

AP PHYSICS B PARTICIPATION AND SCORE ANALYSIS

Prepared for the New Jersey 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 the Advanced Placement (AP) Physics exams B in New Jersey and the United States, as well as among the schools participating in the New Jersey Center for Teaching and Learning's (CTL's) Progressive Science Initiative (PSI) in 2012 through 2014.

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EXECUTIVE SUMMARY AND KEY FINDINGS

INTRODUCTION

On behalf of the New Jersey Center for Teaching and Learning (CTL), Hanover Research examines trends in the number of students taking and passing Advanced Placement (AP) Physics B among the schools participating in the Progressive Science Initiative (PSI), as well as in New Jersey and the United States more broadly. As described in greater detail in the “Methodology and Data Overview,” we analyze AP Physics B data for PSI schools from the New Jersey Department of Education (NJDOE), and New Jersey and US AP Physics B data from The College Board, all of which were provided to Hanover by CTL. We also incorporate Grade 9-12 enrollment data from the NJDOE and 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 PSI schools, New Jersey, and the United States, as well as the data used in these calculations.
- **Section II: AP Physics B Participation and Passage Trends** provides the results of our analysis, describing participation and passage trends for the AP Physics B exams. The section further includes a comparison of average scores on the AP Physics B exam between students at PSI schools and throughout New Jersey and the United States.

KEY FINDINGS

- **Compared to New Jersey and the United States, higher percentages of students enrolled in Grades 9-12 at PSI schools participated in the AP Physics B exam in 2012, 2013, and 2014.** Indeed, in 2014, PSI students were 4.4 times more likely to participate in the AP Physics B exam than New Jersey students, and 5.4 times more likely to participate in the exam than students across the United States. These higher participation rates are especially notable among African American students: PSI African American students were 8.7 and 10.8 times more likely to participate in the exam than African American students within New Jersey and across the United States, respectively.
- **Similarly, PSI schools have higher passage rates than schools in New Jersey and throughout the entire United States.** In 2014, students in PSI schools were 3.4 times more likely to pass the AP Physics B exam than students in New Jersey and 2.4 times more likely to pass the AP Physics B exam than students across the United States. These differences are especially notable among Hispanic students: Hispanic PSI students were 5.0 and 3.9 times more likely to pass the exam than Hispanic students within New Jersey and across the United States, respectively.

- **Among the PSI schools examined in this report, compared to 2012, AP Physics B participation rates dipped slightly in 2013 before partially recovering in 2014.** More specifically, in 2012, 13.83 percent of the students enrolled in Grades 9-12 at PSI schools took the AP Physics B exam. This rate decreased to 9.38 percent in 2013, but bounced to 11.11 percent in 2014. Female, male, black/African American, and Hispanic students achieved similar trends in participation.
- **The percentage of Grades 9-12 students who passed the AP Physics B exam at PSI schools also fluctuated during this time period.** In 2012, 4.22 percent of the students in Grades 9-12 at PSI schools passed the AP Physics B exam (with a score of 3 or above). This rate decreased a little in 2013 (3.56 percent), but increased a little in 2014 (4.16 percent). Female, male, black/African American, and Hispanic students achieved similar trends in the pass rate.
- **PSI schools are closing the mean score gap with New Jersey and United States students.** While PSI schools have statistically significantly lower average scores on the AP Physics B exam than New Jersey and the United States from 2012-2014, the PSI school average scores have increased over this timeframe (from 1.96 in 2012 to 2.24 in 2014). Further, the difference between PSI schools and both the New Jersey and US average scores has declined over time, indicating that the gap is closing. For example, while the gap between PSI school average scores and US average scores was 0.91 points in 2012, the gap narrowed to only 0.59 points in 2014.

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 B exam¹
 - *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 B 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 each of these rates is drawn from AP Physics B data for PSI schools from the New Jersey Department of Education (NJDOE), and New Jersey and US AP Physics B data from The College Board. We use Grade 9-12 enrollment (all high school students) as our denominator. As discussed in greater detail in the “Data Overview” below, while we investigated multiple sources of Grade 9-12 enrollment data, we ultimately chose to use NJDOE enrollment information for PSI students and US Census Bureau American Community Survey (ACS) data for New Jersey and US students. Specifically, with respect to the ACS data, this source provided information that most closely aligned with the New Jersey and US AP data, as well as provided consistent enrollment data over the longest timeframe (2005-2014). Please see the “Data Overview” for additional detail on this decision. After conferring with CTL, we adjusted 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.

¹ Throughout the report, “AP Physics” refers to the course “AP Physics B.” We focus on this course because the PSI school data are only available for the “AP Physics B” course performance.

