AP PHYSICS B PARTICIPATION AND PASSAGE ANALYSIS

Prepared for the Center for Teaching and Learning

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In the following report, Hanover Research examines the trends in the number of students taking and passing Advanced Placement (AP) Physics exams in New Jersey and the United States.

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EXECUTIVE SUMMARY AND KEY FINDINGS

INTRODUCTION

On behalf of the Center for Teaching and Learning (CTL), Hanover Research examines trends in the number of students taking and passing Advanced Placement (AP) Physics B exams in New Jersey and the United States. As described in greater detail in the "Methodology and Data Overview" section of this report, we analyze AP Physics data from The College Board, as well as Grade 9-12 enrollment data from the US Census Bureau's American Community Survey (ACS).

The report is organized as follows:

- **Section I: Methodology and Data Overview** describes how participation and pass rates were calculated for New Jersey and the United States, as well as the data used in these calculations.
- **Section II: AP Physics Participation and Passage Trends** provides the results of our analysis, describing participation and passage trends for the AP Physics B exam.

Note that the structure of this report is based on a theoretical framework and set of working hypotheses provided by CTL. As such, the report examines trends in participation and pass rates among all students in New Jersey and the United States, as well as subgroups of students traditionally underrepresented in advanced physics education (black/African American students, Hispanic students, and female students). This report is intended to serve as a basis for future work examining the relationship between trends in schools participating in CTL's Progressive Science Initiative (PSI) and trends observed at the state level in New Jersey.[1]

KEY FINDINGS

- **Among New Jersey students enrolled in Grades 9-12, participation in the AP Physics B exam increased from 2005-2014, overall and for traditionally underrepresented student subgroups.** Overall, participation in the AP Physics B exam increased by 240 percent for Black/African American students, and by 600 percent for Hispanic students, while the participation rate among *all* students increased by only 104 percent. Notably, the greatest year-to-year percentage-point increases for all students, Hispanic students, and female students occurred between 2010 and 2011. For black/African American students, the greatest increase occurred the following year (between 2011 and 2012).
- **Similarly, the participation rate *ratio* improved from 2005-2014 for black/African American students, Hispanic students, and female students in New Jersey.** This ratio – representing how much more or less likely a specific subgroup of students is to participate in the AP Physics B exam, as compared to students not in that subgroup

[1] In addition to analyses of pass and participation rates in PSI schools and other New Jersey schools, future work may incorporate comparisons of AP test scores among PSI schools and other New Jersey schools.

– illustrates the progress of subgroups of New Jersey students that have been traditionally underrepresented in advanced physics education.[2]
    - For example, in 2005, the ratio of the AP Physics B participation rate of non-Hispanic students and that of Hispanic students was 6.13, meaning that the percentage of non-Hispanic students participating in AP Physics B was 6.13 times the percentage of Hispanic students. By 2014, the ratio of the rate of non-Hispanic students participating in AP Physics B was only 2.13 times that of Hispanic students demonstrating substantial progress.
    - Likewise, in 2005, the ratio of the AP Physics B participation rate of non-Black/African American students and Black/African American students was 6.61, while in 2014 the ratio had fallen to 3.6, again demonstrating improvement within this subgroup.

- **The percentage of Grade 9-12 New Jersey students passing the AP Physics B exam has also increased from 2005-2014, overall and for traditionally underrepresented student subgroups.** Once again, Hispanic and Black/African American students had the greatest increase in the percentage of students passing the exam, with 243 percent and 153 percent respectively. The greatest year-to-year percentage-point increases in pass rates occurred between 2012 and 2013 for all students, black/African American students, Hispanic students, and female students (i.e., all student populations examined in this analysis).
- **The pass rate ratio also improved from 2005-2014 for black/African American students, Hispanic students, and female students in New Jersey.** Similar to participation rate ratios, the pass rate ratio illustrates substantial progress among traditionally underrepresented students in taking and passing the AP Physics B exam.
    - For example, in 2005, the ratio of the AP Physics B pass rate of non-Hispanic students and that of Hispanic students was 12.79, meaning that the percentage of non-Hispanic students passing the AP Physics B exam was 12.79 times that of Hispanic students. By 2014, the rate of non-Hispanic students passing AP Physics B was only 4.04 times that of Hispanic students.
    - Similarly, in 2005 the ratio of the AP Physics B pass rate of non-Black students and that of Black students was 13.16; by 2014, this ratio had dropped to 11.25.
- **Similarly positive trends in AP Physics B participation and pass rates are observed at the national level, though it is interesting to note that participation rates and pass rates of New Jersey students were higher in 2014 than the corresponding rates of US students more broadly.** This was true for all students, as well as for the three subgroups of students traditionally underrepresented in advanced physics education examined in this analysis.
    - For example, in 2014, the participation rate for black/African American students in New Jersey was 0.80 percent, compared to 0.64 percent nationally. Hispanic and female students in New Jersey also participated at

[2] Please see Section I for additional description of how this ratio is calculated.

higher rates than their peers nationally (1.35 percent versus 1.14 percent for Hispanics) and 1.83 percent versus 1.47 percent for females.
- Additionally, the percentage-point change in pass rates for these student subgroups (calculated from 2005-2014) were higher in New Jersey than for the United States overall (0.88 points versus 0.59 points), for Hispanic students (0.43 points versus 0.25 points), and for female students (0.65 points versus 0.38 points).

SECTION I: METHODOLOGY AND DATA OVERVIEW

METHODOLOGY

This analysis focuses on the development of two sets of statistics:

- **Participation Rate and Ratios:**
  - *Participation Rate:* Percentage of students enrolled in Grades 9-12 attempting an AP Physics exam.
  - *Participation Rate Ratio:* For student subgroups that have been traditionally underrepresented in advanced physics education, we calculate the ratio between participation rates of students who are not in the underrepresented group and participation rates of students who are in the group. For example, we divide the participation rate of non-black/African-American students by the participation rate of black/African American students. This provides an indication of how much more or less likely a specific subgroup is to participate in AP Physics B than students who are not in that subgroup.
- **Pass Rate and Ratios:**
  - *Pass Rate:* Percentage of students enrolled in Grades 9-12 passing an AP Physics exam (with a score of 3 or higher).
  - *Pass Rate Ratio:* For student subgroups that have been traditionally underrepresented in advanced physics education, we calculate the ratio between pass rates of students who are not in the underrepresented group and pass rates of students who are in the group.

The numerator for the participation and pass rates is based on New Jersey and US AP Physics data from The College Board. For the denominator of these rates, we use Grade 9-12 enrollment from the US Census Bureau's American Community Survey (ACS). After conferring with CTL, we adjust the denominator to reflect average enrollment *per grade* by dividing the enrollment figures by four. This allows us to approximate the number of students who *could* take the AP test each year, as students take each test only one time in a four-year period.

