RESEARCH REPORT

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# A Model-Based Examination of College Outcomes for AP® Fee Reduction Students

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## Executive Summary

A recent report by Wyatt and Mattern (2011) compared college outcomes for low-socioeconomic status (low-SES) students who received Advanced Placement® (AP®) fee reductions versus low-SES students who did not participate in the AP Program. The results indicated that AP Fee Reduction students had better college outcomes than students from low-SES backgrounds who did not participate in AP. The results were parsed by gender, ethnicity, HSGPA, SAT® score, and highest parental education level to evaluate whether the AP effect remained after considering these variables. In general, there was still an AP effect; however, these analyses only controlled for one variable at a time. This report describes a follow-up study employing more rigorous methods to determine whether an AP effect remains when all demographic and academic variables are simultaneously controlled for using regression analysis. Results reveal that after controlling for gender, ethnicity, HSGPA, SAT score, and highest parental education level concurrently, low-SES students who participated in AP through the fee reduction program were more likely to enroll in a four-year college, transfer to a four-year college from a two-year college, earn higher college grades, and ultimately graduate college as compared to low-SES students not participating in AP.

# Introduction

The College Board has initiated several efforts to increase low-socioeconomic (low-SES) students' access to the AP® Program. In one effort, the College Board has worked with schools and states to provide AP fee reductions to students who qualify based on eligibility for free and reduced-price lunch. Typically, students receiving a College Board–issued fee reduction take an AP Exam(s) at no cost or for a nominal fee (College Board, n.d.). The results of these efforts have led to an increased number of low-SES students participating in the AP Program. For example, in 2009, over 150,000 graduating seniors, or 18.9% of the AP cohort, had received an AP fee reduction for at least one AP Exam, up from 17.0% in 2008 and 13.7% in 2004 (College Board, 2010). Even more dramatic results have been achieved through targeted initiatives such as the Expansion Project (College Board, 2010). This initiative provided funding to 51 pilot schools in six states to expand their AP course offerings, which in turn has more than doubled participation of minority and low-SES students within two years. The main rationale of such efforts is to better prepare low-SES students to attend college and successfully complete college-level work by providing them with the opportunity to take rigorous courses in high school.

What has been the impact of these initiatives targeted at low-SES students? In terms of increasing low-SES participation, these initiatives have been very successful as described in the previous paragraph. However, questions remain as to whether participation in the AP Program better prepares low-SES students for college, resulting in more positive education outcomes. There is a lack of research evaluating whether low-SES students who received an AP fee reduction have better college outcomes than their low-SES peers who did not participate in the AP Program. One exception is a study conducted by Wyatt and Mattern (2011) that examined numerous college outcomes for low-SES students who received an AP fee reduction as compared to their low-SES peers who did not participate in AP. The college outcomes investigated included college enrollment, first-year grade point average (FYGPA), and retention to the second year. Overall, the low-SES students participating in AP through the fee reduction program had more positive college outcomes than students not taking AP courses. The AP Fee Reduction students had higher four-year college enrollment rates (60.5% vs. 38.0%), higher FYGPAs (2.76 vs. 2.49), and higher retention rates to second year (83.6% vs. 74.1%). This also was true when the data was disaggregated by demographic and academic variables (e.g., ethnicity or SAT® scores).

However, there were several limitations of the Wyatt and Mattern (2011) study that should be noted. One limitation is that the study didn't consider several important variables of interest to the education community such as transfer rates from a two-year to a four-year college and graduation. Transferring from a two-year institution to a four-year institution, referred to as transferring up, indicates a positive step toward bachelor's degree attainment. Four-year and six-year graduation rates provide a measure of whether students were able to successfully complete their bachelor's degree.

A second limitation of Wyatt and Mattern (2011) is that the study did not consider student access to AP courses within their school, an important consideration with a low-SES student population. Student access to AP could be limited in two ways: (1) the student may attend a school that does not offer AP courses, or (2) the student may attend a school without an open enrollment policy and may be denied participation in an AP course. This could be problematic in that there may be an association between AP access and overall school quality.

A third limitation was that no statistical controls were employed in the first study; the analyses were all descriptive in nature. Specifically, Wyatt and Mattern (2011) did parse the

results by gender, ethnicity, HSGPA, SAT score, and highest parental degree to evaluate whether the AP effect remained; however, these analyses only considered one variable at a time. Since all of the control variables were related to AP participation and to college outcomes, more sophisticated analyses that control for all variables concomitantly is needed to see if an AP effect remains. The current study was designed to investigate whether low-SES students who participated in an AP course(s) through the AP Fee Reduction program (AP Fee Reduction students) had more positive college outcomes than low-SES students not participating in AP (Low-SES, No AP students[1]). This paper addresses several of the limitations of Wyatt and Mattern (2011). Specifically, the college outcomes of transfer up and four-year and six-year graduation were added to provide a more complete picture of students' postsecondary behavior. In order to address the issue of student access to AP courses, all three samples used in this study were limited to students attending high schools that offered at least one AP course and maintained an open enrollment AP policy. Lastly, this study employed regression analyses that simultaneously controlled for all of the variables in the study. This methodology produced an estimation of the differences in college outcomes (e.g., enrollment, college grades) between AP Fee Reduction students and Low-SES, No AP students with otherwise similar demographic and academic characteristics.

# Method

## Sample

**Sample 1.** Three national datasets were used in this study. The first dataset was obtained from the National Student Clearinghouse (NSC). NSC tracks student enrollment and degree attainment for over 3,100 two- and four-year colleges and universities in the United States (a list of participating institutions is located at http://www.studentclearinghouse.org/colleges/enrollment_reporting/participating_schools.php), equivalent to 93% of the U.S. college-going population. NSC enrollment data were matched to the College Board's 2007 cohort database of 2,522,235 students, which contains AP, SAT, and PSAT/NMSQT® scores, self-reported high school grade point average (HSGPA), and demographic information. The dataset used in this study was restricted to those students who attended a U.S. high school, took the SAT exam with writing, indicated a household income of $30,000 or less and either took an AP Exam(s) using a College Board Fee Reduction or did not take any AP Exams. This yielded a sample of 135,652 students; the same sample was used previously in a prior study on AP Fee Reduction students (Wyatt & Mattern, 2011). This sample was then restricted to those students who attended a school that completed the "AP Coordinators Survey," which is administered to schools known to offer AP courses in their schools, further reducing the sample size to 92,763. Sample 1 was further restricted to students who attended a high school that had an "open enrollment" policy regarding AP participation. Open enrollment is defined as a policy that allows students to enroll in AP courses regardless of prior grades and teacher recommendations[2]. The final size of Sample 1 was 46,411 students, which was largely representative of the unrestricted sample used in Wyatt and Mattern (2011) in terms of demographic characteristics of the two groups (refer to Table 1[3]).

1. AP Exam participation is used as a proxy for AP course participation. This is described in more detail in the method section of the paper.

2. This information was obtained from question 4 of the 2011–2012 AP Coordinator Survey, which is completed by the AP Coordinator at high schools that administer AP Exams. The exact question was "Typically, does your school allow any student to enroll in an AP course, regardless of their prior grades and teacher recommendations?" Respondents had the option of indicating "yes" or "no."