We produced these 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 for New Jersey/US students and 2012-2014 for PSI students).

Finally, because we are working with aggregate AP test data for New Jersey and the US, rather than student- or school-level data (e.g., the school-level data available for PSI schools), significance testing requires three summary statistics: mean, standard deviation, and sample size. While the New Jersey and US *participation* and *passing rate* data do not allow us to calculate standard deviations, we are able to do so for New Jersey and US, as well as PSI, *score* data.² As such, we present comparisons between PSI student average scores and New Jersey student average scores, as well as between PSI student average scores and US student average scores. We then conduct t-tests of the difference in mean scores between groups.³

DATA OVERVIEW

AP DATA

As noted above, CTL provided Hanover with AP participation and score information for each PSI school, as well as aggregate data for New Jersey and the United States. PSI school data were available in a single file titled “AP_PSI_data_2015_2014_2013_2012.” Obtained by CTL from the NJDOE, this file includes the following information relevant to this analysis:

- Number of students scoring at each level (1-5) on the AP Physics B (2012-2014) and AP Physics B I (2015) exams segmented by demographic subgroup in each PSI school.

Please note that in our analysis of PSI data, we focused on the 2012-2014 time period as suggested by CTL.⁴ In addition, the data file “AP_PSI_data_2015_2014_2013_2012”

² In particular, score data are reported as the number of students achieving a 1, 2, 3, 4, or 5 on each AP assessment. Using this information, standard deviation can be calculated as follows:

$$\sigma = \sqrt{\frac{n_1 * (1 - m)^2 + n_2 * (2 - m)^2 + n_3 * (3 - m)^2 + n_4 * (4 - m)^2 + n_5 * (5 - m)^2}{N}}$$

where m = mean score, n₁ = the number of students achieving a score of 1, n₂ = the number of students achieving a score of 2, etc., and N= total number of scores.

As we needed to collapse multiple race categories related to Hispanic students in order to align the AP data with enrollment figures, we also recalculated mean scores as follows:

$$m = \frac{1 * n_1 + 2 * n_2 + 3 * n_3 + 4 * n_4 + 5 * n_5}{N}$$

where n₁ = the number of students achieving a score of 1, n₂ = the number of students achieving a score of 2, etc. (as above), and N= total number of scores.

³ To be consistent with the previous report titled “AP Physics Participation and Score Analysis - Center for Teaching and Learning,” we focus on the overall mean score comparison between groups in this report. We may also compare the mean scores by demographic subgroup as a follow-up analysis if CTL is interested.

⁴ Based on CTL, the 2015 data are not complete.

presents 13 PSI schools in 2012, 18 PSI schools in 2013, and 16 PSI schools in 2014 (Figure A.1 in the Appendix displays the full list of PSI schools in each year).

Next, CTL provided Hanover with a set of files containing aggregate/summary AP participation and score information for students in New Jersey and throughout the United States. 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

Representing the denominator of our participation and pass rate calculations, we obtained enrollment data for each PSI school (for which AP Physics B exam information were provided) from the NJDOE.⁵

With respect to New Jersey and US enrollment data, we investigated multiple sources. Importantly, as the AP Physics B 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 aggregate student counts (public and private school), we needed to use a measure of enrollment that reflected both public and private school students.⁶ 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 B data (2001-2014).⁷

⁵ "Fall Survey Collections." State of New Jersey Department of Education.
<http://www.state.nj.us/education/data/enr/>

⁶ 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).

⁷ 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>

SECTION II: AP PHYSICS B 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 exams. We close with a comparison of average AP Physics B scores among students enrolled in PSI schools, New Jersey, and the United States.