We produced the above statistics for all students, as well as for key demographic subgroups, including female students, Hispanic students, and black/African American students. We track participation and pass rates for each of these groups over time (2005-2014).

DATA OVERVIEW

AP DATA

Hanover retrieved aggregate AP participation and score data for New Jersey and the United States from publicly available sources. The information most relevant to our analysis was contained in 28 files (14 for New Jersey and 14 for the United States) and covered the following:

- Number of AP Physics B (2001-2014) test-takers overall and segmented by race/ethnicity and gender.
- Number of students scoring at each level (1-5) and mean scores on the AP Physics B (2001-2014) exams, overall and segmented by demographic subgroup.

Note that while the New Jersey and US data contained separate tabs for all students (enrolled in both public and private schools) and public school students only, gender segmentations were only available for all students. We therefore chose to analyze data for all students for this report.

ENROLLMENT DATA

For the denominator of our participation and pass rate calculations, we investigated multiple sources. Importantly, as the AP Physics data for New Jersey and the United States provided public school data for all students and race/ethnicity subgroups, but only provided gender segmentations for all students (public and private school), we needed to use a measure of enrollment that reflected both public and private school students.[3] Therefore, we chose to use enrollment data reported through the US Census Bureau's American Community Survey. Consistent enrollment data at the state and national level are available for the period 2005-2014, aligning with the bulk of the available AP Physics data (2001-2014).[4]

NOTE ON RACE/ETHNICITY

As described in our outline for this project, in order to align AP data with enrollment data, it was necessary to combine multiple race/ethnicity categories related to Hispanic students. Specifically, the AP data separate Hispanic students into "Mexican/Mexican American," "Puerto Rican," and "Other Hispanic" students,[5] while enrollment data were available for a single Hispanic category (from the ACS). We collapsed the three AP categories into a single Hispanic category prior to analyzing the results.

[3] Enrollment data from both the National Center for Education Statistics' Common Core of Data and the NJDOE were limited to public school students. Furthermore, the NCES Common Core of Data changed its subgroup reporting structure in 2008-09 (prior to 2008-09, NCES did not provide grade-level enrollment breakdowns by gender) and in 2007-08 (moving from five-category race/ethnicity reporting to seven categories).

[4] Specifically, we use ACS 1-year estimates of school enrollment by level of school for the population 3 years and over, focusing on students enrolled in Grades 9-12. We collected these data for all students, female students, "black or African American alone," and "Hispanic or Latino." See: "American Factfinder." US Census Bureau. http://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml

[5] Some additional variation appeared in the US and New Jersey AP data in some years, including "Latino: Chicano/Mex.Amer," "Latino: Puerto Rican," and "Latino: Other." All such groups were combined into the Hispanic student group for the purpose of this analysis.

SECTION II: AP PHYSICS PARTICIPATION AND PASSAGE TRENDS

In the following pages, we present the results of our analysis, including an examination of participation and passing rate trends on the AP Physics B exam. Though this analysis primarily focuses on New Jersey, US results are provided for comparison purposes.

PARTICIPATION RATE TRENDS

NEW JERSEY

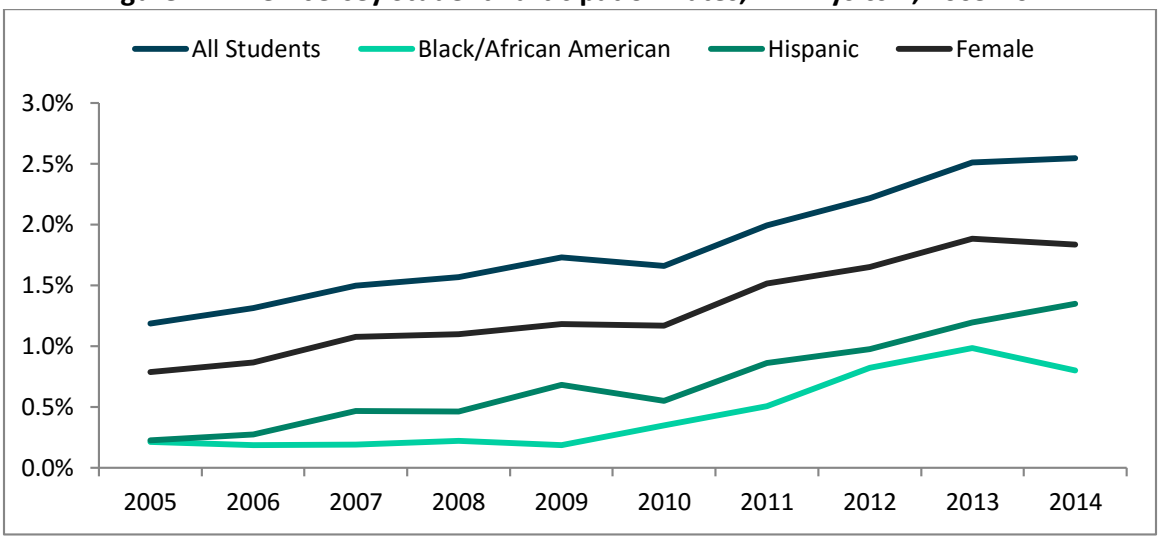
We begin by examining participation rates for New Jersey. As the figures below display, participation in the AP Physics B exam has generally increased among all students and within each subgroup of interest.

Figure 2.1: New Jersey Student Participation Rates, AP Physics B, 2005-2014

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
All Students										
# of Test-Takers	1,511	1,661	1,885	1,932	2,128	2,035	2,442	2,701	3,031	3,080
Grade 9-12 Enrollment	509,316	506,271	503,215	493,018	492,002	490,212	490,940	487,505	483,295	484,152
Enrollment/4	127,329	126,568	125,804	123,255	123,001	122,553	122,735	121,876	120,824	121,038
Participation Rate	1.19%	1.31%	1.50%	1.57%	1.73%	1.66%	1.99%	2.22%	2.51%	2.54%
Black/African American										
# of Test-Takers	45	41	43	47	39	69	103	163	193	153
Grade 9-12 Enrollment	85,956	88,797	89,962	85,548	83,901	79,935	81,262	79,262	78,586	76,681
Enrollment/4	21,489	22,199	22,491	21,387	20,975	19,984	20,316	19,816	19,647	19,170
Participation Rate	0.21%	0.18%	0.19%	0.22%	0.19%	0.35%	0.51%	0.82%	0.98%	0.80%
Hispanic										
# of Test-Takers	50	57	97	101	154	132	224	259	301	350
Grade 9-12 Enrollment	88,351	83,730	83,594	87,403	90,590	96,047	104,261	106,527	100,916	103,999
Enrollment/4	22,088	20,933	20,899	21,851	22,648	24,012	26,065	26,632	25,229	26,000
Participation Rate	0.23%	0.27%	0.46%	0.46%	0.68%	0.55%	0.86%	0.97%	1.19%	1.35%
Female										
# of Test-Takers	489	541	648	658	704	699	903	977	1,078	1,074
Grade 9-12 Enrollment	248,806	250,193	241,122	239,478	238,622	239,233	238,592	236,738	229,180	234,498
Enrollment/4	62,202	62,548	60,281	59,870	59,656	59,808	59,648	59,185	57,295	58,625
Participation Rate	0.79%	0.86%	1.07%	1.10%	1.18%	1.17%	1.51%	1.65%	1.88%	1.83%

Source: The College Board and US Census Bureau.