3. The characteristics of the unrestricted sample are available in Table 2 and Table 6 of Wyatt and Mattern (2011), located at: https://files.eric.ed.gov/fulltext/ED561029.pdf

**Sample 2.** College performance data were available for a subsample of Sample 1 students. Namely, 110 four-year institutions have partnered with the College Board to provide college performance data (i.e., course grades, FYGPA, and retention) on their 2007 entering freshmen class for research and validation purposes. Institutions were recruited to be representative of the target population of 726 four-year institutions that received at least 200 SAT score reports in 2005. This sample of 110 institutions was diverse with respect to geographic location, control (i.e., public vs. private), selectivity, and size. Postsecondary data were matched to College Board records that included AP Exam participation, SAT scores, self-reported HSGPA, and demographic information. Analyses were limited to students with a valid SAT score and a self-reported household income of $30,000 or less. Additionally, only students who took an AP Exam via the AP Fee Reduction program or who took no AP Exams were included, resulting in a sample size of 8,482 students and corresponds to Sample 2 in Wyatt and Mattern (2011). This sample was restricted to students who had attended a high school that completed the AP Coordinator Survey, which resulted in 6,286 students. The sample was then further restricted to those students who attended a high school with an open enrollment AP policy, which further reduced the sample to 3,356.

**Sample 3.** As with Sample 1, Sample 3 also used NSC data and included students who attended a U.S. high school, took the SAT exam with writing, indicated a household income of $30,000 or less, and either took an AP Exam(s) using a College Board Fee Reduction or did not take any AP Exams. Unlike Sample 1, which was based on the 2007 cohort, Sample 3 was based on data from the 2006 cohort, which allowed the examination of six-year graduation rates. This yielded a sample of 133,347 students that was then restricted to students who attended a school that completed the AP Participation Survey, reducing the sample to 88,709 students. This sample was then further restricted to students who attended a high school that had an "open enrollment" policy regarding AP participation, reducing the sample to 44,673 students. Finally, since the only outcome of interest for Sample 3 was six-year graduation, only students who first enrolled in four-year institutions post-high school were included, resulting in a final sample size of 22,088 students.

## Measures

**Advanced Placement® Participation.** Advanced Placement (AP) exam participation was obtained from College Board data. AP classes are college-level courses administered to high school students within their normal high school setting. These courses must conform to an AP curriculum, which provides guidance on the depth and breadth of content that should be covered during the course. At the completion of the course, students may choose to complete a standardized exam that measures domain-specific, college-level knowledge and skills. AP Exams are scored from 1 (no recommendation) to 5 (extremely well qualified). The American Council on Education recommends awarding college credit or placement into higher-level courses for students scoring 3 or higher (Ewing, 2006).

AP Exam participation is used as a proxy for AP course participation although some students take an AP Exam without having taken the corresponding course. However, this is fairly uncommon[4]. Alternatively, students have the option to take an AP course but not an AP Exam. These students are not included in the AP Fee Reduction group but could be inadvertently included in the Low-SES, No AP group.

**SAT® Scores.** SAT test scores were obtained from the 2007 College Bound Seniors cohort, which includes students who graduated from high school in 2007 and had taken an SAT exam.

4. For more information on AP course-taking and AP Exam-taking, see Wyatt and Mattern (2011).

The SAT consists of three sections: critical reading, mathematics, and writing, each with a score scale ranging from 200 to 800 with 10-point increments. SAT composite score is the sum of all three section scores and therefore has a score scale range of 600 to 2400.

**HSGPA.** HSGPA was self-reported by students on the SAT Questionnaire (SAT-Q), which is completed during registration for the SAT. Grades were reported in letter grades ranging from an F (below 65) to an A+ (97–100).

**Household Income.** Household income was obtained from self-reported data on the SAT-Q. Only students indicating household incomes of $30,000 or less were included in the study to focus solely on low-SES students.

**Highest Parental Education.** Parental education was also derived from self-reported data obtained from responses on the SAT-Q. Student responses were provided for both mother's and father's highest education level. The highest degree (i.e., no high school diploma, high school diploma, associate degree, bachelor's degree, or graduate degree) of either parent was used to create this variable.

**Parental Bachelor's Degree Attainment.** Parental education was dichotomized into two categories: students reporting neither parent as earning a bachelor's degree (or higher) and students reporting at least one parent as having earned a bachelor's degree.

**Gender.** Students provided their gender (female or male) when they completed the SAT-Q.

**Ethnicity.** Students indicated their race/ethnicity on the SAT-Q. The categories include (1) Native American or Alaska Native, (2) Asian, Asian American, or Pacific Islander, (3) Black or African American, (4) Mexican or Mexican American, (5) Puerto Rican, (6) Other Hispanic, Latino, or Latin American, (7) White, and (8) Other. In this report, categories 4, 5, and 6 were combined into a single category titled "Hispanic."

**Underserved Minority Student.** This is a dichotomous variable that was created for the regression analyses. A value of "0" indicated that the student was not a member of an underserved minority group and consisted of Asian and white students. A value of "1" indicated that the student was a member of an underserved minority group and included American Indian, African American, and Hispanic students. Students who failed to indicate their ethnicity or self-identified as "Other" were excluded.

**Four-Year College Enrollment.** Initial four-year college enrollment data were obtained from NSC for the students in Sample 1.

**College Grades.** For Sample 2, FYGPA, second-year cumulative GPA, and third-year cumulative GPA were obtained from participating colleges and universities.

**Retention.** For Sample 2, institutions also indicated whether students returned for the fall semester of their second year, for the fall semester of their third year, and fall semester fourth year.

**Transfer Up.** Sample 1 was used to identify transfer patterns between types of institutions. A "transfer up" refers to a student who began at a two-year institution and transferred to a four-year institution.

**Four-Year Graduation.** Sample 1 contains enrollment and graduation data through the spring and summer terms of 2011 that provide four-year graduation rates. All students who began at a four-year institution and earned a bachelor's degree within four years from any institution are

considered as having graduated. It should be noted that this methodology differs from other methodologies that only consider graduation from the same institution from which the student was initially enrolled with a full-time status.

**Six-Year Graduation.** Sample 3 contains enrollment and graduation data through the spring and summer terms of 2012 that provide six-year graduation rates. Six-year graduation rates were calculated according to the same methodology as four-year graduation rates.

### Analysis

A series of regressions were conducted to measure the impact of AP participation for low-SES students upon the college outcomes of four-year college enrollment, transfer, graduation, college grades, and retention. Regression analyses model the expected change in the dependent variable (e.g., college enrollment or grades) given changes in the independent variables (e.g., participation in AP through the fee reduction program), quantifying the degree to which the dependent and independent variables are related. Additional variables were included in the regression model to measure the impact of AP participation after accounting for differences in the academic performance and demographic characteristics of the two groups. The academic variables included in the model were HSGPA and SAT scores while the demographic variables included gender, ethnicity, and parental education. Income was not included in the model as all students in the study indicated having a household income of $30,000 or less. Logistic regressions were used for all dichotomous outcomes (e.g., enrollment and graduation) and linear regression was used for college grades (i.e., FYGPA, second-year cumulative GPA, third-year cumulative GPA), which are continuous outcomes.