PARTICIPATION RATE TRENDS

AP PHYSICS B EXAMS

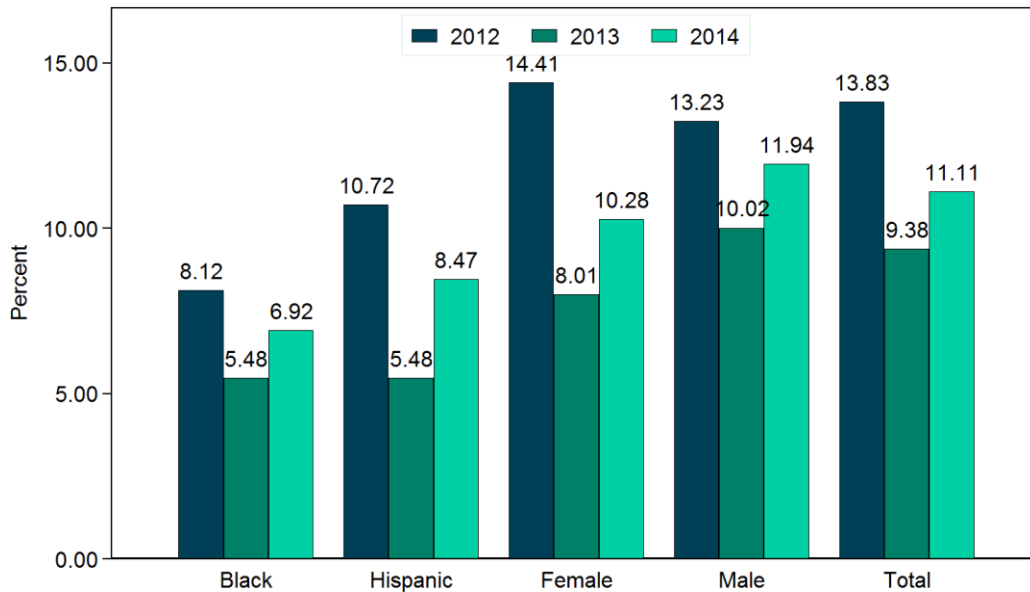
As the figures below illustrate, AP Physics B participation rates among students at PSI schools fluctuated in from 2012 (13.83 percent) to 2014 (11.11 percent), with the lowest rate in 2013 (9.38 percent). Further, these PSI schools witnessed similar trends among key student subgroups, including black/African American, Hispanic, female, and male students. Finally, Grade 10 students in PSI schools have the highest participation rates among students, and Grade 9 and Grade 11 students have the lowest participation rates.

Figure 2.1: PSI School Student Participation Rates, AP Physics, 2012-2014

YEAR	2012	2013	2014
All Students			
# of Test-Takers	380	358	390
Grade 9-12 Enrollment	10,988	15,268	14,044
Enrollment/4	2,747	3,817	3,511
Participation Rate	13.83%	9.38%	11.11%
Black/African American			
# of Test-Takers	102	88	79
Grade 9-12 Enrollment	5,025	6,424	4,565
Enrollment/4	1,256	1,606	1,141
Participation Rate	8.12%	5.48%	6.92%
Hispanic			
# of Test-Takers	93	78	134
Grade 9-12 Enrollment	3,470	5,692	6,328
Enrollment/4	868	1,423	1,582
Participation Rate	10.72%	5.48%	8.47%
Female			
# of Test-Takers	202	153	181
Grade 9-12 Enrollment	5,607	7,641	7,045
Enrollment/4	1,402	1,910	1,761
Participation Rate	14.41%	8.01%	10.28%
Male			
# of Test-Takers	178	191	209
Grade 9-12 Enrollment	5,381	7,627	6,999
Enrollment/4	1,345	1,907	1,750
Participation Rate	13.23%	10.02%	11.94%

Source: NJDOE.

Figure 2.2: PSI School Student Participation Rates, AP Physics, 2012-2014



Source: NJDOE

Figure 2.3: PSI School Student Participation Rates by Grade Level, AP Physics, 2012-2014

YEAR	2012	2013	2014
Grade 9			
# of Grade 9 Test-Takers	21	19	49
Grade 9 Enrollment	3,275.5	3,900	4,043.5
Participation Rate	0.64%	0.49%	1.21%
Grade 10			
# of Grade 10 Test-Takers	231	204	230
Grade 10 Enrollment	2,568	4,081	3,471.5
Participation Rate	9.00%	5.00%	6.63%
Grade 11			
# of Grade 11 Test-Takers	25	18	28
Grade 11 Enrollment	2,425.5	3,394.5	3,370
Participation Rate	1.03%	0.53%	0.83%
Grade 12			
# of Grade 12 Test-Takers	99	106	72
Grade 12 Enrollment	2,467	3,671	2,866.5
Participation Rate	4.01%	2.89%	2.51%

Source: NJDOE.

Next, we examine participation rates for New Jersey and the United States more broadly. As the tables on the next page display, participation in the AP Physics B exam have generally increased among all students and within each subgroup of interest at both the state and national levels.

Figure 2.4: New Jersey Student Participation Rates, AP Physics, 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%
Male										
# of Test-Takers	1,022	1,120	1,237	1,274	1,424	1,336	1,539	1,724	1,953	2,006
Grade 9-12 Enrollment	260,510	256,078	262,093	253,540	253,380	250,979	252,348	250,767	254,115	249,654
Enrollment/4	65,127	64,020	65,523	63,385	63,345	62,745	63,087	62,691	63,529	62,413
Participation Rate	1.57%	1.75%	1.89%	2.01%	2.25%	2.13%	2.44%	2.75%	3.07%	3.21%

Source: The College Board and US Census Bureau.