Figure 2.2: New Jersey Student Participation Rates, AP Physics B, 2005-2014



Source: The College Board and US Census Bureau.

Offering another means of examining these data, the figures below show the percentage-point change in participation *rates* and participation *numbers* over the previous year, as well as over the full time period (2005-2014). For example, as the participation rate for all students was 1.19 percent in 2005 and 1.31 percent in 2006, the figure presents a 0.13 percentage-point increase in participation among all students for 2006 (note these calculations are based on unrounded participation rates). These figures have been formatted to show the highest (dark green) and lowest (dark red) increases for each group.

We observe that for all students, Hispanic students, and female students, the greatest increase in participation rates occurred between 2010 and 2011. For black/African American students, the greatest increase occurred the following year, from 2011 to 2012. CTL began implementing its Progressive Science Initiative (PSI) in New Jersey during the 2010-2011 academic year, and we note that the implementation of this program may have had some effect on the dramatic rise in participation rates among minority students at this time. However, further research is needed—using school- and student-level data—to fully examine the effect of PSI implementation on statewide trends.

Figure 2.3: Percentage-Point Change in New Jersey Student Participation Rates Over Previous Year, AP Physics B, 2006-2014

	2006	2007	2008	2009	2010	2011	2012	2013	2014	'05-'14
All Students	0.13%	0.19%	0.07%	0.16%	-0.07%	0.33%	0.23%	0.29%	0.04%	**1.36%**
Black/African American	-0.02%	0.01%	0.03%	-0.03%	0.16%	0.16%	0.32%	0.16%	-0.18%	**0.59%**
Hispanic	0.05%	0.19%	0.00%	0.22%	-0.13%	0.31%	0.11%	0.22%	0.15%	**1.12%**
Female	0.08%	0.21%	0.02%	0.08%	-0.01%	0.35%	0.14%	0.23%	-0.05%	**1.05%**

Note: Higher values shaded in dark green; lower values shaded in dark red. Change calculated based on unrounded rates.
Source: The College Board and US Census Bureau.

Figure 2.4: Percentage-Point Change in New Jersey Student Participation Numbers Over Previous Year, AP Physics B, 2006-2014

	2006	2007	2008	2009	2010	2011	2012	2013	2014	'05-'14
All Students	9.93%	13.49%	2.49%	10.14%	-4.37%	20.00%	10.61%	12.22%	1.62%	**104%**
Black/African American	-8.89%	4.88%	9.30%	-17.02%	76.92%	49.28%	58.25%	18.40%	-20.73%	**240%**
Hispanic	14.00%	70.18%	4.12%	52.48%	-14.29%	69.70%	15.63%	16.22%	16.28%	**600%**
Female	10.63%	19.78%	1.54%	6.99%	-0.71%	29.18%	8.19%	10.34%	-0.37%	**120%**

Note: Higher values shaded in dark green; lower values shaded in dark red. Change calculated based on unrounded rates.
Source: The College Board and US Census Bureau.

We next present information regarding the participation rate ratio among student subgroups that have been traditionally underrepresented in advanced physics education. As noted in the methodology discussion, we calculate the ratio between participation rates of students who are not in a given underrepresented subgroup and participation rates of students who are in the subgroup. For example, we divide the participation rate of non-black/African-American students by the participation rate of black/African American students. This provides an indication of how much more or less likely a specific subgroup is to participate in AP Physics B than students who are not in that subgroup.

Once again, we have applied conditional formatting to more clearly visualize trends in the data, with higher values shaded in dark red and lower values shaded in dark green. The participation rate ratio has generally declined for each group over time, with the lowest ratios occurring after 2010, indicating that black/African American, Hispanic, and female students are closing the gap with students outside of each of these groups (respectively). For example, in 2005, the ratio of the AP Physics B participation rate among non-Hispanic students (1.39 percent) and that of Hispanic students (0.23 percent) was 6.13.[6] This means that the rate of non-Hispanic students participating in AP Physics B was 6.13 times that of Hispanic students in 2005. By 2014, the rate of non-Hispanic students participating in AP Physics B was only 2.13 times that of Hispanic students, demonstrating substantial progress within this subgroup.

Finally, note that there was a dramatic increase in participation rate ratios for underrepresented groups between 2009 and 2011, particularly among Black/African American students. More research will be needed to determine the cause of this increase, and can be addressed in more detail through an analysis of student-level data from districts within New Jersey.

Figure 2.5: New Jersey Student Participation Rate Ratios for Traditionally Underrepresented Groups, AP Physics B, 2005-2014 (Where Equity Between Groups = 1)

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Black/African American	6.61	8.4	9.33	8.42	11.01	5.55	4.5	3.02	2.86	3.6
Hispanic	6.13	5.58	3.67	3.91	2.89	3.51	2.67	2.64	2.39	2.13
Female	2	2.02	1.76	1.83	1.9	1.82	1.61	1.67	1.63	1.75

Note: Higher values shaded in dark red; lower values shaded in dark green, where green represents an improvement in equity between groups. Ratio calculated based on unrounded rates.
Source: The College Board and US Census Bureau.

[6] Note that all calculations are based on the actual, unrounded statistics but are presented as rounded to the nearest hundredth in this document.

