A Review of Student Achievement and Participation Trends in Howard County Public Schools

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Executive Summary

Overview of Project

On July 1, 2012, Renee Foose began as superintendent of Howard County Public Schools System (HCPSS). Superintendent Foose retained the Center for Education Policy Research (CEPR) at Harvard University to conduct an independent analysis of HCPSS student achievement data to better understand recent trends in student achievement and gaps in achievement among students served by the school system. The superintendent indicated that the achievement of students from low-income families—those receiving free and reduced-price meals services (FARMS)—was of particular concern.

The Howard County Public Schools System serves approximately 50,000 students in 82 schools. In the last 20 years, student enrollment has grown by over 70% (Figure 1), and the demographic composition of HCPSS students has also changed (Figure 2 and Figure 3). In 1991 a large majority of the students in the district were White (79%). By 2007–08, White students made up 53% of students in the district.[1] In terms of economic diversity, almost 20% of students were eligible to receive subsidized lunch in the 2011–12 school year, an increase from just 4.5% in 1991 (Howard County Public School System, 2011). In just the last five years, from 2007–08 to 2011–12, the number of FARMS students increased by more than 50%.

These changing demographics are spread across the district as whole and evident in most individual schools. As shown in Figure 4, over the last five years the percentage of FARMS students has increased in almost every school at every level across the district. This underscores the importance of ensuring that schools and teachers clearly understand the existing achievement patterns of all of their students and develop strategies for closing achievement and attainment gaps for groups in danger of falling behind.

This report focuses on three primary questions.

- First, what have been the recent patterns in student achievement in HCPSS on the Maryland State Assessments (MSAs)? How have these patterns varied by student characteristics such as race/ethnicity and receipt of free and reduced-price meals services? In addition to overall trends in student achievement across all groups, we examine trends in achievement gaps between groups and differences across schools.

[1] We compare the racial/ethnic composition of the school district in 2007–08 to the composition in 1991 because race coding in the data was comparable between these two years. The race and ethnic classification codes changed in 2010–11.

- Second, what are the participation and passing rates on the High School Assessments (HSAs) and Advanced Placement (AP) exams in HCPSS? Are there gaps between groups and across schools?
- Finally, how has participation in gifted and talented (G/T) courses changed over time, and does it vary across groups?

Data Used

In our analysis of student achievement, we rely primarily on academic performance as measured by the MSA exams taken by students in Grades 3 through 8. We focus on these data because the test scores associated with these exams are comparable over time. In addition, these data are consistently available for a large majority of students, and results are not sensitive to students dropping out, unlike test results at the high school level.

Because we are interested in recent trends, we restrict our examination of trends in mathematics and reading MSA performance to the five most recent years of data, from 2007–08 to 2011–12. We utilize data only for students taking unmodified assessments. Across the years examined, this includes approximately 98% of all students in the tested grades.

We present most MSA trends in scale scores. The assessments are linked such that they are comparable over the time period of our investigation within each subject and grade (Maryland State Department of Education, 2012b). For several analyses, we model growth over time across grades. Because the MSAs are not vertically equated, for these analyses we standardize the scaled scores within subject, grade, and year, so that the average score is 0 and the standard deviation is 1. The change from year to year in analyses that use standardized scores represents a student's changing placement in the distribution of scores in their grade level, measured in standard deviation units.

In our analysis of college readiness, we focus on participation and academic performance as measured by end-of-course exams required for graduation (the HSAs) and by exams of college-level rigor (AP exams). The majority of these exams are taken in high school, but some students take the HSAs for the first time in middle school. For some of the analyses, we focus on individual classes. For example, the class of 2012 comprises students who first started ninth grade in 2008–09 (excluding ninth-grade repeaters). If these first-time ninth graders graduated on time, they graduated at the end of the 2011–12 school year. For the purposes of our analyses, the class of 2012 includes first-time ninth graders from 2008–09 who graduated on time in the spring of 2012, who dropped out, and who are still enrolled in HCPSS in the fall of 2012.

Finally, we also explore participation in gifted and talented coursework in elementary and middle schools over time. We focus on participation rates, the process for first-time placement (eligible by testing or review process), and participation rate gaps.