## Results

### Descriptive Statistics

Table 1 provides information on the demographic and academic composition of students in the Low-SES, No AP group to those in the AP Fee Reduction group. For all three samples, nearly half of the AP Fee Reduction groups consisted of Hispanic students whereas white students made up the largest percentage of the Low-SES, No AP group (ranging from 31% to 37% across samples) followed by African American students. For all three AP groups, roughly 60% to 70% of students came from a household where the highest level of parental education was a high school diploma or where a high school diploma was not awarded. Compared to the Low-SES, No AP group, the AP Fee Reduction group was more academically prepared as measured by SAT Composite scores and HSGPA.

## Table 1.

Demographic and Academic Characteristics by AP Exam Participation Group

| | | Sample 1 | | Sample 2 | | Sample 3 | |
|---|---|---|---|---|---|---|---|
| | | Low-SES, No AP | AP Fee Reduction | Low-SES, No AP | AP Fee Reduction | Low-SES, No AP | AP Fee Reduction |
| Number of Students | | 34,225 | 12,186 | 1,815 | 1,541 | 14,337 | 7,751 |
| Gender | Female | 58.4 | 64.0 | 60.9 | 62.1 | 61.1 | 64.8 |
| | Male | 40.7 | 35.6 | 39.1 | 37.9 | 38.9 | 35.2 |
| | No Response | 0.8 | 0.3 | N/A | N/A | | |
| Race/ Ethnicity | American Indian | 1.0 | 0.5 | 0.9 | 0.6 | 1.0 | 0.5 |
| | Asian | 11.0 | 19.9 | 12.3 | 17.7 | 11.2 | 22.6 |
| | Black/African American | 27.1 | 13.1 | 22.5 | 11.6 | 29.4 | 14.3 |
| | Hispanic | 24.9 | 48.2 | 22.0 | 49.1 | 16.4 | 41.8 |
| | White | 31.0 | 14.8 | 37.2 | 16.6 | 37.3 | 17.1 |
| | Other | 4.1 | 3.5 | 3.1 | 2.6 | 3.8 | 3.8 |
| | No Response | 0.9 | 0.0 | 1.9 | 1.8 | 0.8 | 0.0 |
| Highest Parental Education | No High School Diploma | 15.5 | 29.7 | 11.6 | 26.9 | 11.1 | 25.4 |
| | High School Diploma | 53.9 | 41.5 | 51.7 | 42.4 | 53.2 | 44.1 |
| | Associate Degree | 8.7 | 6.2 | 10.3 | 7.3 | 9.6 | 7.1 |
| | Bachelor's Degree | 13.1 | 11.9 | 17.0 | 14.4 | 16.6 | 12.9 |
| | Graduate Degree | 5.5 | 6.2 | 7.0 | 6.4 | 7.0 | 6.7 |
| | No Response | 3.4 | 4.4 | 2.4 | 2.5 | 2.5 | 3.8 |
| High School GPA | A+ | 1.8 | 8.8 | 3.2 | 14.1 | 3.2 | 11.4 |
| | A | 9.1 | 21.8 | 15.9 | 28.7 | 12.2 | 25.0 |
| | A- | 12.2 | 19.6 | 21.8 | 23.2 | 16.0 | 21.4 |
| | B+ | 18.7 | 19.0 | 22.8 | 17.8 | 20.7 | 18.7 |
| | B | 22.1 | 16.3 | 18.5 | 9.0 | 21.6 | 13.4 |
| | B- | 13.4 | 7.0 | 9.0 | 2.9 | 10.9 | 5.0 |
| | C+ | 11.1 | 4.1 | 4.0 | 1.6 | 7.4 | 2.1 |
| | C | 7.1 | 2.3 | 1.8 | 0.8 | 4.1 | 1.1 |
| | C- or Lower | 2.7 | 0.5 | 0.7 | 0.1 | 1.2 | 0.3 |
| | No Response | 1.9 | 0.7 | 2.3 | 1.8 | 2.7 | 1.7 |
| SAT Composite Score Band | 2100–2400 | 0.1 | 1.2 | 0.3 | 1.2 | .2 | 1.9 |
| | 1800–2090 | 1.6 | 9.3 | 3.3 | 13.8 | 3.2 | 12.7 |
| | 1500–1790 | 14.6 | 30.6 | 29.6 | 41.9 | 22.6 | 35.7 |
| | 1200–1490 | 44.8 | 42.1 | 51.0 | 37.0 | 48.6 | 38.4 |
| | 900–1190 | 34.0 | 15.7 | 14.8 | 6.0 | 23.4 | 10.7 |
| | 600–890 | 4.9 | 1.1 | 1.0 | 0.1 | 2.1 | 0.5 |

Note: Percentages may not sum to 100 due to rounding. For Sample 2, the number and percentage of students was based on initial enrollment during freshman year. Fewer students were in the sample during second and third year.

Table 2 compares Low-SES, No AP students and AP Fee Reduction students on important college outcomes. For Sample 1, differences in college enrollment, transfer behavior, and four-year graduation rates were examined. As compared with the Low-SES, No AP students, the AP Fee Reduction students had a four-year college enrollment rate that was 24 percentage points higher. Among those who initially enrolled in a two-year school, AP Fee Reduction students were more likely to transfer to a four-year school with a "transfer up" rate that was 12 percentage points higher. Four-year graduation rate among AP Fee Reduction students was 11 percentage points higher although only just over a quarter of the AP Fee Reduction students graduated within four years. This is consistent with other national data that shows markedly lower graduation rates for low-SES students (Bowen, Chingos, & McPherson, 2009).

Data from Sample 2 was used to compare the retention rates (at initial institution) of AP Fee Reduction students as compared to Low-SES, No AP students. As displayed in Table 2, AP Fee Reduction students were also more likely to be retained within their original institution with retention rates 9 percentage points higher for the second year, 14 percentage points higher for the third year, and 15 percentage points higher for the fourth year. AP Fee Reduction students also earned higher grades in college; however, the magnitude of the performance differences decreased over the course of their college career. Data from Sample 3 was used to compare six-year graduation rates, which were 19 percentage points higher for the AP Fee Reduction students.