UNITED STATES

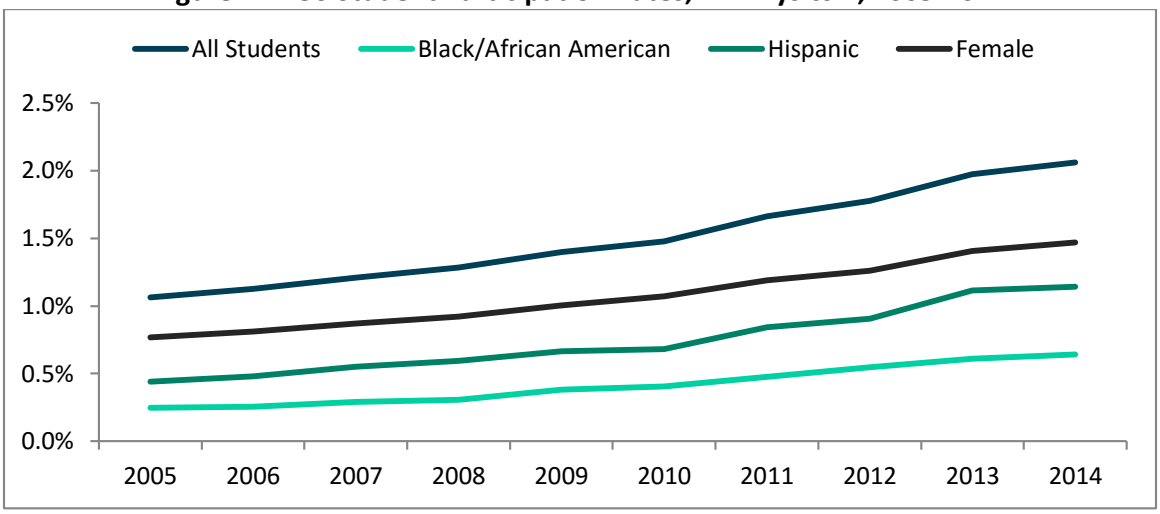
For comparison purposes, below we examine participation rates and participation rate ratios for students throughout the United States. Similar to New Jersey, we observe increases in participation rates in the AP Physics B exam among all students, and within each subgroup of interest.

Figure 2.6: US Student Participation Rates, AP Physics B, 2005-2014

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
All Students										
# of Test-Takers	45,251	49,184	52,635	55,227	59,797	63,654	71,395	75,510	83,756	87,495
Grade 9-12 Enrollment	17,008,892	17,500,472	17,433,100	17,208,364	17,106,388	17,235,496	17,198,388	17,013,440	16,983,808	17,008,156
Enrollment/4	4,252,223	4,375,118	4,358,275	4,302,091	4,276,597	4,308,874	4,299,597	4,253,360	4,245,952	4,252,039
Participation Rate	1.06%	1.12%	1.21%	1.28%	1.40%	1.48%	1.66%	1.78%	1.97%	2.06%
Black/African American										
# of Test-Takers	1,627	1,797	2,048	2,107	2,608	2,801	3,252	3,558	3,972	4,121
Grade 9-12 Enrollment	2,644,680	2,820,434	2,832,170	2,761,651	2,740,839	2,754,840	2,733,028	2,609,304	2,600,566	2,571,684
Enrollment/4	661,170	705,109	708,043	690,413	685,210	688,710	683,257	652,326	650,142	642,921
Participation Rate	0.25%	0.25%	0.29%	0.31%	0.38%	0.41%	0.48%	0.55%	0.61%	0.64%
Hispanic										
# of Test-Takers	3,249	3,706	4,344	4,799	5,555	6,265	7,932	8,579	10,711	11,138
Grade 9-12 Enrollment	2,939,284	3,074,983	3,163,004	3,226,648	3,344,873	3,675,933	3,773,047	3,797,012	3,849,202	3,900,269
Enrollment/4	734,821	768,746	790,751	806,662	836,218	918,983	943,262	949,253	962,301	975,067
Participation Rate	0.44%	0.48%	0.55%	0.59%	0.66%	0.68%	0.84%	0.90%	1.11%	1.14%
Female										
# of Test-Takers	16,068	17,330	18,436	19,261	20,878	22,353	24,726	26,006	28,924	30,352
Grade 9-12 Enrollment	8,390,804	8,558,225	8,488,362	8,359,532	8,318,572	8,341,578	8,321,965	8,259,172	8,234,100	8,261,084
Enrollment/4	2,097,701	2,139,556	2,122,091	2,089,883	2,079,643	2,085,395	2,080,491	2,064,793	2,058,525	2,065,271
Participation Rate	0.77%	0.81%	0.87%	0.92%	1.00%	1.07%	1.19%	1.26%	1.41%	1.47%

Source: The College Board and US Census Bureau.

Figure 2.7: US Student Participation Rates, AP Physics B, 2005-2014



Source: The College Board and US Census Bureau.

The next figures display the percentage-point change in participation *rates* and participation *numbers* over the previous year, as well as across the full period observed (2005-2014). These figures have been formatted to show the highest (dark green) and lowest (dark red) increases for each group. We observe that for all students, Hispanic students, and female students, the greatest increases in participation rates occurred between 2012 and 2013. For black/African American students, the greatest increase occurred between 2008 and 2009.

Figure 2.8: Percentage-Point Change in US Student Participation Rates Over Previous Year, AP Physics B, 2006-2014

	2006	2007	2008	2009	2010	2011	2012	2013	2014	'05-'14
All Students	0.06%	0.08%	0.08%	0.11%	0.08%	0.18%	0.11%	0.20%	0.09%	**0.99%**
Black/African American	0.01%	0.03%	0.02%	0.08%	0.03%	0.07%	0.07%	0.07%	0.03%	**0.39%**
Hispanic	0.04%	0.07%	0.05%	0.07%	0.02%	0.16%	0.06%	0.21%	0.03%	**0.70%**
Female	0.04%	0.06%	0.05%	0.08%	0.07%	0.12%	0.07%	0.15%	0.06%	**0.70%**

Note: Higher values shaded in dark green; lower values shaded in dark red. Change calculated based on unrounded rates.
Source: The College Board and US Census Bureau.

Figure 2.9: Percentage-Point Change in US Student Participation Numbers Over Previous Year, AP Physics B, 2006-2014

	2006	2007	2008	2009	2010	2011	2012	2013	2014	'05-'14
All Students	8.69%	7.02%	4.92%	8.27%	6.45%	12.16%	5.76%	10.92%	4.46%	**93%**
Black/African American	10.45%	13.97%	2.88%	23.78%	7.40%	16.10%	9.41%	11.64%	3.75%	**153%**
Hispanic	14.07%	17.22%	10.47%	15.75%	12.78%	26.61%	8.16%	24.85%	3.99%	**243%**
Female	7.85%	6.38%	4.47%	8.40%	7.06%	10.62%	5.18%	11.22%	4.94%	**89%**

Note: Higher values shaded in dark green; lower values shaded in dark red. Change calculated based on unrounded rates.
Source: The College Board and US Census Bureau.

We next present information regarding the participation rate ratio among student subgroups that have been traditionally underrepresented in advanced physics education,[7] with higher values shaded in dark red and lower values shaded in dark green. Similar to New Jersey, the participation rate ratio across the United States has generally declined for black/African American students and Hispanic students, illustrating progress by these subgroups in narrowing the participation gap with non-black/African American and non-Hispanic students, respectively. By contrast, however, the ratio for females has held relatively steady (between 1.73 and 1.80) at the national level over this time period, compared to the steeper declines observed in New Jersey (from a high of 2.02 in 2006 to a low of 1.61 in 2011, and resting at 1.75 in 2014).