All of our analyses report results for aggregate groups, not individual students. We do not report results for any group that includes fewer than 20 students. Because the race codes changed in 2010–11, we use the most current race code for all students.

These analyses are descriptive only, and we do not attempt to make causal inferences. While they provide information about achievement and participation trends, they do not provide information about *why* these trends occur. The analyses presented in this paper are not intended to illuminate the efficacy of any particular policy or set of policies used by HCPSS in recent years.

Key Findings

- MSA achievement gaps
    - Grade-level average performance in mathematics and in reading has improved consistently over the past five years and the gains have been larger than those experienced by the rest of the state of Maryland.
    - While student averages are generally improving, there are large and persistent achievement gaps between student groups.

- HSA participation and performance gaps
    - An increased proportion of all students are taking the algebra/data analysis HSA in earlier grades across all student groups.
    - The timing of when HSAs are taken is, not surprisingly, related to achievement. However, there are also differences in timing by student group unrelated to achievement.

- Advanced Placement participation and performance gaps
    - Participation on Advanced Placement exams for FARMS students lags behind non-FARMS students even after controlling for eighth-grade math MSA achievement. However, FARMS students who do take an AP exam are just as likely to pass as non-FARMS students who take the exam.
    - In contrast, there is no difference in AP participation or pass rates between White or Asian students and African American or Latino students after controlling for prior achievement. That is, the gap in AP participation appears to be driven by academic preparation in elementary and middle school.

- Gifted and talented course participation
    - There are large discrepancies in the proportion of students from different groups placed into G/T classes. These discrepancies are closely related to prior student performance on the third-grade math and reading MSAs.

1. Maryland School Assessment (MSA) Achievement Trends and Gaps in HCPSS

Methodology

Data

We utilize HCPSS student-level performance on MSAs in mathematics and reading in Grades 3 through 8 to assess patterns and trends in student achievement in the district. Because we focus on recent trends, we use the five most recent years of student test data. These data are comparable over time within subject and grade. In these years, approximately 98% of all students took unmodified assessments; thus, the results are representative of nearly all students in the district in the grades covered by these exams.

Measuring group performance and achievement gaps: two test score metrics

When assessing gaps in achievement between groups and trends in those gaps over time, the test score metric used to report outcomes matters a great deal. To illustrate this point, Figure 5 shows the distribution of student performance on the Grade 5 mathematics MSA in 2011–12 by FARMS status. In looking at Figure 5, we observe that on average FARMS students score lower than their non-FARMS counterparts. However, many FARMS students have test scores that are significantly higher than the average of non-FARMS students, and many non-FARMS students have scores that are significantly lower than the average of FARMS average. In other words, there is a substantial overlap in the two distributions. What types of measures should we use to summarize achievement in each of these two groups of students and the gaps in achievement between them? Here, we consider two different metrics and why they may lead to different conclusions about achievement gap trends.

The first metric is simply the scale score mean, i.e., the average of all scores for students in a given group. We illustrate average scores for the FARMS and non-FARMS students included in the distributions in Figure 5. We observe that in the 2011–12 school year, FARMS students, on average, earned a score of 419 on the Grade 5 mathematics MSA whereas non-FARMS students earned a score of 457. This constitutes a difference of nearly one standard deviation in average performance across groups.[2]

A second metric, one emphasized in the No Child Left Behind Act, is the percentage of students scoring above a certain cutoff score on a given assessment. As an example, advanced proficiency is defined as the share of students meeting the advanced proficiency cutoff score on the continuous distribution of student performance on a given assessment. Building from the

[2] The standard deviation for Grade 5 math scale scores in 2011–12 is 39. The standard deviation is a measure that describes the amount of variation there is in the data.

distributions of test scores presented in Figure 5, we overlay in Figure 6 the proficiency standards for the Grade 5 mathematics MSA. In Figure 6 we observe that 55% of non-FARMS fifth graders fell above the advanced proficiency threshold in 2011–12 while only 16% of FARMS students did.