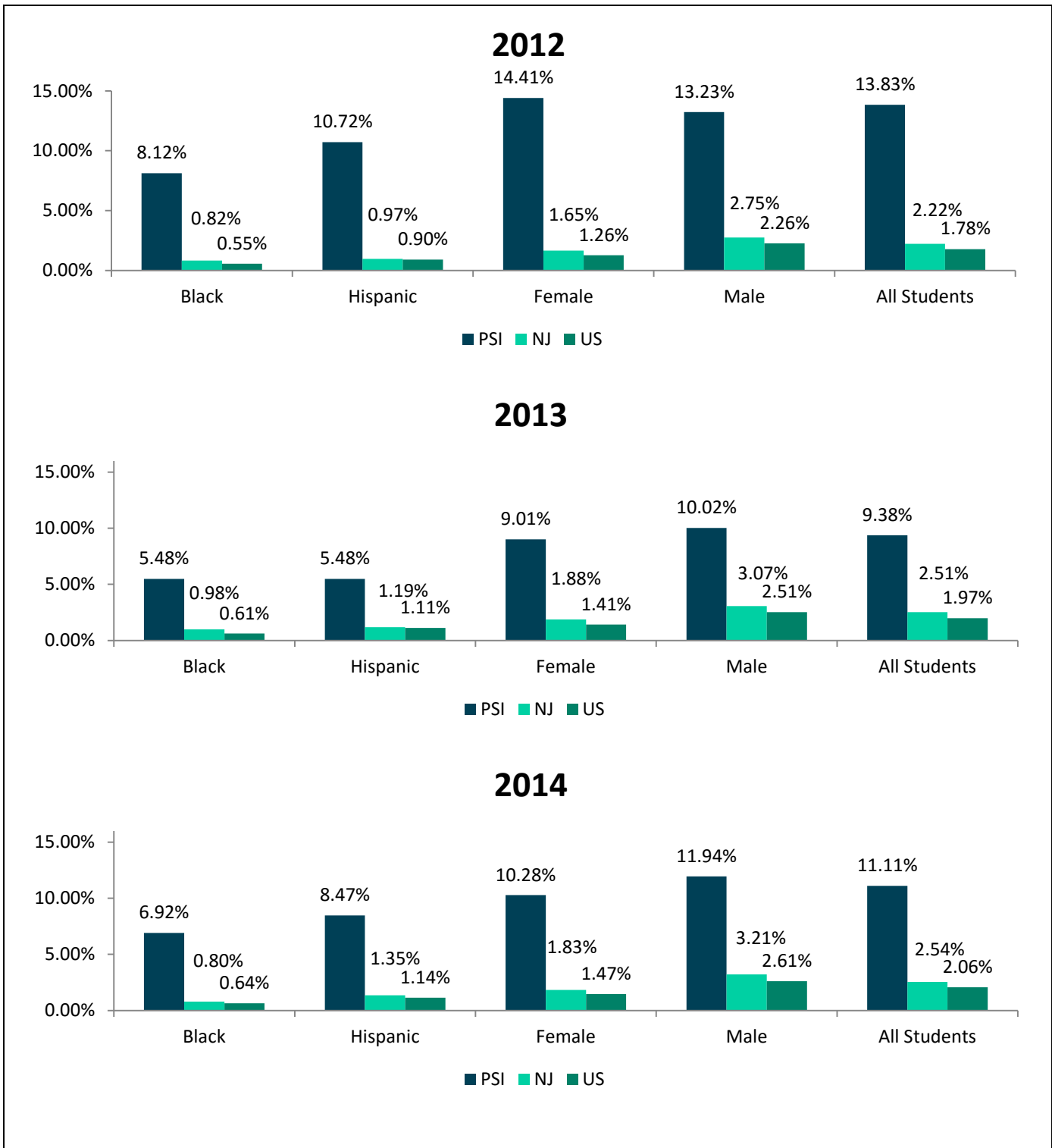
Figure 2.5 US Student Participation Rates, AP Physics, 2005-2014

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%
Male										
# of Test-Takers	29183	31854	34199	35966	38919	41301	46669	49504	54832	57143
Grade 9-12 Enrollment	8,618,088	8,942,247	8,944,738	8,848,832	8,787,816	8,893,918	8,876,423	8,754,268	8,749,708	8,747,072
Enrollment/4	2,154,522	2,235,562	2,236,184	2,212,208	2,196,954	2,223,479	2,219,106	2,188,567	2,187,427	2,186,768
Participation Rate	1.35%	1.42%	1.53%	1.63%	1.77%	1.86%	2.10%	2.26%	2.51%	2.61%

Source: The College Board and US Census Bureau.

