tested student count at each school in conjunction with the advanced-coursework-taken indicators provided by students at the time of ACT registration.

Average School Achievement. Based on data from the graduating class of 2022, average high school GPA was calculated for inclusion in the study.

Testing Characteristics. Research has demonstrated that students tend to increase their scores on the ACT when they retest (Allen, 2022). They also experience diminishing gains with additional retesting. For that reason, the number of times a student took the ACT was included in this study. Additionally, students in the study may have taken the ACT as part of a State and District school-day testing program or during a National test session. Because of the differences in testing context, an indicator was included in the study for the type of test the student took.

Analytical Methodology

I first used a linear regression model with cluster-robust standard errors to assess the statistical significance of the predictors to be included in further analysis. Following this step, dominance analysis was used to deconstruct the proportion of variance explained to identify the most important predictors of ACT Composite score (Azen & Budescu, 2006; Budescu, 1993).[1] Dominance analysis is a method for assessing the relative importance of predictors in multiple regression models. This approach examines the R^2 values for all possible subset models of the predictors. The method attempts to overcome limitations of traditional methods that determine the importance of predictors, which depend on the specific model used and may not remain invariant across different subsets of predictors. Dominance analysis addresses this by decomposing the total variance in the dependent variable into the variance explained by the predictors, providing a more precise and model-independent measure of predictor importance.

General dominance occurs when one predictor explains more variance in the dependent variable than another across all possible subsets of predictors, on average. It assesses a predictor's average contribution to the model's explanatory power across all combinations of other predictors. This form of dominance allows a ranking of importance of predictors in the model. Conditional dominance is assessed at each level of model subset size. A predictor conditionally dominates another if it contributes more to the explanatory power of the model than the other predictor, for every possible subset of predictors of any given size. This type of dominance is more specific than general dominance, as it requires the predictor to be more important across all subsets of a specific size, rather than on average. A predictor completely dominates another if it explains more variance in the dependent variable in every possible subset model that includes both predictors. This is the strictest form of dominance, indicating that regardless of the combination of other predictors in the model, one predictor always contributes more to the model's explanatory power than another.

The traditional interpretation of the importance of a predictor in the model using R^2 is limited by the fact that the order in which a predictor enters a model impacts the additional percentage of variance explained by that predictor. It is also limited by the fact that R^2 is dependent upon which other variables are included in the model. The advantage of using dominance analysis is the analysis examines all possible subsets of models to arrive at a determination of the importance of a predictor.

Results

The results of the linear model with conditional standard errors as well as the results of the dominance analysis are presented in the Technical Appendix. Here I consider the research questions proposed.

[1] The R package "domir" was used to conduct the dominance analysis.

Research Question 1

Is HSGPA a more dominant predictor of ACT Composite score in comparison to advanced coursework indicators, demographics, and school-level characteristics?

From Tables B1–B3, we can see that HSGPA completely dominated family income, race/ethnicity, and gender. This means that in all possible combinations of models, HSGPA was always a stronger predictor than socioeconomic status and demographic characteristics. We can also see that HSGPA completely dominated indicators of having taken advanced coursework in English, social studies, and science. It also conditionally dominated advanced coursework in math. We can therefore say that HSGPA was, in most cases, a stronger predictor than indicators of taking advanced coursework. The dominance analysis also found that HSGPA completely dominated school average HSGPA, the percentage of students of color at a high school, the percentage of students in a high school eligible for free and reduced-price lunch, and the percentage of ACT-tested students taking advanced coursework at a school. We can therefore conclude that HSGPA was a stronger predictor of ACT Composite score than school-level characteristics. HSGPA completely dominated all other predictors examined. This complete dominance implies both conditional and general dominance over all other predictors. In terms of its general dominance ranking, HSGPA was the most important predictor of ACT Composite score. In examining the conditional dominance statistics, we can see that HSGPA explained between 5% and 33% of the variance of ACT Composite score in models that included HSGPA and at least one other predictor.

Research Question 2

Are advanced coursework indicators more dominant predictors of ACT Composite score in comparison to demographics and school-level characteristics?

From Tables B1–B3, we can see that taking advanced coursework in math completely dominated gender as a predictor of ACT Composite score. It also generally dominated race/ethnicity and conditionally dominated family income. Advanced mathematics coursework taking also completely dominated taking advanced coursework in English, social studies, and science, as well as the percentage of ACT-tested students taking advanced coursework at a school. Additionally, it conditionally dominated school average HSGPA, the percentage of students of color at a school, and the percentage of ACT-tested students taking advanced coursework at a school. Finally, it completely dominated the percentage of ACT-tested students taking advanced coursework at a school. In terms of its general dominance ranking, taking advanced coursework in math was the second-most important predictor of ACT Composite score.