Figure 2.10: US Student Participation Rate Ratios for Traditionally Underrepresented Groups, AP Physics B, 2005-2014 (Where Equity Between Groups = 1)

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Black/African American	4.94	5.07	4.79	4.82	4.18	4.13	3.96	3.66	3.63	3.6
Hispanic	2.7	2.62	2.46	2.43	2.37	2.48	2.25	2.24	2	2.04
Female	1.77	1.76	1.76	1.76	1.76	1.73	1.77	1.8	1.78	1.78

Note: Higher values shaded in dark red; lower values shaded in dark green, where green equals an improvement in equity between groups.
Ratio calculated based on unrounded rates.
Source: The College Board and US Census Bureau.

[7] As noted in the methodology discussion, we calculate the ratio between participation rates of students who are not in a given underrepresented subgroup and participation rates of students who are in the subgroup.

PASS RATE TRENDS

NEW JERSEY

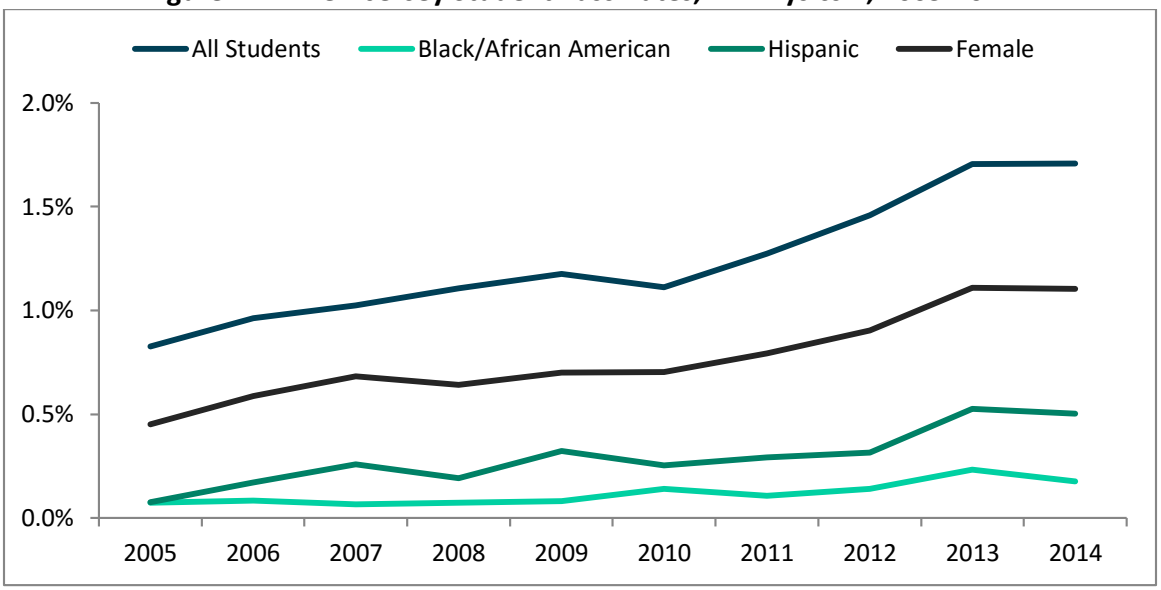
We now turn to AP Physics B exam pass rates for New Jersey. Recall from the methodology that pass rates are calculated as the percentage of students achieving a passing score (3 or above) on the AP Physics B exam, divided by an adjusted total Grade 9-12 enrollment figure (i.e., total Grade 9-12 enrollment divided by four to reflect average enrollment per grade). Similar to participation rates, we observe a general increase in pass rates among all students and within each subgroup of interest.

Figure 2.11: New Jersey Student Pass Rates, AP Physics B, 2005-2014

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
All Students										
# Passing	1,053	1,218	1,288	1,363	1,447	1,361	1,562	1,779	2,061	2,067
Grade 9-12 Enrollment	509,316	506,271	503,215	493,018	492,002	490,212	490,940	487,505	483,295	484,152
Enrollment/4	127,329	126,568	125,804	123,255	123,001	122,553	122,735	121,876	120,824	121,038
Pass Rate	0.83%	0.96%	1.02%	1.11%	1.18%	1.11%	1.27%	1.46%	1.71%	1.71%
Black/African American										
# Passing	16	19	15	16	17	28	22	28	46	34
Grade 9-12 Enrollment	85,956	88,797	89,962	85,548	83,901	79,935	81,262	79,262	78,586	76,681
Enrollment/4	21,489	22,199	22,491	21,387	20,975	19,984	20,316	19,816	19,647	19,170
Pass Rate	0.07%	0.09%	0.07%	0.07%	0.08%	0.14%	0.11%	0.14%	0.23%	0.18%
Hispanic										
# Passing	17	36	54	42	73	61	76	84	133	131
Grade 9-12 Enrollment	88,351	83,730	83,594	87,403	90,590	96,047	104,261	106,527	100,916	103,999
Enrollment/4	22,088	20,933	20,899	21,851	22,648	24,012	26,065	26,632	25,229	26,000
Pass Rate	0.08%	0.17%	0.26%	0.19%	0.32%	0.25%	0.29%	0.32%	0.53%	0.50%
Female										
# Passing	281	368	412	385	418	421	473	535	635	648
Grade 9-12 Enrollment	248,806	250,193	241,122	239,478	238,622	239,233	238,592	236,738	229,180	234,498
Enrollment/4	62,202	62,548	60,281	59,870	59,656	59,808	59,648	59,185	57,295	58,625
Pass Rate	0.45%	0.59%	0.68%	0.64%	0.70%	0.70%	0.79%	0.90%	1.11%	1.11%

Source: The College Board and US Census Bureau.

Figure 2.12: New Jersey Student Pass Rates, AP Physics B, 2005-2014



Source: The College Board and US Census Bureau.

Next we examine the percentage-point change in pass rates and pass numbers over the previous year, with conditional formatting to illustrate the highest (dark green) and lowest (dark red) increases for each group. The highest increase for all students and each subgroup clearly occurred between 2012 and 2013, with pass rates improving by 0.20-0.25 percentage points for all students, Hispanic students, and female students. The increase was somewhat less pronounced for black/African American students, though the 0.09 percentage-point growth over the previous year was higher in 2013 than in any other year examined.