For the overlapping period for which data are available at all levels (PSI, New Jersey, and the United States), we observe that participation rates are consistently and substantially higher among the PSI schools than New Jersey and the United States overall.

Figure 2.6: Comparison of PSI, NJ, and US Student Participation Rates, AP Physics, 2012-2014



Source: The College Board, US Census Bureau, and NJDOE.

As demonstrated in the figure above, PSI students consistently outperform New Jersey and U.S. students in terms of participation rates. This finding is especially true for minority and female students; for these subgroups, PSI students are more than five times as likely to participate in the AP exam as students throughout New Jersey or the United States.

Figure 2.7: AP Physics B Participation Rate Comparison – PSI Schools vs New Jersey and United States

Multiple Times Better

SUBGROUP	PSI SCHOOLS Vs	
	New Jersey	United States
Overall	4.4	5.4
Black/African American	8.7	10.8
Hispanic	6.3	7.4
Female	5.6	7.0
Male	3.7	4.6

Figures 2.8 to 2.10 present the participation rate ratio for PSI schools, New Jersey, and the United States overall. For the overlapping period for which data are available at all levels (PSI, New Jersey, and the United States), we observe that participation rate ratio is generally lower among the PSI schools than New Jersey and the United States overall.

Figure 2.8: PSI School Student Participation Rate Ratios for Traditionally Underrepresented Groups, AP Physics B, 2012-2014 (Where Equity Between Groups = 1)

Year	2012	2013	2014
Black/African American	2.30	2.23	1.90
Hispanic	1.42	2.13	1.57
Female	0.92	1.34	1.16

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.

Figure 2.9: 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.

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.

PASSING RATE TRENDS

AP PHYSICS B EXAMS

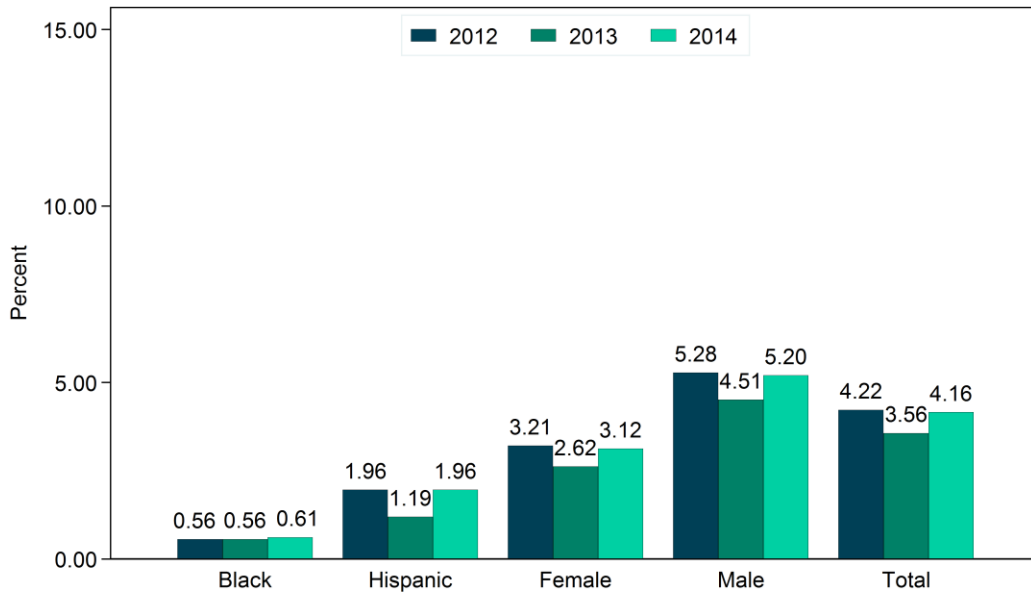
The figures below illustrate trends in PSI school passing rates among all students and by subgroup. Similar to participation rates, these figures demonstrate that the percentage of Grade 9-12 students enrolled at PSI schools who passed the AP Physics B exam has fluctuated over the time period observed. Further, these PSI schools witnessed similar trends among key student subgroups, including black/African American, Hispanic, female, and male students, and by grade level.