Taking advanced coursework in science generally dominated race/ethnicity, family income, and gender. Furthermore, it conditionally dominated the average HSGPA at a school, the percentage of students of color at a school, and the percentage of ACT-tested students taking advanced coursework at a school. It also generally dominated the percentage of students eligible for free and reduced-price lunch at a high school. In terms of its general dominance ranking, taking advanced coursework in science was the third-most important predictor of ACT Composite score.

Taking advanced coursework in English was completely dominated by taking advanced coursework in math. Advanced coursework in English also generally dominated taking advanced coursework in social studies and the percentage of high school students eligible for free and reduced-price lunch. Moreover, taking advanced coursework in English conditionally dominated the average HSGPA at a school, the percentage of students of color at a school, and the percentage of ACT-tested students taking advanced coursework at a school. Advanced English coursework also generally dominated race/ethnicity, family income, and gender. In terms of its general dominance ranking, taking advanced coursework in English was the fourth-most important predictor of ACT Composite score.

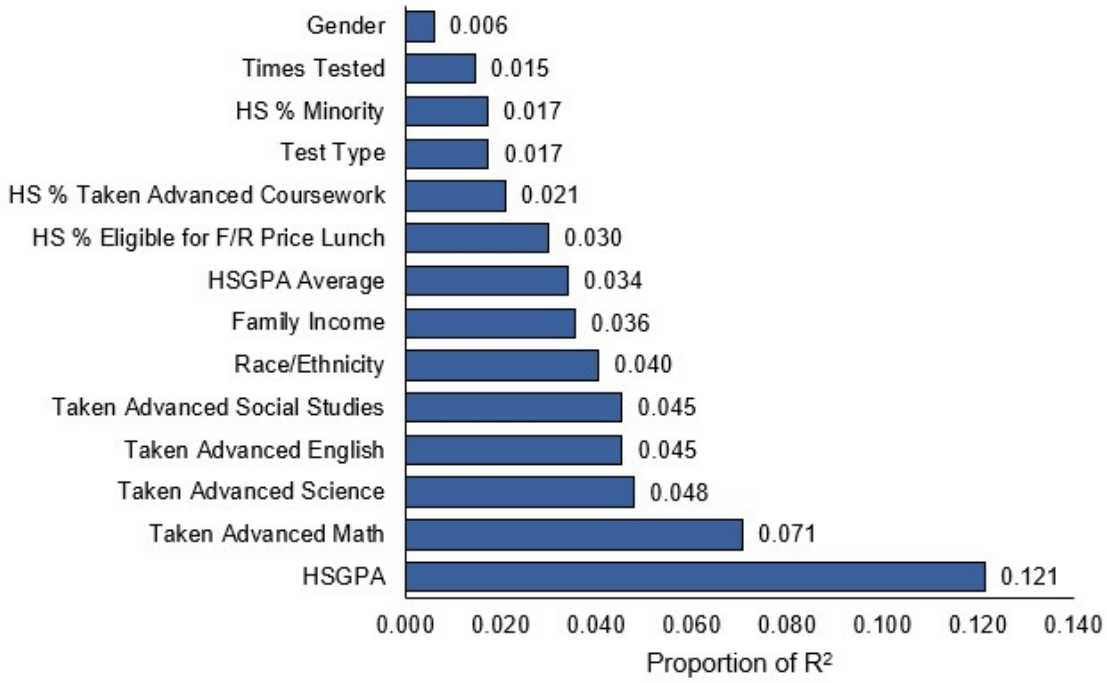
Advanced coursework taking in social studies conditionally dominated the average HSGPA at a school, the percentage of students of color at a school, and the percentage of ACT-tested students taking advanced coursework at a school. Taking advanced coursework in social studies generally dominated race/ethnicity, family income, and gender in the prediction of ACT Composite score. Taking advanced coursework in social studies also generally dominated the percentage of students that were eligible for free and reduced-price lunch at a school. In terms of its general dominance ranking, taking advanced coursework in social studies was the fifth-most important predictor of ACT Composite score.