Figure 2.13: Percentage-Point Change in New Jersey Student Pass Rates Over Previous Year, AP Physics B, 2006-2014

	2006	2007	2008	2009	2010	2011	2012	2013	2014	'05-'14
All Students	0.14%	0.06%	0.08%	0.07%	-0.07%	0.16%	0.19%	0.25%	0.00%	**0.88%**
Black/African American	0.01%	-0.02%	0.01%	0.01%	0.06%	-0.03%	0.03%	0.09%	-0.06%	**0.10%**
Hispanic	0.10%	0.09%	-0.07%	0.13%	-0.07%	0.04%	0.02%	0.21%	-0.02%	**0.43%**
Female	0.14%	0.10%	-0.04%	0.06%	0.00%	0.09%	0.11%	0.20%	0.00%	**0.65%**

Note: Higher values shaded in dark green; lower values shaded in dark red. Change calculated based on unrounded rates.
Source: The College Board and US Census Bureau.

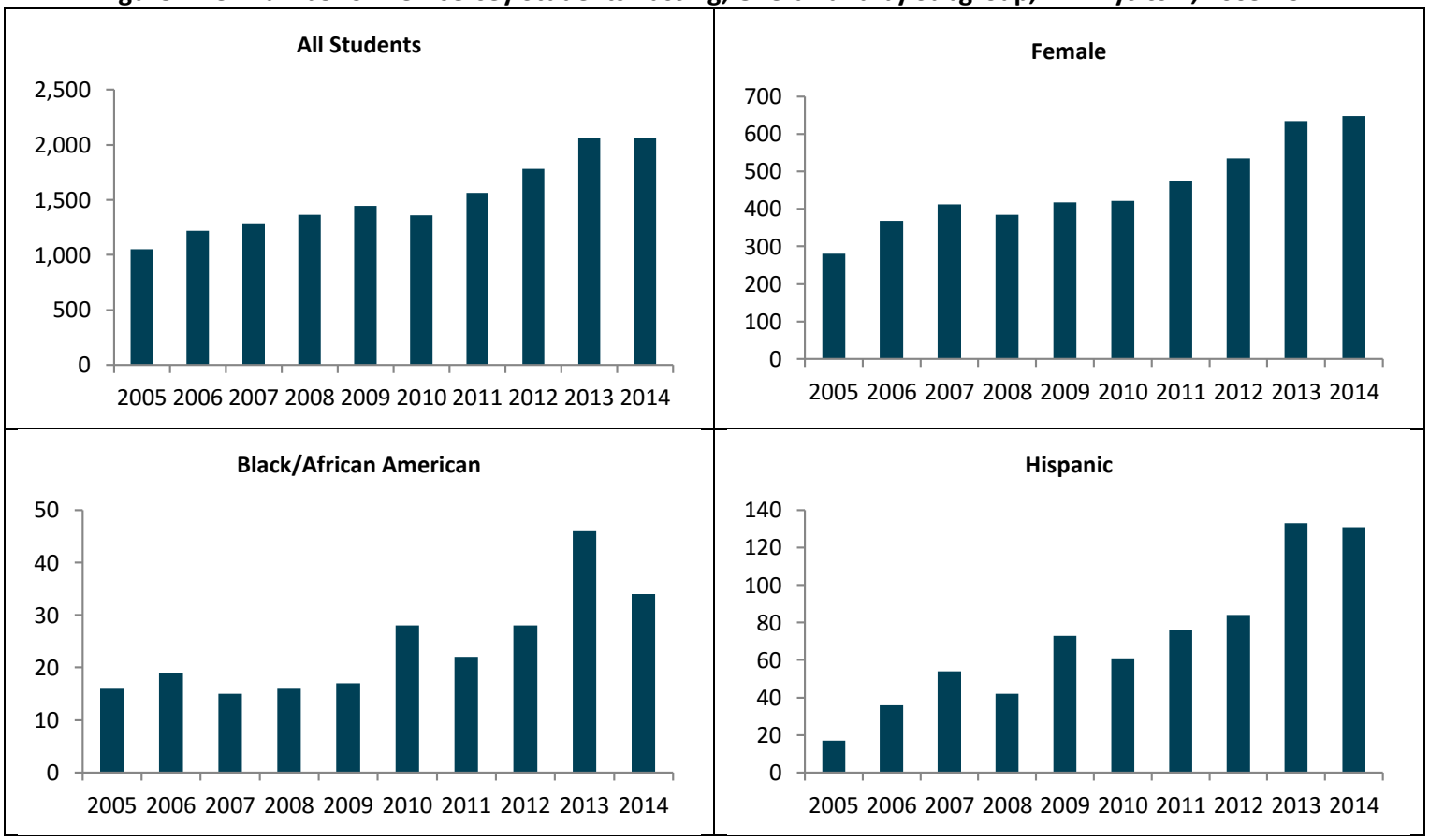
Figure 2.14: Percentage-Point Change in New Jersey Student Pass Rates Over Previous Year, AP Physics B, 2006-2014

	2006	2007	2008	2009	2010	2011	2012	2013	2014	'05-'14
All Students	15.67%	5.75%	5.82%	6.16%	-5.94%	14.77%	13.89%	15.85%	0.29%	**96%**
Black/African American	18.75%	-21.05%	6.67%	6.25%	64.71%	-21.43%	27.27%	64.29%	-26.09%	**113%**
Hispanic	111.76%	50.00%	-22.22%	73.81%	-16.44%	24.59%	10.53%	58.33%	-1.50%	**671%**
Female	30.96%	11.96%	-6.55%	8.57%	0.72%	12.35%	13.11%	18.69%	2.05%	**131%**

Note: Higher values shaded in dark green; lower values shaded in dark red. Change calculated based on unrounded rates.
Source: The College Board and US Census Bureau.

Given the relatively small sample of students passing this exam each year, it is also helpful to look at trends in the raw numbers of students passing the exam, overall and within each subgroup. As the charts below illustrate, each group has made substantial progress in terms of the number of students passing the AP Physics B exam. Further, even though the number of black/African American students passing the exam dipped from its peak in 2013 (46 students), the number of students passing in 2014 (34) was more than double the number passing in 2005 (16).

Figure 2.15: Number of New Jersey Students Passing, Overall and by Subgroup, AP Physics B, 2005-2014



Source: The College Board and US Census Bureau.

As with participation rates, we calculated pass rate ratios among student subgroups that have been traditionally underrepresented in advanced physics education. These ratios are calculated by dividing the pass rates of students who are not in a given underrepresented subgroup by the pass rates of students who are in the subgroup. For example, we divide the pass rate of non-black/African American students by the pass rate of black/African American students. This provides an indication of how much more or less likely a specific subgroup is to pass AP Physics B than students who are not in that subgroup. The trend is somewhat less well-defined for female students, with their lowest pass rate ratio occurring in 2007. However, across the years examined, we still observe a general narrowing of the gap with male students, as the ratio is 2.62 in 2005 and 2.06 in 2014.