When considering achievement gap trends the choice of metric matters. In Figure 7, we again present the test score distributions from Figure 5 and, in a second panel, add analogous test score distributions for the cohort of Grade 5 students four years prior. The gap in achievement between FARMS and non-FARMS students in school year 2007–08 was 38 scale score points. Over the next four years, the average performance of both groups improved by 12 scale score points. Thus, the average scale score achievement gap between FARMS and non-FARMS students remained unchanged over the five years. Therefore, despite the improvement exhibited by both groups, based on average scale score, we would conclude that the "gap" between FARMS and non-FARMS students remained constant.

However, if we focus only on the percentage of students achieving advanced proficiency, the results are different. In 2007–08, 11% of FARMS students reached advanced proficiency. By 2011–12, this figure was up to 16%, an improvement of 5 percentage points. For non-FARMS students, the analogous figures are 44% in 2007–08 and 55% in 2011–12, for an improvement of 11 percentage points. Therefore, if we use only percent achieving "advanced proficiency," it would appear that the achievement gap between FARMS and non-FARMS students is growing. This apparent growth, however, is simply a function of the fact that a greater share of non-FARMS students had test scores near the advanced proficiency cutoff at the beginning of the period. Indeed, if we looked at proficiency rates as opposed to advanced proficiency rates, it would appear as if the achievement gap shrank over this time period (Figure 8).

Percentage proficient or percentage advanced proficient, as metrics, allow us to gauge the extent to which students meet a specified level of knowledge and skill in a given subject area. If the cutoffs used are educationally meaningful benchmarks, this could be an important metric. However, the well-known variance in the relative difficulty of proficiency cutoffs across states and the often arbitrary process for setting proficiency cutoffs (Koretz, 2009) suggest using such metrics with caution. In addition, the percentage proficient approach ignores any improvement students make below or above the cutoff and is misleading about conveying information about groups' relative changes in performance over time. We have illustrated through this discussion that even when test scores for FARMS and non-FARMS students improve at similar rates, proficiency rate gaps may increase or decrease. We therefore recommend using proficiency rate measures with caution and considering both average score and proficiency rates when assessing gaps in academic achievement.

Overall Trends in District Performance

Grade-level average performance in mathematics and in reading has improved consistently over the past five years. [3] Figure 9 shows HCPSS grade-level average trends on the MSA in mathematics. Over this five-year period, increases in average performance range from an 18 scale score point increase in Grade 3 to a 5 scale score point increase in Grade 8. These increases range from 0.13 to 0.46 of a standard deviation.[4] Trends in reading are also improving but generally not at the same pace as in math (Figure 10).

Using percentage of students achieving advanced proficiency in reading and mathematics as an additional metric for district improvement, we again observe positive improvements over time. As we show in Figure 11, in the five most recent years, the percentage of students achieving advanced proficiency in mathematics has increased across grades.[5] Increases in the early grades have been greater. For instance, the advanced proficiency rate in mathematics for Grade 3 has improved by 22 percentage points on average. The proficiency rate in reading has also improved across almost all grades (Figure 12).[6]

Taken together, overall district performance appears to have trended positively over the past several years. The gains have been larger than those experienced by the rest of the state of Maryland (Appendix 2). As these overall measures may mask important differences between groups, we turn next to comparing trends between groups.

Achievement Gap Trends

The first objective in the superintendent's entry plan is to "ensure a world class education for every child" (Foose, 2012). To monitor progress towards this objective, one must know not only how the district as a whole is performing, but also how different groups of students are faring.

In this section we look beyond overall trends in achievement to consider whether all student groups are achieving at the same levels. As discussed above, depending on the metric utilized, conclusions about the extent to which gaps in achievement are narrowing or growing over time may differ. Therefore, we present results using two metrics: average scale score and percentage advanced proficient. The district has made some progress in decreasing scale score gaps in achievement. However, as explained above, this will not necessarily translate into a

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[3] Sample sizes for average test score by grade and year are available in Appendix 1.

[4] The increases in standard deviation units are as follows: Grade 3=0.46, Grade 4=0.39; Grade 5=0.22, Grade 6=0.21, Grade 7=0.22, and Grade 8=0.13.