Overall, we can see that while advanced coursework taking was a less dominant predictor than HSGPA, advanced coursework taking in English, math, social studies, and science were more dominant predictors than race/ethnicity, family income, and gender. These indicators of advanced coursework taking were also more dominant predictors than any of the school-level characteristics examined.

General Dominance Summary

Figure 1 illustrates the relative percentage of R^2 explained by model predictors. This is an illustration of the general dominance statistics among predictors. Although this is the weakest of the three forms of dominance examined, it is perhaps the most intuitive to interpret for readers who are accustomed to utilizing R^2 to judge predictor importance. Recall that the R^2 percentage represented by general dominance is the average R^2 for pairs of all subset models. We can see that HSGPA contributes the most to total R^2, followed by the indicator of a student having taken advanced math and then an indicator of having taken advanced science, and so on for other predictors. In the case of HSGPA, this predictor contributed between 33% and 5% to total R^2 depending on the number of predictors included in subset models. Its average R^2 contribution was 12% among all subset models. The range of contributions for each predictor across models with different numbers of predictors can be seen in Table D1.

Figure 1. Proportion of R^2 Explained by Model Predictors



Discussion

The present research extends the discussion on the relationship between HSGPA, socioeconomic status, demographics, and ACT Composite scores. By utilizing dominance analysis, the present study seeks to inform the relative importance of these factors in predicting ACT scores, offering a more detailed and comprehensive understanding of their impact on ACT scores. While considering a broad array of individual- and school-level characteristics in this study, the present analysis also directly addresses the limitations associated with using increases in R^2 as a measure of predictor importance.

The current research study demonstrates the robustness of the predictive validity of HSGPA and its position as the primary predictor of ACT Composite scores, unreservedly surpassing other variables considered such as socioeconomic and demographic characteristics, indicators of advanced coursework, and school-level characteristics. This dominance is consistent across all combinations of models, indicating the strength of the predictive relationship over both student-level and school-level factors. Specifically, HSGPA is superior in predicting ACT Composite scores over family income, race/ethnicity, gender, and advanced coursework taking across the core subjects of English, math, social studies, and science.

The analysis also demonstrates the strong predictive power of advanced coursework taking that, while not as dominant as HSGPA, significantly influences ACT Composite scores. Advanced coursework taking in math notably outperformed other predictors, including socioeconomic and demographic factors, other advanced coursework indicators, and school-level characteristics, positioning it as the second-most crucial predictor following HSGPA.

Similarly, advanced coursework taking in science, English, and social studies were more dominant predictors than socioeconomic and demographic factors, as well as other school-level factors.

This dominance analysis emphasizes the unparalleled role that HSGPA has in explaining the variance in ACT Composite scores, explaining between 5% and 25% of the variance in ACT Composite score in predictive models that include HSGPA with other predictors. The findings also highlight the significant role of advanced coursework taking in enhancing predictive models of ACT Composite score. This underscores the importance of a rigorous high school curriculum along with strong academic performance as a foundation for college readiness.

The dominance of advanced coursework taking over socioeconomic, demographic, and school-level characteristics further illustrates the importance of academic preparation for performance on the ACT.

Limitations

Although this study utilized a diverse array of student and school-level characteristics in predicting ACT Composite scores, additional predictors may have accounted for other relevant factors that would influence ACT scores. At the student level, this could include such factors as parental education, student motivation or engagement, and participation in extracurricular activities, while at the school level it could include school quality, teacher effectiveness, and school safety environment. While the inclusion of the number of times a student took the ACT attempts to account for retesting effects, it may not capture potential variability in test preparation resources, testing conditions, or test-taking strategies, which could also influence ACT scores.

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Appendix A

Linear Regression Model

Table A1 displays the standardized regression coefficients and significance for all predictors considered for the dominance analysis. From this linear regression model, we can see that all predictors were significant predictors of ACT Composite score. This model accounted for 54.57% of the variance in ACT Composite scores.