Figure 2.16: New Jersey Student Pass Rate Ratios for Traditionally Underrepresented Groups, AP Physics B, 2005-2014 (Where Equity Between Groups = 1)

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Black/African American	13.16	13.42	18.47	17.68	17.29	9.28	13.88	12.14	8.51	11.25
Hispanic	12.79	6.51	4.55	6.78	4.25	5.19	5.27	5.64	3.83	4.04
Female	2.62	2.26	1.96	2.4	2.32	2.13	2.18	2.2	2.03	2.06

Note: Higher values shaded in dark red; lower values shaded in dark green, where green equals an improvement in equity between groups.
Ratio calculated based on unrounded rates.
Source: The College Board and US Census Bureau.

UNITED STATES

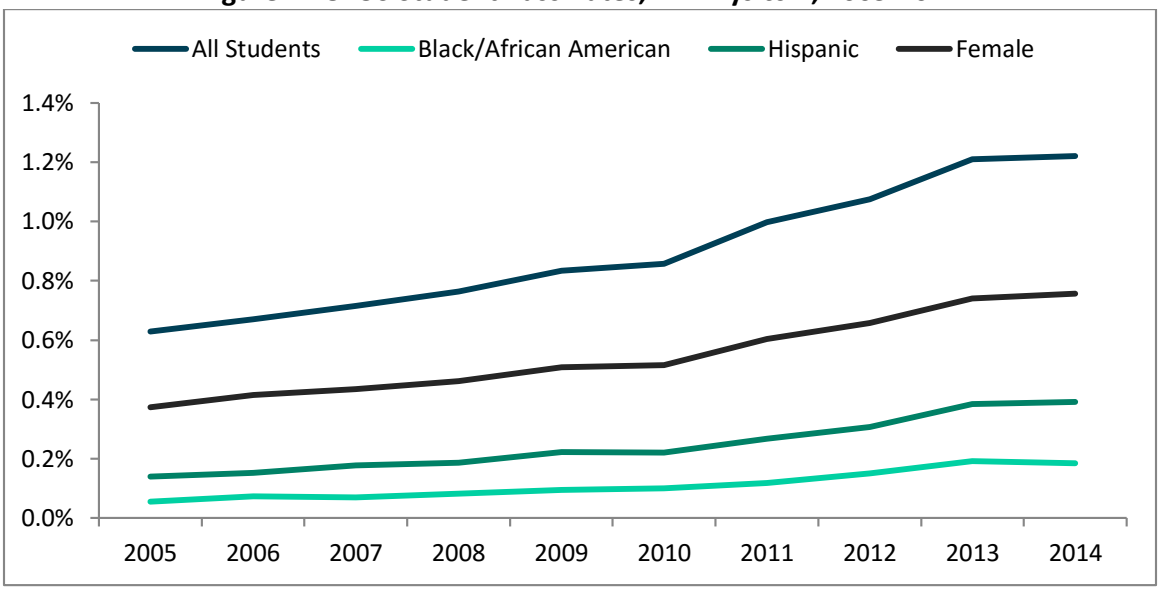
Below, we display AP Physics B pass rates for the United States. These rates have increased for all students, as well as each student subgroup.

Figure 2.17: US Student Pass Rates, AP Physics B, 2005-2014

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
All Students										
# Passing	26,775	29,360	31,213	32,848	35,675	36,912	42,917	45,746	51,360	51,896
Grade 9-12 Enrollment	17,008,892	17,500,472	17,433,100	17,208,364	17,106,388	17,235,496	17,198,388	17,013,440	16,983,808	17,008,156
Enrollment/4	4,252,223	4,375,118	4,358,275	4,302,091	4,276,597	4,308,874	4,299,597	4,253,360	4,245,952	4,252,039
Pass Rate	0.63%	0.67%	0.72%	0.76%	0.83%	0.86%	1.00%	1.08%	1.21%	1.22%
Black/African American										
# Passing	367	524	497	573	648	694	804	982	1,253	1,184
Grade 9-12 Enrollment	2,644,680	2,820,434	2,832,170	2,761,651	2,740,839	2,754,840	2,733,028	2,609,304	2,600,566	2,571,684
Enrollment/4	661,170	705,109	708,043	690,413	685,210	688,710	683,257	652,326	650,142	642,921
Pass Rate	0.06%	0.07%	0.07%	0.08%	0.09%	0.10%	0.12%	0.15%	0.19%	0.18%
Hispanic										
# Passing	1,030	1,172	1,411	1,509	1,862	2,034	2,529	2,922	3,702	3,823
Grade 9-12 Enrollment	2,939,284	3,074,983	3,163,004	3,226,648	3,344,873	3,675,933	3,773,047	3,797,012	3,849,202	3,900,269
Enrollment/4	734,821	768,746	790,751	806,662	836,218	918,983	943,262	949,253	962,301	975,067
Pass Rate	0.14%	0.15%	0.18%	0.19%	0.22%	0.22%	0.27%	0.31%	0.38%	0.39%
Female										
# Passing	7,831	8,887	9,247	9,658	10,563	10,751	12,573	13,580	15,257	15,614
Grade 9-12 Enrollment	8,390,804	8,558,225	8,488,362	8,359,532	8,318,572	8,341,578	8,321,965	8,259,172	8,234,100	8,261,084
Enrollment/4	2,097,701	2,139,556	2,122,091	2,089,883	2,079,643	2,085,395	2,080,491	2,064,793	2,058,525	2,065,271
Pass Rate	0.37%	0.42%	0.44%	0.46%	0.51%	0.52%	0.60%	0.66%	0.74%	0.76%

Source: The College Board and US Census Bureau.

Figure 2.18: US Student Pass Rates, AP Physics B, 2005-2014



Source: The College Board and US Census Bureau.

As with New Jersey, we observe the greatest percentage-point increase in US student pass rates between 2012 and 2013, after which pass rates remain relatively flat.

Figure 2.19: Percentage-Point Change in US Student Pass Rates Over Previous Year, AP Physics B, 2006-2014

	2006	2007	2008	2009	2010	2011	2012	2013	2014	'05-'14
All Students	0.04%	0.05%	0.05%	0.07%	0.02%	0.14%	0.08%	0.13%	0.01%	**0.59%**
Black/African American	0.02%	0.00%	0.01%	0.01%	0.01%	0.02%	0.03%	0.04%	-0.01%	**0.13%**
Hispanic	0.01%	0.03%	0.01%	0.04%	0.00%	0.05%	0.04%	0.08%	0.01%	**0.25%**
Female	0.04%	0.02%	0.03%	0.05%	0.01%	0.09%	0.05%	0.08%	0.01%	**0.38%**

Note: Higher values shaded in dark green; lower values shaded in dark red. Change calculated based on unrounded rates.
Source: The College Board and US Census Bureau.