Figure 2.11: PSI School Student Pass Rates, AP Physics, 2012-2014

YEAR	2012	2013	2014
All Students			
# Passing	116	136	146
Grade 9-12 Enrollment	10,988	15,268	14,044
Enrollment/4	2,747	3,817	3,511
Pass Rate	4.22%	3.56%	4.16%
Black/African American			
# Passing	7	9	7
Grade 9-12 Enrollment	5,025	6,424	4,565
Enrollment/4	1,256	1,606	1,141
Pass Rate	0.56%	0.56%	0.61%
Hispanic			
# Passing	17	17	31
Grade 9-12 Enrollment	3,470	5,692	6,328
Enrollment/4	868	1,423	1,582
Pass Rate	1.96%	1.19%	1.96%
Female			
# Passing	45	50	55
Grade 9-12 Enrollment	5,607	7,641	7,045
Enrollment/4	1,402	1,910	1,761
Pass Rate	3.21%	2.62%	3.12%
Male			
# Passing	71	86	91
Grade 9-12 Enrollment	5,381	7,627	6,999
Enrollment/4	1,345	1,907	1,750
Pass Rate	5.28%	4.51%	5.20%

Source: NJDOE.

Figure 2.12: PSI School Student Pass Rates, AP Physics, 2012-2014



Source: NJDOE.

Figure 2.13: PSI School Student Pass Rates by Grade Level, AP Physics, 2012-2014

YEAR	2012	2013	2014
Grade 9			
# Passing	8	12	20
Grade 9 Enrollment	3,275.5	3,900.0	4,043.5
Pass Rate	0.24%	0.31%	0.49%
Grade 10			
# Passing	82	92	98
Grade 10 Enrollment	2,568.0	4,081.0	3,471.5
Pass Rate	3.19%	2.25%	2.82%
Grade 11			
# Passing	8	7	12
Grade 11 Enrollment	2,425.5	3,394.5	3,370.0
Pass Rate	0.33%	0.21%	0.36%
Grade 12			
# Passing	18	23	12
Grade 12 Enrollment	2,467.0	3,671.0	2,866.5
Pass Rate	0.73%	0.63%	0.42%

The next two figures provide AP Physics B pass rates for New Jersey and the United States more broadly. Pass rates at both levels have generally risen from 2005 to 2014, overall and for each subgroup examined. A notable exception is the dip in the percent (and number) of black/African American students passing the AP Physics B exam in New Jersey from 2013 to 2014, although for African Americans too, the overall trend remains positive.

Figure 2.14: New Jersey Student Pass Rates, AP Physics, 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%
Male										
# Passing	772	850	876	978	1029	940	1089	1244	1426	1419
Grade 9-12 Enrollment	260,510	256,078	262,093	253,540	253,380	250,979	252,348	250,767	254,115	249,654
Enrollment/4	65,127	64,020	65,523	63,385	63,345	62,745	63,087	62,691	63,529	62,413
Pass Rate	1.19%	1.33%	1.34%	1.54%	1.62%	1.50%	1.73%	1.98%	2.24%	2.27%

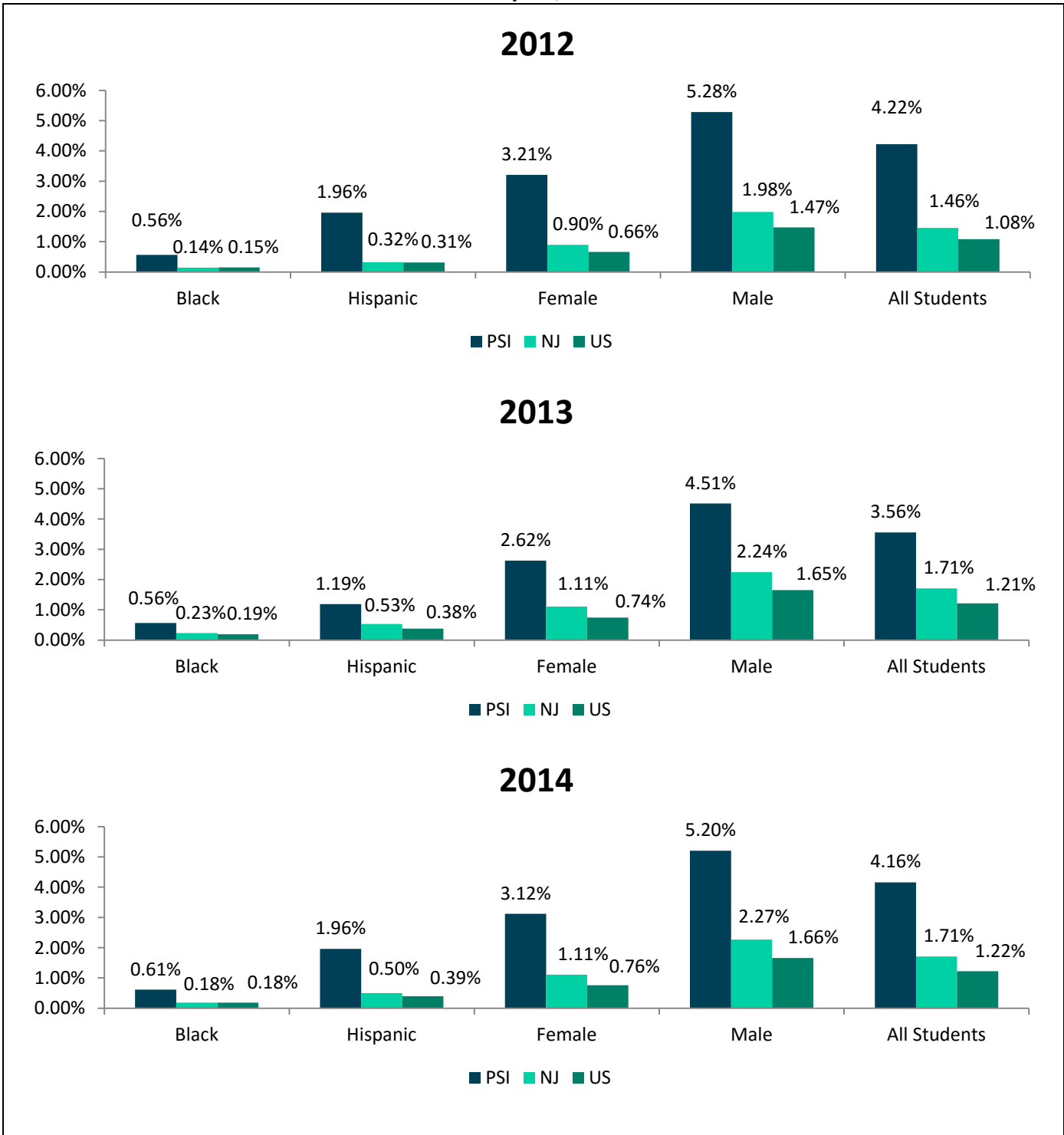
Source: The College Board and US Census Bureau.