[5] Improvements from 2007–08 to 2011–12 are statistically significant at $p < .05$ for all grades.

[6] Improvements from 2007–08 to 2011–12 are statistically significant at $p < .05$ for all grades except for Grade 6.

narrowing of the gap in advanced proficiency rates for many years to come. In addition, the existing gaps between groups remain large and educationally meaningful.

Figure 13 shows the trend in math MSA average scale scores by FARMS status and grade.[7] Here we observe that while the average score of both groups is improving, there is a large and persistent achievement gap between the two groups. On the fifth-grade math MSA, the size of this gap is 38 scale score points in 2012, which is approximately one standard deviation unit. To give a sense of the size of this difference, one standard deviation is the difference between fifth-grade students at the 50th and 84th percentiles in math achievement.[8]

While gaps in average scale score achievement have remained relatively constant, we observe that gaps based on percentage of students achieving advanced proficiency have increased over this period. We illustrate trends in advanced proficiency rates on the math MSA for FARMS and non-FARMS students in Figure 14.[9] In Grade 5, we observe that while non-FARMS students improved their advanced proficiency rate by 11 percentage points, from 44% to 55%, FARMS students realized a less substantial improvement of 5 percentage points, from 11% to 16%.

In Figure 15, we sort each group by test score and divide each group into ten equal size subgroups which we call “achievement deciles.” Figure 15 plots the average test scores for each decile by group.[10] In other words, we compare the average test scores of the top 10% of FARMS students to the average test scores of the top 10% of non-FARMS students, of the next 10% of FARMS students to the next 10% of non-FARMS students, and so on. We see significant differences in performance across each decile. In Figure 16, we map these gaps to see if the gaps across deciles changed between 2009–10 and 2011–12. They did not.

As we summarize in Figure 17, gaps between groups on the fifth-grade math MSA are different depending on metric. The largest achievement gaps, regardless of metric, are between African American and Asian students. Gaps in scale score points between all subgroups have not changed significantly between 2009–10 and 2011–12, except for Hispanic and White students, for whom the gap decreased.[11] In contrast, we observe gaps increasing based on the share of students meeting advanced proficiency standards between FARMS and non-FARMS students, between African American and Asian students, and between African American and

[7] See Appendix 3 for the trends in reading MSA average scale scores by FARMS status and grade. See Appendix 4 for the trends in math MSA average scale scores for White and African American students by grade.
[8] Approximately 34% of students on a normal distribution fall between the mean plus one standard deviation.
[9] See Appendix 5 for the trends in advanced proficiency rates on the reading MSA.
[10] Deciles are ten groups of equal size.
[11] Statistical significance is calculated at the $p < .05$ level.

White students. We also note that the increasing gaps in scale score points and percentage advanced proficient for English Language Learners (ELL) versus non-ELL students, although these gaps are not statistically significant. We will investigate this further later in this report. While we highlight Grade 5 math results, there are some patterns that are similar across Grades 3 through 8 in math (Appendix 6) and reading (Appendix 7).

One final analysis in this section investigated achievement gaps in individual schools. One potential reason for differences in achievement gaps across schools in Grades 3, 4, and 5 might be that schools with a high percentage of FARMS students may be more focused on the instructional needs of this population. To test this, we examine the relationship between percentage of FARMS students and the achievement gap in each school in 2012 in Figure 18. We see no clear relationship. Each point represents a school grade level, and each school's grade-level location in the plot is determined by the percentage of FARMS students (on the x-axis) and the average gap between FARMS and non-FARMS students (on the y-axis). Based on the placement of points, we conclude that student composition does not appear to explain within-school test score gaps at all. That is, school grade levels with relatively high percentages of FARMS students show the same size of achievement gaps as school grade levels with relatively low percentages of FARMS students.

Cohort Trends in District Performance

The trend analyses that we have discussed thus far examine trends across successive cohorts of students. We now turn to test score changes for a fixed group of students in order to focus on how performance gaps change over time within HCPSS as students progress through the system. Here, we focus on the comparison of growth between FARMS students and their non-FARMS counterparts.