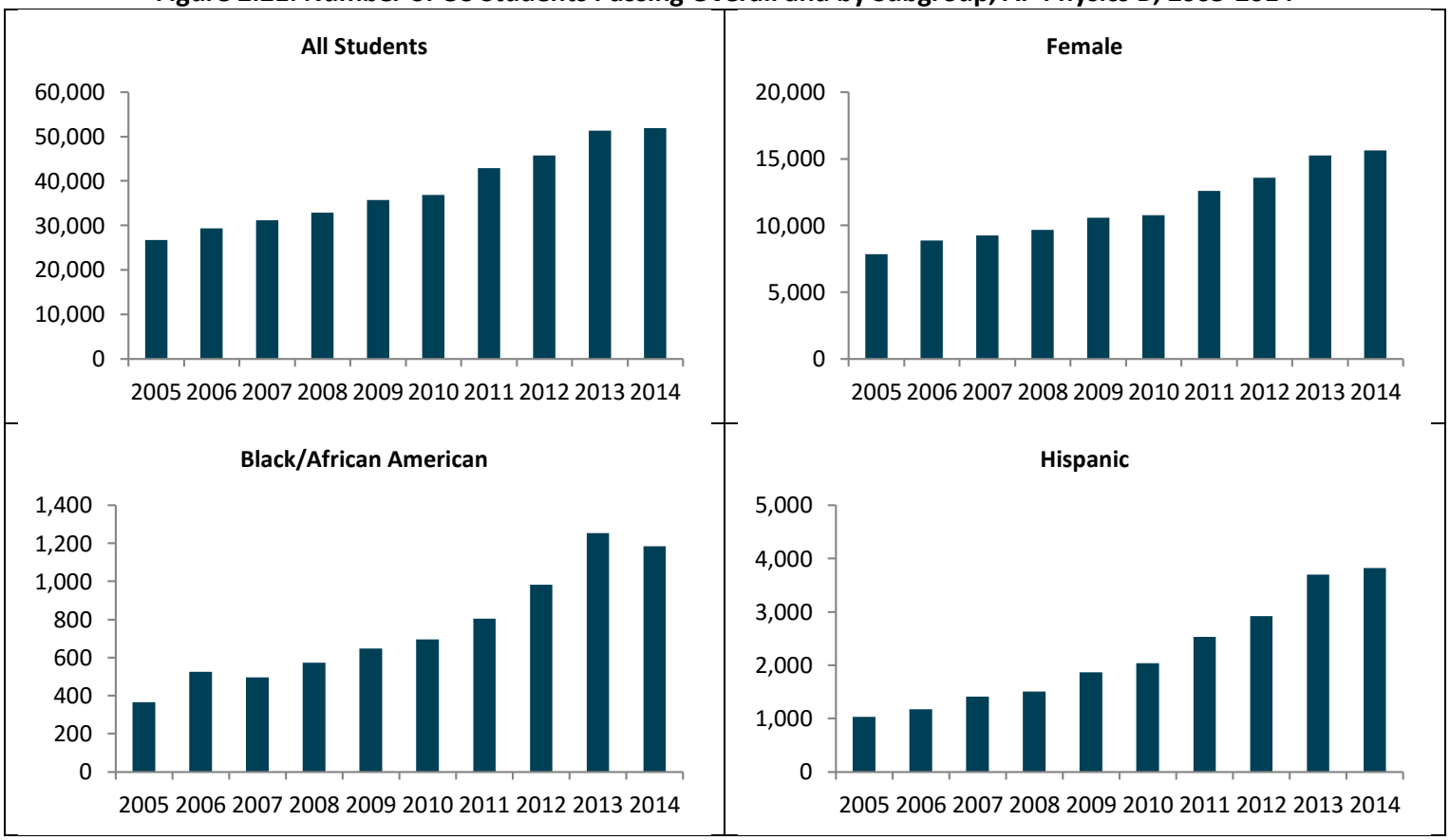
Figure 2.20: Percentage-Point Change in US Student Pass Numbers Over Previous Year, AP Physics B, 2006-2014

	2006	2007	2008	2009	2010	2011	2012	2013	2014	'05-'14
All Students	9.65%	6.31%	5.24%	8.61%	3.47%	16.27%	6.59%	12.27%	1.04%	**94%**
Black/African American	42.78%	-5.15%	15.29%	13.09%	7.10%	15.85%	22.14%	27.60%	-5.51%	**223%**
Hispanic	13.79%	20.39%	6.95%	23.39%	9.24%	24.34%	15.54%	26.69%	3.27%	**271%**
Female	13.48%	4.05%	4.44%	9.37%	1.78%	16.95%	8.01%	12.35%	2.34%	**99%**

Note: Higher values shaded in dark green; lower values shaded in dark red. Change calculated based on unrounded rates.
Source: The College Board and US Census Bureau.

Though certainly larger than the New Jersey sample, it is again helpful to look at the raw numbers of students passing the AP Physics B exam each year. Similar to the state level, though we see a slight decline in the number of black/African American students passing the AP Physics B exam in 2014 (1,184) compared to 2013 (1,253), this still represents a dramatic increase over 2005 (367).

Figure 2.21: Number of US Students Passing Overall and by Subgroup, AP Physics B, 2005-2014



Source: The College Board and US Census Bureau.

Lastly, we report national trends in pass rate ratios among student subgroups that have been traditionally underrepresented in advanced physics education.[8] Both black/African American students and Hispanic show notable improvements on this metric, with the pass rate ratio declining substantially from 2005 to 2014. The trend among females is not as clear, as the pass rate ratio holds fairly steady over this time period, fluctuating slightly from a high of 2.36 in 2005 to a low of 2.19 in 2014 (note that 2006 was the next lowest point, with a ratio of 2.20).

[8] As noted previously, these ratios are calculated by dividing the pass rates of students who are not in a given underrepresented subgroup by the pass rates of students who are in the subgroup.

Figure 2.22: US Student Pass Rate Ratios for Traditionally Underrepresented Groups, AP Physics B, 2005-2014 (Where Equity Between Groups = 1)

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Black/African American	13.25	10.57	11.99	10.77	10.31	9.93	9.9	8.26	7.23	7.63
Hispanic	5.22	5.13	4.68	4.79	4.41	4.65	4.49	4.21	3.77	3.74
Female	2.36	2.2	2.25	2.27	2.25	2.28	2.26	2.23	2.23	2.19

Note: Higher values shaded in dark red; lower values shaded in dark green, where green equals an improvement in equity between groups. Ratio calculated based on unrounded rates.
Source: The College Board and US Census Bureau.

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