Figure 2.15: US Student Pass Rates, AP Physics, 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%
Male										
# Passing	18944	20473	21966	23190	25112	26161	30344	32166	36103	36282
Grade 9-12 Enrollment	8,618,088	8,942,247	8,944,738	8,848,832	8,787,816	8,893,918	8,876,423	8,754,268	8,749,708	8,747,072
Enrollment/4	2,154,522	2,235,562	2,236,184	2,212,208	2,196,954	2,223,479	2,219,106	2,188,567	2,187,427	2,186,768
Pass Rate	0.88%	0.92%	0.98%	1.05%	1.14%	1.18%	1.37%	1.47%	1.65%	1.66%

Source: The College Board and US Census Bureau.

Figure 2.16: Comparison of PSI, NJ, and US Student Pass Rates, AP Physics, 2012-2014



Source: The College Board, US Census Bureau, and NJDOE.

As demonstrated in the figure above, PSI students consistently outperform New Jersey and U.S. students in terms of passing rates. This finding is especially true for minority students; for these subgroups, PSI students are more than three times as likely to pass the AP exam as students throughout New Jersey or the United States.

Figure 2.17: AP Physics B Performance Rate Comparison – PSI Schools vs New Jersey and United States
Multiple Times Better

SUBGROUP	PSI SCHOOLS Vs	
	New Jersey	United States
Overall	3.4	2.4
Black/African American	3.4	3.4
Hispanic	5.0	3.9
Female	4.1	2.8
Male	3.1	2.3

For the overlapping period for which data are available at all levels (PSI, New Jersey, and the United States), we observe that the passing rate ratio of Grade 9-12 students for female students is consistently lower among the PSI schools than New Jersey and the United States overall. Pass rate ratio of black/African American students among the PSI schools is higher than New Jersey and the United States, except the dip in the pass rate ratio of black/African American students in New Jersey from 2013 to 2014

Figure 2.18: New Jersey Student Pass Rate Ratios for Traditionally Underrepresented Groups, AP Physics B, 2012-2014 (Where Equity Between Groups = 1)

Year	2012	2013	2014
Black/African American	13.06	10.26	9.62
Hispanic	2.69	4.18	3.04
Female	1.64	1.72	1.67

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.

Figure 2.19: 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.

Figure 2.20: 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.

SCORE COMPARISONS

Finally, we examine mean scores among test-takers. We note, however, that this analysis should be interpreted with caution. AP exam takers among public school districts are typically those students who are performing the highest within a given subject. To that end, there is an inherent selection bias in AP exam participation that in turn predicts higher scores among those students already excelling in a given subject. By contrast, CTL’s PSI program is designed to prepare and encourage *all students* to take the AP Physics B exam. This issue of selection bias among public schools and districts may account for some of the variation in mean scores observed in this analysis.