Table A1. Linear Regression Model of ACT Composite Score With Cluster Robust Standard Errors

Variable		Standardized Estimate	Std. Error
(Intercept)		18.703***	0.020
Race/Ethnicity	Asian	1.628***	0.028
	Black	−1.729***	0.018
	Hispanic	−0.963***	0.017
	American Indian	−1.216***	0.049
	Native Hawaiian/Pacific Islander	−1.376***	0.100
	Two or More Races	−0.023	0.100
	Prefer Not to Respond	0.589***	0.024
	Missing	−0.632***	0.039
Family Income	$36K–$60K	0.404***	0.018
	$60K–$100K	0.695***	0.017
	> $100K	1.402***	0.017
	Missing	0.918***	0.017
Gender	Female	−0.953***	0.011
	Another Gender	1.934***	0.095
	Prefer Not to Respond	1.588***	0.061
	Missing	−0.615***	0.282
Taken Advanced Coursework	English	0.932***	0.015
	Math	1.883***	0.015
	Social Studies	0.973***	0.015
	Science	0.842***	0.015
Test Type	State/District	−0.473***	0.013
Times Tested	2	0.562***	0.014
	3	0.815***	0.019
	4	0.786***	0.026
	5+	0.725***	0.029
High School Characteristic	HSGPA	1.698***	0.006
	Average HSGPA	0.280***	0.010
	Percent Students of Color	−0.296***	0.008
	Percent Eligible for Free/Reduced-Price Lunch	−0.664***	0.007
	Percent Taking Advanced Coursework	0.149	0.007

Note: *p<0.1; **p<0.05; ***p<0.01. The reference levels for the model were White; less than $36,000; male; not having taken advanced coursework in English, math, social studies, and science; national test taking; and taking the ACT once. The quantitative predictors of HSGPA, high school average HSGPA, high school percent students of color, high school percent eligible for free/reduced-price lunch, and high school percent taking advanced coursework were standardized.

Appendix B

Dominance Analysis: Strongest Level of Dominance

Tables B1–B3 designate the strongest level of dominance attained between predictors. The table should be read first by column and then by row. For example, race/ethnicity generally dominated family income, and race/ethnicity is completely dominated by HSGPA. Tables B1–B3 summarize the results found in Tables C1–C3, D1, and E1.

Table B1. Strongest Level of Dominance Among Predictors

Variable	Race/Ethnicity	Family Income	Gender	Taken Advanced Coursework in English
Race/Ethnicity	—	—	—	—
Family Income	generally dominates	—	—	—
Gender	completely dominates	generally dominates	—	—
Taken Advanced Coursework in English	is generally dominated by	is generally dominated by	is generally dominated by	—
Taken Advanced Coursework in Math	is generally dominated by	is conditionally dominated by	is completely dominated by	is completely dominated by
Taken Advanced Coursework in Social Studies	is generally dominated by	is generally dominated by	is generally dominated by	generally dominates
Taken Advanced Coursework in Science	is generally dominated by	is generally dominated by	is generally dominated by	is generally dominated by
Test Type = State/District	conditionally dominates	conditionally dominates	is generally dominated by	conditionally dominates
Times Tested	conditionally dominates	conditionally dominates	is generally dominated by	conditionally dominates
HSGPA	is completely dominated by	is completely dominated by	is completely dominated by	is completely dominated by
High School Average HSGPA	generally dominates	generally dominates	is generally dominated by	conditionally dominates
% HS Students of Color	completely dominates	conditionally dominates	is generally dominated by	conditionally dominates
% HS FRL Eligible	conditionally dominates	generally dominates	is generally dominated by	generally dominates
% HS Taking Advanced Coursework	conditionally dominates	conditionally dominates	is generally dominated by	conditionally dominates

Table B2. Strongest Level of Dominance Among Predictors

Variable	Taken Advanced Coursework in Math	Taken Advanced Coursework in Social Studies	Taken Advanced Coursework in Science	Test Type = State/District
Race/Ethnicity	—	—	—	—
Family Income	—	—	—	—
Gender	—	—	—	—
Taken Advanced Coursework in English	—	—	—	—
Taken Advanced Coursework in Math	—	—	—	—
Taken Advanced Coursework in Social Studies	completely dominates	—	—	—
Taken Advanced Coursework in Science	completely dominates	is generally dominated by	—	—
Test Type = State/District	completely dominates	conditionally dominates	conditionally dominates	—
Times Tested	completely dominates	conditionally dominates	generally dominates	generally dominates
HSGPA	is conditionally dominated by	is completely dominated by	is completely dominated by	is completely dominated by
High School Average HSGPA	conditionally dominates	conditionally dominates	conditionally dominates	is generally dominated by
% HS Students of Color	conditionally dominates	conditionally dominates	conditionally dominates	generally dominates
% HS FRL Eligible	conditionally dominates	generally dominates	generally dominates	is conditionally dominated by
% HS Taking Advanced Coursework	completely dominates	completely dominates	conditionally dominates	conditionally dominates