**Table 2.**

Comparison of College Outcomes for Low SES, No AP Students and AP Fee Reduction Students

| | | | *N* | Low-SES, No AP | AP Fee Reduction |
|---|---|---|---|---|---|
| Sample 1 | Initial College Enrollment | 4-Year | 46,411 | 41.1 | 65.0 |
| | Transfer | Transfer Up | 16,996 | 24.9 | 36.6 |
| | Graduation | In 4 Years | 21,994 | 16.1 | 26.7 |
| Sample 2 | Retention | To 2nd Year | 3,353 | 74.4 | 83.2 |
| | | To 3rd Year | 2,970 | 60.3 | 74.7 |
| | | To 4th Year | 2,878 | 55.0 | 69.7 |
| | College Grades | FYGPA | 3,327 | 2.39 | 2.71 |
| | | 2nd Year Cum, GPA | 2,386 | 2.63 | 2.86 |
| | | 3rd Year Cum, GPA | 1,971 | 2.74 | 2.92 |
| Sample 3 | Graduation | In 6 Years | 22,088 | 42.0 | 61.3 |

One problem with directly comparing outcomes between the two groups is that their demographic and academic characteristics differ considerably, as indicated in Table 1. This makes it difficult to draw conclusions from such comparisons if demographic and academic variables are correlated with both AP participation and the college outcome variables (e.g., college enrollment). Correlation matrices for Samples 1, 2, and 3 are provided in Tables 3, 4, and 5, respectively, and indicate the degree of association between the variables used in the study. All three tables indicate that academic and demographic variables are correlated with both participation in the AP Fee Reduction program and with college outcomes, such as enrollment. Those with higher SAT scores and HSGPA are more likely to participate in the AP Fee Reduction program and are more likely to have positive college outcomes, confounding the relationship between AP Fee Reduction participation and college success. Thus, inferences based on

a comparison of outcomes between the Low-SES, No AP students and AP Fee Reduction students (as in Table 2) may be misleading. In order to isolate and measure the relationship between AP Fee Reduction participation and college outcomes, a series of regressions were conducted, which included these academic and demographic factors as control variables.

**Table 3.**

Correlations Between Study Variables for Sample 1

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| 1. AP Fee Reduction | – | | | | | | | |
| 2. Gender | -.05** | – | | | | | | |
| 3. Underrepresented Minority | .07** | -.02** | – | | | | | |
| 4. Highest Parental Education | .00 | .04** | -.13** | – | | | | |
| 5. HSGPA | .29** | -.11** | -.14** | .08** | – | | | |
| 6. SAT Score | .31** | .03** | -.31** | .15** | .40** | – | | |
| 7. 4-Year Enrollment | .21** | -.03** | -.06** | .07** | .27** | .33** | – | |
| 8. Transfer Up | .10** | .01 | -.07** | .08** | .16** | .16** | – | – |
| 9. 4-Year College Graduation | .13** | -.07** | -.11** | .07** | .23** | .25** | – | – |

Note: Pairwise restriction was used and the N's ranged between 16,124 and 46,411.
**Significant at the .01 level

## Table 4.

Correlations Between Study Variables for Sample 2

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. AP Fee Reduction | – | | | | | | | | | | |
| 2. Gender | -.01 | – | | | | | | | | | |
| 3. Underrepresented Minority | .16** | -.03 | – | | | | | | | | |
| 4. Highest Parental Education | -.04* | .01 | -.17** | – | | | | | | | |
| 5. HSGPA | .30** | -.05** | -.08** | .04* | – | | | | | | |
| 6. SAT Score | .29** | .07** | -.31** | .19** | .35** | – | | | | | |
| 7. 1st-Year GPA | .18** | -.07** | -.16** | .12** | .34** | .32** | – | | | | |
| 8. Retention to 2nd Year | .11** | -.02 | -.04* | .05** | .15** | .14** | .47** | – | | | |
| 9. 2nd-Year Cum. GPA | .17** | -.09** | -.21** | .14** | .34** | .31** | .89** | .22** | – | | |
| 10. Retention to 3rd Year | .15** | -.01 | -.04* | .08** | .20** | .16** | .50** | .66** | .44** | – | |
| 11. 3rd-Year Cum. GPA | .15** | -.14** | -.23** | .11** | .33** | .33** | .81** | .22** | .94** | .19** | – |
| 12. Retention to 4th Year | .15** | -.01 | -.04* | .08** | .19** | .16** | .48** | .60** | .47** | .79** | .41** |

Note: Pairwise restriction was used and the N's ranged between 1,871 and 3,356.
*Significant at the .05 level
**Significant at the .01 level

## Table 5.

Correlations Between Study Variables for Sample 3

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| 1. AP Fee Reduction | – | | | | | | |
| 2. Gender | -.04** | – | | | | | |
| 3. Underrepresented Minority | .09** | -.03** | – | | | | |
| 4. Highest Parental Education | -.04** | .04** | -.14** | – | | | |
| 5. HSGPA | .29** | -.11** | -.15** | .05** | – | | |
| 6. SAT Score | .30** | .05** | -.33** | .17** | .41** | – | |
| 7. 6-Year College Graduation | .18** | -0.7** | -.12** | .08** | .28** | .26** | – |

Note: Pairwise restriction was used and the N's ranged between 20,519 and 22,088.
**Significant at the .01 level

## Regression Results

**Four-Year College Enrollment.** Table 6 summarizes the logistic regression results for predicting four-year college enrollment. The results indicate that all of the variables in the equation were significant at the .01 level. The impact of the predictor variables on the outcome variable is measured through the change in the odds of the outcome variable occurring. Odds are defined as the probability of an event occurring divided by the probability of the event not occurring [*P*/ (*1-P*)]. As an example, an event with an 80% probability of occurring would have odds of [.8/ (1-.8)] = 4. The odds ratio [Exp (B)] indicates the change in odds of the outcome variable (in this case four-year enrollment) occurring for a one unit change in the predictor variable. An odds ratio of 1 indicates that a one-unit increase in the predictor variable results in no predicted increase or decrease in the odds of achieving the outcome variable (e.g., enrollment in a four-year institution). In other words, there is no relationship between the predictor and the outcome. An odds ratio of 1.50 (for example) indicates that a one-unit increase in the predictor variable results in a predicted 50% increase in the odds (i.e., from 4 to 6) of achieving the outcome variable whereas an odds ratio of .50 indicates that a one-unit increase in the predictor variable results in a predicted 50% decrease in the odds (i.e., from 4 to 2) of achieving the outcome variable[5].

In the case of the AP Fee Reduction, a dichotomous variable, the odds ratio indicates the estimated increase or decrease in the odds of achieving the outcome variable (e.g., four-year college enrollment) associated with participating in AP through the fee reduction program. The odds ratio of 1.555 indicates that the estimated odds of enrolling in a four-year institution are approximately 56% higher for AP Fee Reduction students than for that of the Low-SES, No AP group. HSGPA, SAT scores, highest parental degree, and underserved minority status are also positively correlated with four-year enrollment rates, while males had lower predicted enrollment rates.

**Table 6.**

Logistic Regression Results for Four Year College Enrollment (Sample 1)

| Variable | *B* | SE | Exp(B) | Sig. | Pseudo $R^2_{CS}$ | Pseudo $R^2_N$ |
|---|---|---|---|---|---|---|
| Intercept | -0.303 | 0.020 | 0.739 | <.01 | .140 | .187 |
| Male | -0.075 | 0.022 | 0.928 | <.01 | | |
| Underserved Minority Student | 0.185 | 0.023 | 1.203 | <.01 | | |
| Highest Parental Degree – Bachelor's or Higher | 0.175 | 0.028 | 1.191 | <.01 | | |
| HSGPA | 0.490 | 0.019 | 1.632 | <.01 | | |
| SAT Composite | 0.002 | <0.001 | 1.002 | <.01 | | |
| AP Fee Reduction | 0.442 | 0.026 | 1.555 | <.01 | | |

Note: *N* = 41,773. *B* = log odds; Exp(B) = odds ratio, Pseudo $R^2_{CS}$ = Cox and Snell $R^2$; Pseudo $R^2_N$ = Cox = Nagelkerke $R^2$. HSGPA and SAT Composite scores were mean centered on 3.14 and 1320, respectively. Males and Underserved Minority students were coded as 1. Underserved minority students include American Indian, African American (black), and Hispanic students. Nonminority students include Asian and white students. Students who self-identified as "Other" or did not provide a response were excluded from this analysis.