As the figures below illustrate, the differences in scores between students in PSI schools and both New Jersey and the United States are statistically significant, with PSI students achieving lower scores in each comparison. Notably, however, the observed difference in scores between students in both sets of comparisons is decreasing, indicating that the gap in scores is closing over time.

Figure 2.21: Comparison of Mean Scores, PSI versus New Jersey, AP Physics, 2012-2014

GROUP	2012	2013	2014
PSI School Students	1.96	2.17	2.24
New Jersey Students	3.07	3.11	3.10
Difference	1.10*	0.94*	0.86*

*Differences are statistically significant at the 99% confidence level (p<0.01).

Source: NJDOE and The College Board.

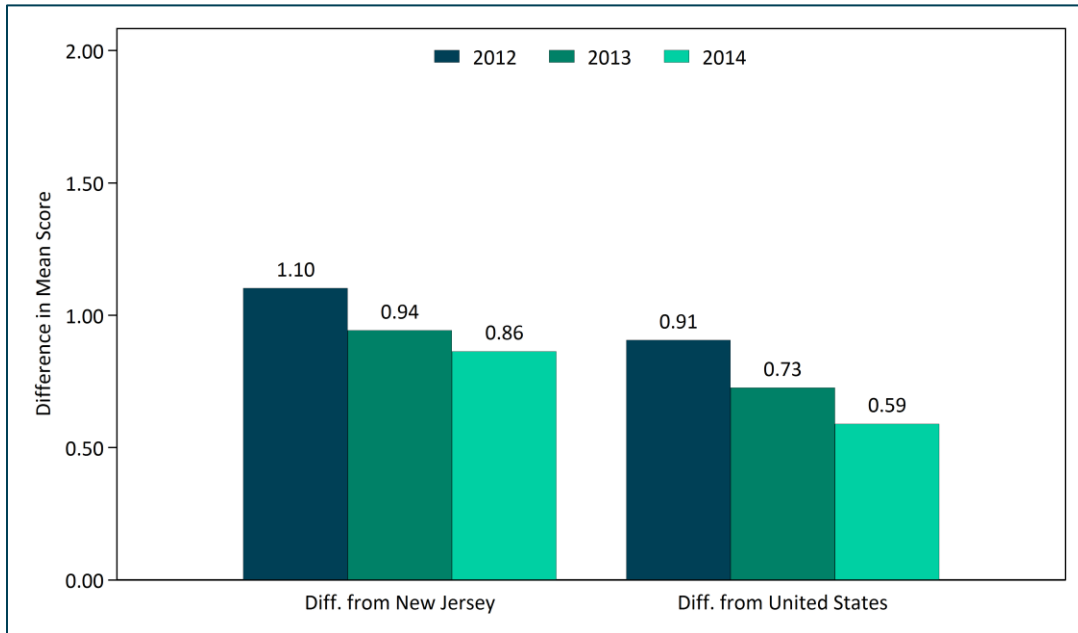
Figure 2.22: Comparison of Mean Scores, PSI versus United States, AP Physics, 2012-2014

GROUP	2012	2013	2014
PSI School Students	1.96	2.17	2.24
US Students	2.87	2.89	2.83
Difference	0.91*	0.73*	0.59*

*Differences are statistically significant at the 99% confidence level (p<0.01).

Source: NJDOE and The College Board.

Figure 2.23: Difference in Mean Scores, PSI versus NJ and US, AP Physics, 2012-2014



Source: NJDOE and The College Board.

APPENDIX

Figure A.1: PSI School List by Year

	2012	2013	2014
American History High School (Newark)		X	X
Arts High School (Newark)	X	X	X
Barringer High School (Newark)		X	
Bergen County Technical High School (Teterboro)	X	X	X
Bergenfield High School (Bergenfield)	X	X	X
Central High School (Newark)		X	
East Orange STEM Academy High School (East Orange)			X
Eastside High School (Paterson)	X	X	X
High School Government And Public Administration (Paterson)		X	X
High School Of Culinary Arts/Hospitality/Tourism @ JFK (Paterson)	X	X	
Irvington High School (Irvington)	X	X	X
James J Ferris High School (Jersey City)	X	X	X
Liberty High School (Jersey City)	X		X
Malcolm X Shabazz High School (Newark)	X	X	X
McNair Academic High School (Jersey City)	X	X	X
Orange High School (Orange)		X	X
Perth Amboy High School (Perth Amboy)			X
Technology High School (Newark)	X	X	X
Weequahic High School (Newark)	X	X	
West Side High School (Newark)	X	X	
William L Dickinson High School (Jersey City)		X	X
Total	13	18	16

Note: "X" indicates that the corresponding school was presented in the corresponding year in the PSI school data "AP_PSI_data_2015_2014_2013_2012" in the corresponding year.

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