Table B3. Strongest Level of Dominance Among Predictors

Variable	Times Tested	HSGPA	HSGPA_HSAVG	% HS Students of Color	% HS FRL Eligible
Race/Ethnicity	—	—	—	—	—
Family Income	—	—	—	—	—
Gender	—	—	—	—	—
Taken Advanced Coursework in English	—	—	—	—	—
Taken Advanced Coursework in Math	—	—	—	—	—
Taken Advanced Coursework in Social Studies	—	—	—	—	—
Taken Advanced Coursework in Science	—	—	—	—	—
Test Type = State/District	—	—	—	—	—
Times Tested	—	—	—	—	—
HSGPA	is completely dominated by	—	—	—	—
High School Average HSGPA	is generally dominated by	completely dominates	—	—	—
% HS Students of Color	is generally dominated by	completely dominates	generally dominates	—	—
% HS FRL Eligible	is conditionally dominated by	completely dominates	generally dominates	is conditionally dominated by	—
% HS Taking Advanced Coursework	is generally dominated by	completely dominates	conditionally dominates	is generally dominated by	generally dominates

Appendix C

Dominance Analysis: Complete Dominance

Tables C1–C3 designate complete dominance attained between predictors. A predictor is said to completely dominate another if it contributes more to the explained variance (R^2) of the dependent variable in every possible subset of regression models in which both predictors are included. This means that for a given predictor to be considered completely dominant over another, its inclusion must result in a higher R^2 value in every comparison. The tables should be read first by row and then by column. For example, it was the case that race/ethnicity completely dominated gender, and it was true that HSGPA completely dominated race/ethnicity. When complete dominance could not be determined between two predictors, the table displays "NA."

Table C1. Complete Dominance among Predictors

Variable	Race/Ethnicity	Family Income	Gender	Taken Advanced Coursework in English	Taken Advanced Coursework in Math
Race/Ethnicity	NA	NA	TRUE	NA	NA
Family Income	NA	NA	NA	NA	NA
Gender	FALSE	NA	NA	NA	FALSE
Taken Advanced Coursework in English	NA	NA	NA	NA	FALSE
Taken Advanced Coursework in Math	NA	NA	TRUE	TRUE	NA
Taken Advanced Coursework in Social Studies	NA	NA	NA	NA	FALSE
Taken Advanced Coursework in Science	NA	NA	NA	NA	FALSE
Test Type = State/District	NA	NA	NA	NA	FALSE
Times Tested	NA	NA	NA	NA	FALSE
HSGPA	TRUE	TRUE	TRUE	TRUE	NA
High School Average HSGPA	NA	NA	NA	NA	NA
% HS Students of Color	FALSE	NA	NA	NA	NA
% HS FRL Eligible	NA	NA	NA	NA	NA
% HS Taking Advanced Coursework	NA	NA	NA	NA	FALSE

Table C2. Complete Dominance Among Predictors

Variable	Taken Advanced Coursework in Social Studies	Taken Advanced Coursework in Science	Test Type = State/District	Times Tested	HSGPA
Race/Ethnicity	NA	NA	NA	NA	FALSE
Family Income	NA	NA	NA	NA	FALSE
Gender	NA	NA	NA	NA	FALSE
Taken Advanced Coursework in English	NA	NA	NA	NA	FALSE
Taken Advanced Coursework in Math	TRUE	TRUE	TRUE	TRUE	NA
Taken Advanced Coursework in Social Studies	NA	NA	NA	NA	FALSE
Taken Advanced Coursework in Science	NA	NA	NA	NA	FALSE
Test Type = State/District	NA	NA	NA	NA	FALSE
Times Tested	NA	NA	NA	NA	FALSE
HSGPA	TRUE	TRUE	TRUE	TRUE	NA
High School Average HSGPA	NA	NA	NA	NA	FALSE
% HS Students of Color	NA	NA	NA	NA	FALSE
% HS FRL Eligible	NA	NA	NA	NA	FALSE
% HS Taking Advanced Coursework	NA	NA	NA	NA	FALSE