5. In logistic regression it is important to note that it may be misleading to compare the odds ratio [Exp(B)] of continuous variables with different scales. For example, HSGPA is scaled from 0 to 4.33 while the SAT Composite is scaled from 600 to 2400, so a one-unit change in HSGPA would be expected to have a greater expected impact upon the outcome variable than a one-unit change in SAT Composite scores.

Some students may begin their college career at a two-year institution rather than at a four-year institution. These students may choose to "transfer up" to a four-year institution, which is generally considered a positive education outcome. A logistic regression was conducted to examine whether AP participation through the fee reduction program is associated with a higher likelihood of transferring up (refer to Table 7). All variables in the regression equation were significant ($p \leq .01$) except for gender (male). The odds ratio for AP Fee Reduction of 1.360 indicates that the odds of AP Fee Reduction students transferring to a four-year institution are approximately 36% higher than that of the Low-SES, No AP students. HSGPA, SAT scores[6], and highest parental degree were also positively associated with the likelihood of transferring up.

**Table 7.**

Logistic Regression Results for Transferring Up (Sample 1)

| Variable | *B* | SE | Exp(B) | Sig. | Pseudo $R^2_{CS}$ | Pseudo $R^2_N$ |
|---|---|---|---|---|---|---|
| Intercept | -1.144 | 0.036 | 0.319 | <.01 | .042 | .062 |
| Male | 0.069 | 0.039 | 1.071 | .08 | | |
| Underserved Minority Student | -0.103 | 0.041 | 0.902 | .01 | | |
| Highest Parental Degree – Bachelor's or Higher | 0.374 | 0.049 | 1.453 | <.01 | | |
| HSGPA | 0.435 | 0.033 | 1.545 | <.01 | | |
| SAT Composite | 0.001 | <0.001 | 1.001 | <.01 | | |
| AP Fee Reduction | 0.308 | 0.049 | 1.360 | <.01 | | |

Note: $N = 15{,}068$. *B* = log odds; Exp(B) = odds ratio, Pseudo $R^2_{CS}$ = Cox and Snell $R^2$; Pseudo $R^2_N$ = Nagelkerke $R^2$. HSGPA and SAT Composite scores were mean centered on 2.98 and 1238, respectively. Males and Underserved Minority students were coded as 1. Underrepresented minority students include American Indian, African American (black), and Hispanic students. Nonminority students include Asian and white students. Students who self-identified as "Other" or did not provide a response were excluded from this analysis.

6. This logistic regression measures the increase in the likelihood of transferring up associated with a one-point increase in the predictor variable. The contribution of SAT scores looks considerably smaller than that of HSGPA because they are on different scales. A one-point increase in HSGPA (e.g., from 2.00 to 3.00), measured on a 0.00–4.33 scale should be expected to have a greater impact than a one-point increase in SAT scores (e.g., 1500 to 1501) which is measured on a 600 to 2400 scale. One way to compare the relative contribution of variables with different scales is to compare the relative contribution predicted by a one standard deviation (SD) change. The predicted increase in the transfer rate changes by 34.3% for a 1 SD (.63) change in HSGPA and 21.8% for a 1 SD (223) change in SAT Composite scores.

Four-year college graduation rates for students who initially enrolled at a four-year institution were estimated through logistic regression; results are presented in Table 8. In this regression, all variables were significant ($p < .01$). The odds ratio for AP Fee Reduction participation is 1.15, indicating that the odds of graduating were 15% higher for AP Fee Reduction students.

## Table 8.

Logistic Regression Results for Four Year Graduation (Sample 1)

| Variable | *B* | SE | Exp(B) | Sig. | Pseudo $R^2_{CS}$ | Pseudo $R^2_N$ |
|---|---|---|---|---|---|---|
| Intercept | -1.380 | 0.035 | 0.252 | <.01 | .089 | .141 |
| Male | -0.426 | 0.040 | 0.653 | <.01 | | |
| Underserved Minority Student | -0.214 | 0.040 | 0.807 | <.01 | | |
| Highest Parental Degree – Bachelor's or Higher | 0.210 | 0.043 | 1.234 | <.01 | | |
| HSGPA | 0.714 | 0.038 | 2.041 | <.01 | | |
| SAT Composite | 0.002 | <0.001 | 1.002 | <.01 | | |
| AP Fee Reduction | 0.141 | 0.041 | 1.152 | <.01 | | |

Note: $N = 20{,}105$. *B* = log odds; Exp(B) = odds ratio, Pseudo $R^2_{CS}$ = Cox and Snell $R^2$; Pseudo $R^2_N$ = Nagelkerke $R^2$. HSGPA and SAT Composite scores were mean centered on 3.32 and 1408 respectively. Males and Underserved Minority students were coded as 1. Underserved minority students include American Indian, African American (black), and Hispanic students. Nonminority students include Asian and white students. Students who self-identified as "Other" or did not provide a response were excluded from this analysis.

Estimated six-year college graduation rates for students who initially enrolled at a four-year institution are presented in Table 9. In this regression, all variables were significant ($p < .01$). The odds ratio for AP Fee Reduction participation is 1.576, indicating that the odds of graduating within six years were 58% higher for AP Fee Reduction students.

## Table 9.

Logistic Regression Results for Six Year Graduation (Sample 3)

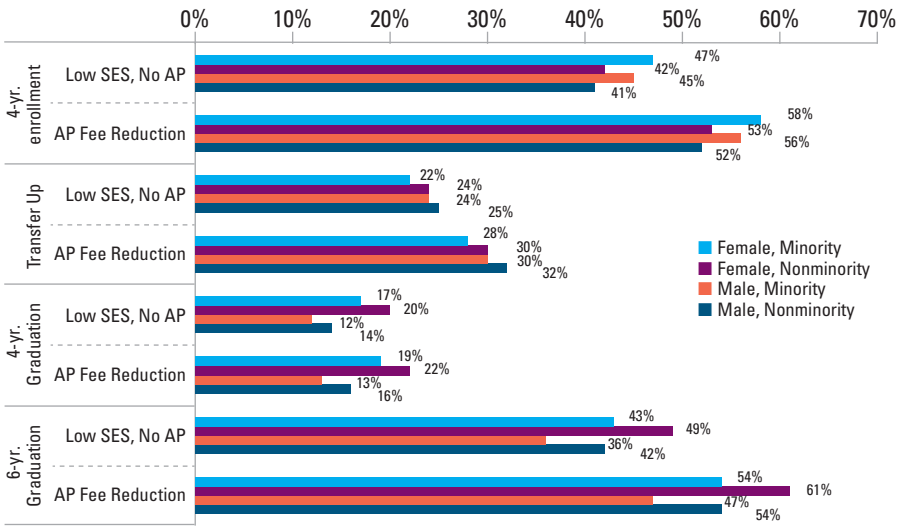
| Variable | *B* | SE | Exp(B) | Sig. | Pseudo $R^2_{CS}$ | Pseudo $R^2_N$ |
|---|---|---|---|---|---|---|
| Intercept | -0.028 | 0.028 | 0.972 | .32 | .115 | .153 |
| Male | -0.278 | 0.031 | 0.757 | <.01 | | |
| Underserved Minority Student | -0.250 | 0.033 | 0.779 | <.01 | | |
| Highest Parental Degree – Bachelor's or Higher | 0.264 | 0.037 | 1.303 | <.01 | | |
| HSGPA | 0.656 | 0.029 | 1.927 | <.01 | | |
| SAT Composite | 0.001 | 0.000 | 1.001 | <.01 | | |
| AP Fee Reduction | 0.455 | 0.034 | 1.576 | <.01 | | |