There is substantial evidence from prior research that students from poor families often enter school substantially behind their peers in terms of skills that are considered precursors for later academic success, such as the number of letters known at kindergarten entry (see, for instance, Stipek & Ryan, 1997). A critical question is whether the school system helps to close or increase these gaps over time. To examine relative growth over time, presented in Figure 19, we divided students in Grade 3 into four quartiles based on performance on the 2007–08 math MSA assessment. Students in the top quartile are the highest-achieving 25% of students within their grade, and students in the bottom quartile are the lowest-achieving 25% of students within their grade in 2007–08. Then, within each quartile, we examine students' relative growth (or "academic change") scores based on their performance on the mathematics MSA in the following four years. We restrict our sample to those students who remained in HCPSS from Grade 3 through Grade 7 and who were not retained in grade during this period, so we are likely understating the gap growth.[12] We utilize standardized scale scores as the metric of analysis in order to compare relative performance across grades.

Figure 19 reveals that, even among FARMS and non-FARMS students who performed similarly at the end of the third grade, over time these students diverge in their assessment results. Within each of the four quartiles of third-grade performance, FARMS and non-FARMS students have similar average scale scores in Grade 3, but by Grade 7 a gap of 0.22 to 0.55 standard deviations has developed. These differences are statistically significant across all test score quartiles. We translate the extent of this divergence for top quartile students and find that FARMS students who had test scores similar to non-FARMS students in Grade 3 have fallen behind by nearly 0.55 standard deviations by the end of Grade 7. A difference of 0.55 standard deviations in seventh grade is the equivalent of a difference of 20 scale score points.[13] Appendix 8 presents similar figures comparing other demographic groups.

While this figure illustrates that FARMS students are not keeping pace relative to their non-FARMS counterparts, we remind the reader that these results do not answer why these patterns exist. One possibility relates to differences in the schools that FARMS and non-FARMS students attend and the educational opportunities they receive. Another relates to time out of school and summer "learning loss" (see, for instance, Alexander, Entwisle, & Olson, 2007). That is, time out of school may be less enriching for FARMS students, and FARMS students may experience a particular detriment in the summer months. A third possibility is that this trend is a function of the test itself if, for example, different levels of background knowledge become more important in test performance as students get older. While we do not know why, it is clear that test performance for FARMS and non-FARMS students diverges over time.

ELL Classification

There appears to be increasing gaps between ELL and non-ELL student performance on the MSAs between 2009–10 and 2011–12 across the elementary and middle school grades, although the growth in these gaps are not statistically significant because of the relatively small numbers of ELL students. A challenge when investigating these gaps is that the ELL category itself is not stable. Individual student classifications change from year to year as students are reclassified as fluent. As a result, gap changes may be the result of changing reclassification policies and rates.

[12] Note that there was differential attrition such that, of those students starting Grade 3 in 2007–08, 92% of non-FARMS students remained enrolled through Grade 7 and were not retained in grade during this time period versus only 79% of FARMS students.

[13] The standard deviation for Grade 7 math scale scores in 2011–12 is 37.

Figure 20 tracks the percentage of students classified as ELL for the 2007–08 through 2009–10 kindergarten cohorts. These cohorts are restricted to those students who enter HCPSS by kindergarten and remain in HCPSS during the time period studied. As the figure illustrates, each successive cohort has been reclassifying students at faster rates. This provides suggestive evidence that increased gaps between ELL and non-ELL students over the last five years may be the result of changing reclassification policies. Indeed, those students who remained classified as ELL have lower performance relative to their grade-level peers in 2011–12 as compared to 2007–08, which would be consistent with changing the bar for reclassification (Figure 21).[14] In contrast, Figure 22 tracks the percentage of students classified as ELL for the 2007–08 through 2009–10 third-grade cohorts. These cohorts are restricted to those students who are in third grade in their respective cohort year and remain in HCPSS during the time period studied. The pattern is less clear in this figure. The contrast between Figure 20 and Figure 22 suggests that changes in reclassification practices may have been concentrated in the early elementary grades.