Table C3. Complete Dominance Among Predictors

Variable	High School Average HSGPA	% HS Students of Color	% HS FRL Eligible	% HS Taking Advanced Coursework
Race/Ethnicity	NA	TRUE	NA	NA
Family Income	NA	NA	NA	NA
Gender	NA	NA	NA	NA
Taken Advanced Coursework in English	NA	NA	NA	NA
Taken Advanced Coursework in Math	NA	NA	NA	TRUE
Taken Advanced Coursework in Social Studies	NA	NA	NA	NA
Taken Advanced Coursework in Science	NA	NA	NA	NA
Test Type = State/District	NA	NA	NA	NA
Times Tested	NA	NA	NA	NA
HSGPA	TRUE	TRUE	TRUE	TRUE
High School Average HSGPA	NA	NA	NA	NA
% HS Students of Color	NA	NA	NA	NA
% HS FRL Eligible	NA	NA	NA	NA
% HS Taking Advanced Coursework	NA	NA	NA	NA

Appendix D

Dominance Analysis: Conditional Dominance

Table D1 displays the conditional dominance statistics between predictors for various combinations of models with differing numbers of predictors. Each cell represents the average of the differences between each model containing the row predictor and a comparable model not containing the row predictor by the number of predictors in the model. For example, the column labeled "IVs:1" indicates the average R^2 contribution of that predictor in a model that only contains that predictor in comparison to a model that only includes an intercept. In the column labeled "IVs: 10," the row value is the average contribution (difference in R^2) of that predictor across all possible models that include any of the other nine predictors. To establish conditional dominance in this table, all cell values in one row should be compared to all cell values in a different row. For example, the average HSGPA at a high school conditionally dominated the percentage of students of color at a high school because all cell values in the row for average HSGPA are larger than all cell values in the row for the percentage of students of color at a high school.

Table D1. Conditional Dominance Statistics Among Predictors

Variable	Number of Predictors in Model (IVs)													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Race/Ethnicity	0.12	0.09	0.07	0.05	0.04	0.04	0.03	0.03	0.02	0.02	0.02	0.02	0.01	0.01
Family Income	0.15	0.09	0.06	0.05	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
Gender	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Taken Advanced Coursework in English	0.21	0.13	0.09	0.06	0.04	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.00	0.00
Taken Advanced Coursework in Math	0.27	0.18	0.13	0.09	0.07	0.05	0.04	0.03	0.03	0.02	0.02	0.02	0.01	0.01
Taken Advanced Coursework in Social Studies	0.21	0.13	0.09	0.06	0.04	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.00	0.00
Taken Advanced Coursework in Science	0.22	0.14	0.09	0.06	0.05	0.03	0.02	0.02	0.01	0.01	0.01	0.00	0.00	0.00
Test Type = State/District	0.09	0.05	0.03	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Times Tested	0.06	0.04	0.03	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
HSGPA	0.33	0.24	0.19	0.15	0.12	0.11	0.09	0.08	0.08	0.07	0.06	0.06	0.06	0.05
High School Average HSGPA	0.16	0.10	0.06	0.04	0.03	0.02	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00
% HS Students of Color	0.05	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
% HS FRL Eligible	0.11	0.07	0.05	0.04	0.03	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
% HS Taking Advanced Coursework	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Appendix E

Dominance Analysis: General Dominance

Table E1 displays the general dominance statistics among predictors. This form of dominance is the weakest of the three forms of dominance. The general dominance statistics are the average of all conditional dominance statistics for a predictor. For example, we can see that HSGPA has the highest R^2 contribution among all predictors and is ranked number one as the most dominant predictor in this table. Of note is that the cumulative R^2 contribution of the advanced coursework indicators in math, science, English, and social studies is larger than the individual contribution of HSGPA. It is not likely that a single indicator for having taken any advanced coursework in high school would contribute more than HSGPA. What is clear is that HSGPA and taking advanced coursework in high school are the strongest predictors of ACT Composite scores. When evaluating the average contributions, we must also consider that this is an average among different combinations of predictors in models of differing sizes.

Table E1. General Dominance Statistics Among Predictors

Variable	R^2 Contribution	Proportion of Total R^2	Rank
HSGPA	0.12	0.22	1
Taken Advanced Math	0.07	0.13	2
Taken Advanced Science	0.05	0.09	3
Taken Advanced English	0.05	0.08	4
Taken Advanced Social Studies	0.05	0.08	5
Race/ethnicity	0.04	0.07	6
Family Income	0.04	0.07	7
HS HSGPA Avg	0.03	0.06	8
HS % Eligible for F/R Price Lunch	0.03	0.05	9
HS % Taken Advanced Coursework	0.02	0.04	10
Test Type	0.02	0.03	11
HS % Students of Color	0.02	0.03	12
Times Tested	0.01	0.03	13
Gender	0.01	0.01	14

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