Note: $N = 20{,}059$. *B* = log odds; Exp(B) = odds ratio, Pseudo $R^2_{CS}$ = Cox and Snell $R^2$; Pseudo $R^2_N$ = Nagelkerke $R^2$. HSGPA and SAT Composite scores were mean centered on 3.34 and 1411 respectively. Males and Underserved Minority students were coded as 1. Underserved minority students include American Indian, African American (black), and Hispanic students. Nonminority students include Asian and white students. Students who self-identified as "Other" or did not provide a response were excluded from this analysis.

Figure 1 displays the estimated four-year college enrollment, transfer-up rates, and graduation rates within four and six years for students obtaining a HSGPA and SAT Composite score at the sample mean. The estimated enrollment and transfer rates are provided by gender and ethnicity (minority and nonminority) for students whose parents did not obtain a bachelor's or more advanced degree. The results indicated that the AP Fee Reduction students had estimated four-year enrollment rates approximately 11 percentage points higher than the Low-SES, No AP students and transfer-up rates approximately 6 percentage points higher. Among students starting at a four-year institution, four-year graduation rates for the AP Fee Reduction students were estimated to be approximately 2 percentage points higher than that of the Low-SES, No AP students, and six-year graduation rates were estimated to be approximately 11 percentage points higher.

## Figure 1.

Estimated enrollment, transfer, and graduation rates by AP fee reduction participation.




Note: The enrollment rates in this figure assume a HSGPA of 3.14 (B) and SAT Composite at 1320, transfer rates assumed HSGPA and SAT score of 2.98 and 1238 respectively, four-year graduation rates assumed a HSGPA of 3.32 and SAT Composite at 1408, and six-year graduation rates assumed a HSGPA of 3.34 and an SAT Composite of 1411, which represents the sample means rounded to the nearest interval. These rates were calculated for students whose parents' highest level of education was less than a bachelor's degree.

This paper also investigated the relationship between participation in the AP Fee Reduction program and retention within one's initial institution based on Sample 2 data. The logistic regression results for predicting retention to second year are displayed in Table 10. The results indicate that all of the variables were significant ($p \leq .01$) aside from gender and ethnicity. The odds ratio for AP Fee Reduction was 1.368, indicating that the odds of being retained were about 37% higher for students participating in the AP Fee Reduction program as compared to Low-SES, No AP students.

## Table 10.

Logistic Regression Results for Retention to Second Year (Sample 2)

| Variable | *B* | SE | Exp(B) | Sig. | Pseudo $R^2_{CS}$ | Pseudo $R^2_N$ |
|---|---|---|---|---|---|---|
| Intercept | 1.199 | 0.089 | 3.318 | <.01 | 0.035 | 0.054 |
| Male | -0.134 | 0.092 | 0.875 | .15 | | |
| Underserved Minority Student | -0.022 | 0.099 | 0.978 | .83 | | |
| Highest Parental Degree – Bachelor's or Higher | 0.303 | 0.118 | 1.354 | .01 | | |
| HSGPA | 0.427 | 0.087 | 1.532 | <.01 | | |
| SAT Composite | 0.001 | <0.001 | 1.001 | <.01 | | |
| AP Fee Reduction | 0.314 | 0.102 | 1.368 | <.01 | | |

Note: $N$ = 3,062. $B$ = log odds; Exp(B) = odds ratio, Pseudo $R^2_{CS}$ = Cox and Snell $R^2$; Pseudo $R^2_N$ = Nagelkerke $R^2$. HSGPA and SAT Composite scores were mean centered on 3.50 and 1471 respectively. Males and Underserved Minority students were coded as 1. Underserved minority students include American Indian, African American (black), and Hispanic students. Nonminority students include Asian and white students. Students who self-identified as "Other" or did not provide a response were excluded from this analysis.

Table 11 contains the results of a logistic regression predicting retention to third year. All of the variables were significant ($p \leq .01$) aside from gender and ethnicity. The odds ratio for AP Fee Reduction participation was 1.585, meaning that the odds of being retained to third year were approximately 59% higher for the AP Fee Reduction students than for the Low-SES, No AP students.

## Table 11.

Logistic Regression Results for Retention to Third Year (Sample 2)

| Variable | *B* | SE | Exp(B) | Sig. | Pseudo $R^2_{CS}$ | Pseudo $R^2_N$ |
|---|---|---|---|---|---|---|
| Intercept | 0.515 | 0.083 | 1.673 | <.01 | .059 | .082 |
| Male | -0.069 | 0.087 | 0.933 | .43 | | |
| Underserved Minority Student | -0.091 | 0.093 | 0.913 | .33 | | |
| Highest Parental Degree – Bachelor's or Higher | 0.415 | 0.109 | 1.515 | <.01 | | |
| HSGPA | 0.559 | 0.083 | 1.749 | <.01 | | |
| SAT Composite | 0.001 | 0.000 | 1.001 | .01 | | |
| AP Fee Reduction | 0.461 | 0.095 | 1.585 | <.01 | | |

Note: $N$ = 2,706. $B$ = log odds; Exp(B) = odds ratio, Pseudo $R^2_{CS}$ = Cox and Snell $R^2$; Pseudo $R^2_N$ = Nagelkerke $R^2$. HSGPA and SAT Composite scores were mean centered on 3.50 and 1477 respectively. Males and Underserved Minority students were coded as 1. Underserved minority students include American Indian, African American (black), and Hispanic students. Nonminority students include Asian and white students. Students who self-identified as "Other" or did not provide a response were excluded from this analysis.

Table 12 contains the results of a logistic regression predicting retention to fourth year. All of the variables were significant ($p \leq .01$) except for gender and ethnicity. The odds ratio for AP Fee Reduction was 1.571, indication that odds of being retained to fourth year for AP Fee Reduction students was 57% greater than that of Low-SES, No AP students.

**Table 12.**

Logistic Regression Results for Retention to Fourth Year (Sample 2)

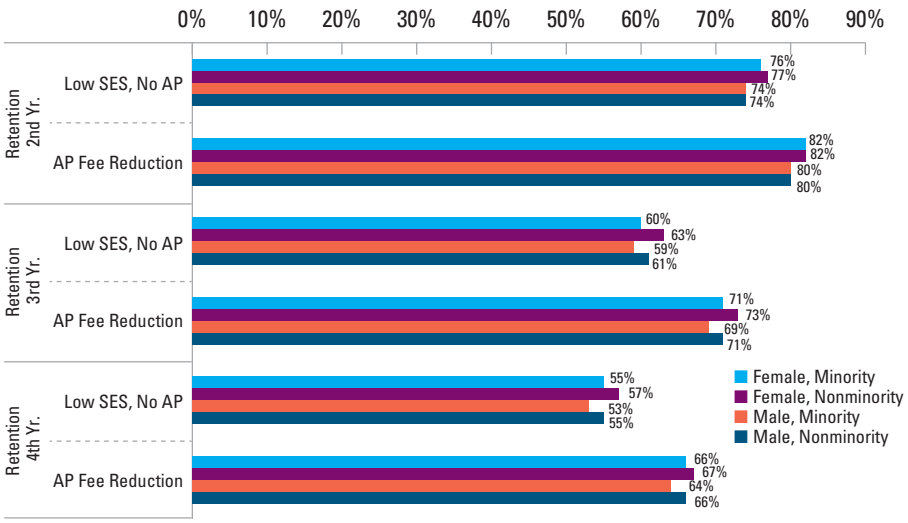
| Variable | *B* | SE | Exp(B) | Sig. | Pseudo $R^2_{CS}$ | Pseudo $R^2_N$ |
|---|---|---|---|---|---|---|
| Intercept | 0.274 | 0.082 | 1.315 | <.01 | .055 | .075 |
| Male | -0.058 | 0.086 | 0.944 | .50 | | |
| Underserved Minority Student | -0.079 | 0.091 | 0.924 | .38 | | |
| Highest Parental Degree – Bachelor's or Higher | 0.389 | 0.106 | 1.476 | <.01 | | |
| HSGPA | 0.495 | 0.083 | 1.640 | <.01 | | |
| SAT Composite | 0.001 | <0.001 | 1.001 | .01 | | |
| AP Fee Reduction | 0.452 | 0.093 | 1.571 | <.01 | | |

Note: $N = 2{,}627$. *B* = log odds; Exp(B) = odds ratio, Pseudo $R^2_{CS}$ = Cox and Snell $R^2$; Pseudo $R^2_N$ = Nagelkerke $R^2$. HSGPA and SAT Composite scores were mean centered on 3.50 and 1477 respectively. Males and Underserved Minority students were coded as 1. Underserved minority students include American Indian, African American (black), and Hispanic students. Nonminority students include Asian and white students. Students who self-identified as "Other" or did not provide a response were excluded from this analysis.

Figure 2 displays the estimated retention rates to second, third, and fourth year for students who scored at the mean of the sample and neither of their parents attained a bachelor's degree. AP Fee Reduction students had higher retention rates: 5 to 6 percentage points higher for second year and 10 to 11 percentage points higher for both the third and fourth year.

## Figure 2.

Estimated retention rates for students at four year institutions by AP fee reduction participation.




Note: The HSGPA and SAT mean scores described in Tables 10–12 were used to compute retention rates. These rates were calculated for students whose parents' highest level of education was less than a bachelor's degree.

This study also investigated the relationship between AP Fee Waiver participation and college grades. Grades differ from the previous outcomes (enrollment, transfer, retention, and graduation) in that they are continuous rather than dichotomous. Thus, linear regression was used to investigate the relationship between AP Fee Waiver participation and the continuous outcome variables of FYGPA, second-year cumulative GPA, and third-year cumulative GPA. In a linear regression, the unstandardized coefficient (*B*) measures the change in college grades that are accompanied by a one-unit change in the predictor variable. Table 13 displays the FYGPA results. The unstandardized coefficient for AP Fee Reduction was .140, indicating that AP Fee Waiver students are predicted to have an FYGPA .140 higher than that of students in the Low-SES, No AP group. Males and minority students were predicted to have lower FYGPAs (.139 and .152 respectively) while students with a parent(s) who obtained a bachelor's degree or higher were predicted to have higher FYGPAs (.137). HSGPA and SAT scores were also positively related to FYGPA[7].

**Table 13.**

Regression Analyses Results for FYGPA (Sample 2)

| Variable | *B* | SE *B* | $\beta$ |
|---|---|---|---|
| Intercept | 2.578 | .030 | |
| Male | -.139 | .031 | -.075** |
| Underserved Minority Student | -.152 | .033 | -.084** |
| Highest Parental Degree – Bachelor's or Higher | .137 | .037 | .063** |
| HSGPA | .407 | .030 | .245** |
| SAT Composite | .001 | <.001 | .180** |
| AP Fee Reduction | .140 | .033 | .077** |
| $R^2$ | | .183 | |

Note: *$p < .05$, **$p < .01$. $N = 3{,}039$ *B* = Unstandardized Coefficient; $\beta$ = Standardized Coefficient. HSGPA and SAT Composite scores were mean centered on 3.50 and 1471 respectively. Males and Underserved Minority students were coded as 1. Underserved minority students include American Indian, African American (black), and Hispanic students. Nonminority students include Asian and white students. Students who self-identified as "Other" or did not provide a response were excluded from this analysis.

7. It is problematic to compare the relative contribution of variables that are not on the same scale. This is the case with HSGPA and SAT Composite scores. HSGPA is scaled from 0 to 4.33 and SAT Composite scores from 600 to 2400. One way to compare the relative contribution of variables with different scales is through the standardized coefficient (β), which represents the number of standard deviations a dependent variable will change per standard deviation increase in the predictor variable. The standardized coefficient for HSGPA is .245 compared to .180 for SAT Composite.

Table 14 contains the regression results for second-year cumulative GPA. The results indicated that AP Fee Reduction students are predicted to have a second-year cumulative GPA that is .107 higher than that of Low-SES, No AP students. Males and minority students are predicted to have lower second-year cumulative GPAs while students with a parent(s) who obtained a bachelor's degree are predicted to have a higher second-year cumulative GPA. HSGPA and SAT scores were also positively related to second-year cumulative GPA.

**Table 14.**

Regression Results for Second Year Cumulative GPA (Sample 2)

| Variable | *B* | SE *B* | $\beta$ |
|---|---|---|---|
| Intercept | 2.816 | 0.028 | |
| Male | -0.129 | 0.028 | -.090** |
| Underserved Minority Student | -0.202 | 0.030 | -.145** |
| Highest Parental Degree – Bachelor's or Higher | 0.132 | 0.033 | .081** |
| HSGPA | 0.320 | 0.028 | .244** |
| SAT Composite | 0.000 | <0.001 | .151** |
| AP Fee Reduction | 0.107 | 0.030 | .077** |
| $R^2$ | | .194 | |

Note: *$p$< .05, **$p$<.01. $N$ = 2,172. $B$ = Unstandardized Coefficient; $\beta$ = Standardized Coefficient. HSGPA and SAT Composite scores were mean centered on 3.55 and 1493 respectively. Males and Underserved Minority students were coded as 1. Underserved minority students include American Indian, African American (black), and Hispanic students. Nonminority students include Asian and white students. Students who self-identified as "Other" or did not provide a response were excluded from this analysis.

Table 15 contains the regression results for predicting third-year cumulative GPA. AP Fee Reduction students were predicted to have a third-year cumulative GPA .062 higher than that of the Low-SES, No AP students. As with the other GPA results, males and underserved minorities were predicted to earn lower grades. Furthermore, students with at least one parent who obtained a bachelor's degree were predicted to have higher GPAs. HSGPA and SAT scores were also positively related to third-year cumulative GPA. The predicted college GPA by gender and ethnicity are also depicted in Figure 3.

**Table 15.**

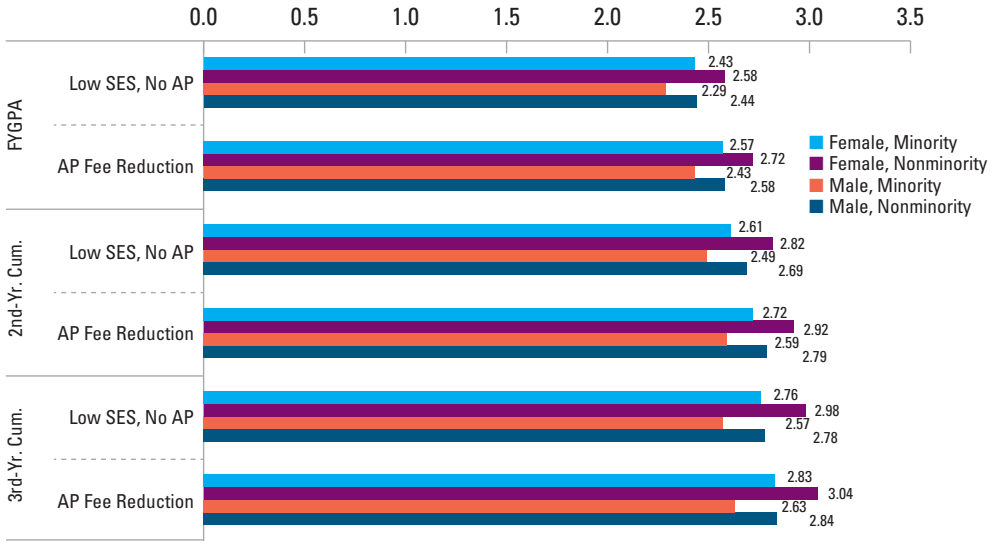
Regression Results for Third Year Cumulative GPA (Sample 2)

| Variable | *B* | SE *B* | $\beta$ |
|---|---|---|---|
| Intercept | 2.977 | 0.028 | |
| Male | -0.199 | 0.027 | -.154** |
| Underserved Minority Student | -0.213 | 0.029 | -.169** |
| Highest Parental Degree – Bachelor's or Higher | 0.061 | 0.032 | .041 |
| HSGPA | 0.277 | 0.028 | .231** |
| SAT Composite | <0.001 | <0.001 | .178** |
| AP Fee Reduction | 0.062 | 0.030 | .049* |
| $R^2$ | | .208 | |

Note: *$p$< .05, **$p$<.01. $N$ = 1,797. $B$ = Unstandardized Coefficient; $\beta$ = Standardized Coefficient. HSGPA and SAT Composite scores were mean centered on 3.58 and 1499 respectively. Males and Underserved Minority students were coded as 1. Underserved minority students include American Indian, African American (black), and Hispanic students. Nonminority students include Asian and white students. Students who self-identified as "Other" or did not provide a response were excluded from this analysis.

**Figure 3.**

Estimated college GPA for students at four year institutions by AP fee reduction participation.




Note: The HSGPA and SAT mean scores described in Tables 13–15 were used to compute college grades. These rates were calculated for students whose parents' highest level of education was less than a bachelor's degree.

## Discussion

Increasing education opportunities for low-SES students has long been an aspiration of educators and policymakers. Prior research has indicated that rigorous course work in high school is related to college success (Adelman, 1999, 2006; Mattern & Wyatt, 2011; Wyatt, Kobrin, Wiley, Camara, & Proestler, 2011) but is less accessible for low-SES students (Adelman, 1999, 2006; Betts, Reubin, & Danenberg, 2000). It is against this backdrop that the College Board initiated the AP Fee Reduction program, which was designed to increase access to a rigorous curriculum along with its associated benefits to low-SES students, who are often educationally disadvantaged. While there is an established body of research indicating positive education outcomes for AP examinees (Bleske-Rechek, Lubinski, & Benbow, 2004; Dougherty, Mellor, & Jian, 2005; Mattern, Shaw, & Xiong, 2009), relatively few studies have investigated whether AP can be used as an effective tool for increasing college success among low-SES students.

One exception is a study conducted by Wyatt and Mattern (2011), which found that AP Fee Reduction students had more positive college outcomes than did their counterparts not participating in AP; however, these analyses were only descriptive in nature. The current study investigated whether a positive relationship between AP participation among low-SES students and college success remained after controlling for academic and demographic variables. The findings confirmed the descriptive results from our previous study. Namely, AP Fee Reduction students had higher four-year enrollment rates, were more likely to transfer up from a two-year institution to a four-year institution, had higher rates of retention, earned higher grades in college, and had higher four- and six-year graduation rates.

While the results are encouraging, several limitations and unanswered questions remain. For one, course work other than AP was not considered in this study. One of the reasons that AP is thought to benefit students is that AP courses are challenging and rigorous. However, students who have taken AP courses may be more likely to have taken rigorous non-AP courses, which are also positively related to success in college, potentially confounding the relationship between AP participation and college outcomes.

A second limitation of this study as of Wyatt and Mattern (2011) is that the reason(s) for the positive relationship between AP participation and college success among low-SES AP students were not investigated. It is possible that AP participation introduces students to rigorous material and more time-demanding course work often required in college but all too infrequently encountered during high school. This fosters more effective time management and study skill habits while still in high school, which are positively related to college success (Credé & Kuncel, 2008). Additionally, research has indicated that college students who report having been held to high expectations in high school were much more likely to report being prepared for college (Achieve, 2005). This may explain why approximately two-thirds of college students reported that they would have applied themselves more during high school if given the opportunity to redo high school. Another possibile explanation of the current findings may be due to motivational factors, which are also related to college success (Robbins, Lauver, Le, Davis, Langley, & Carlstrom, 2004). Specifically, AP students may be more motivated to succeed in both high school and college.

A third limitation is that this paper did not consider the effects of performance in an AP course or on the AP Exam. Prior research has established a positive relationship between performance on the AP Exam and measures of college success, including college grades, retention, and graduation rates (Dougherty, Mellor, & Jian, 2006; Geiser & Santelices, 2004; Hargrove, Godin, & Dodd, 2008; Willingham & Morris, 1986). Thus, it stands to reason that low-SES students who score higher on their AP Exam(s) should have more positive college outcomes than lower performing students not earning college credit. The data exists to address this question; so future research could investigate the relationship between AP performance and subsequent college success among low-SES fee reduction students. Including AP performance would provide a more comprehensive picture of the relationship between participation in the fee reduction program and subsequent college success.

Despite the limitations, the results indicate that students participating in the AP Fee Reduction program have more positive college outcomes in terms of enrollment, retention, college GPA, and graduation rates than do low-SES students not participating in the program. In sum, the AP Fee Reduction initiative appears to have increased access for low-SES students and to be related to long-term positive education outcomes for these students when compared to low-SES students who did not participate in the AP Program.

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