2. High School Assessment (HSA) Participation and Achievement Gaps in HCPSS

The class of 2009 was the first class for which passing the HSAs was a graduation requirement. Students in Maryland must pass three or four HSAs in order to graduate, depending on their year of graduation. The end-of-course exams that were consistently required for graduation during the time period studied are algebra/data analysis, English 2, and biology. The government HSA was offered to students entering ninth grade in 2005–06, 2006–07, and 2007–08. It was reinstated as a graduation requirement for entering ninth graders in 2013–14 and after (MSDE, 2012a).

To date, 26 states have exit exams, and eight of those states have linked their exams to college-readiness standards (McIntosh, 2012). Maryland is one of those states, so HSA course-level exams are meant to assess whether a student is on a trajectory to be ready for work and college at the end of 12th grade. Because they are specifically linked to goals beyond high school, understanding participation and achievement gaps in HSA passage rates is critical to ensuring students leave high school with the skills necessary for success as adults.

Methodology

Data

We utilize HCPSS student-level performance on the HSAs in algebra/data analysis, biology, and English 2 to assess recent patterns and trends in student participation and

[14] ELL students' performance and non-ELL students' performance are not directly comparable because ELL students do not take all parts of the reading MSA exam in third grade.

achievement in the district.[15] We focus on timing for the algebra/data analysis HSA and participation and passing rates for all three exams. The English 2 and biology HSAs are generally taken later than the algebra/data analysis HSA. Students commonly take the English 2 and biology HSA exams in Grade 10 and the algebra/data analysis HSA in middle school. In fact, about nine tenths of high school students take the English 2 HSA exam in Grade 10, and about two thirds take the biology HSA exams in Grade 10. Approximately one half of high school students take the algebra/data analysis HSA for the first time before entering high school.

For some of the analyses, we focus on an individual graduating class. For example, the class of 2012 comprises students who first started ninth grade in fall 2008 and, if they graduated on time, graduated in spring 2012. We consider all cohort members of the class of 2012, including students who dropped out or were still enrolled in HCPSS after four years. We also include HSA tests that cohort members may have taken before high school to ensure that we capture all HSA test taking. While not all students end up taking all exams, either because they did not enroll in the HSA-related course or they dropped out of high school, participation rates in HCPSS are very high.

Differences with published participation and passing rates

Our data is restricted to HSA exams that take place during a student's time within the district. This underestimates HSA participation because some students who transferred into the district may have taken the exams before arriving. Maryland also allows students to complete course-specific projects for assessments that they are not able to pass after repeated attempts through the Bridge Plan for Academic Validation.[16] The passing rates we report do not include this alternative method of passing. Our analyses cover the path most HCPSS students take to "pass" all of their HSA exams, which is simply to receive a passing score on HSA exams.

Timing of First Algebra/Data Analysis HSA Exam

Figure 23 displays the grade in which members of the classes of 2011 through 2013 first took the algebra/data analysis HSA in the district. More students are taking the HSA in middle school in each successive graduating class. While 21% of the class of 2011 took the algebra/data analysis HSA test by Grade 7, 26% of the class of 2013 had taken the exam by the end of Grade 7. The majority of students (54%) in the class of 2013 took the algebra/data analysis HSA for the first time in middle school.

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[15] The government HSA was also offered for a portion of the time period studied. In order to look at trends over time, we will focus on the other three HSAs, which did not have changes in administration during this time period.

[16] Students can substitute course-specific Advanced Placement or International Baccalaureate exams for specific HSAs also, provided they get high enough scores. However, less than 1% of the 2009 ninth-grade cohort passed an AP exam and did not pass all three HSAs.

However, this pattern does not hold across groups. Figure 24 displays the grade in which students first take the math HSA exam by graduating class and whether the student participates in the FARMS program.[17] The graph shows that students from low-income families first take the algebra/data analysis exam, on average, later than students who are not from low-income families. Whereas 54% of all non-FARMS students in the class of 2011 had taken the algebra/data analysis HSA exam by the end of Grade 8, only 20% of FARMS students had done the same. Also, the move towards taking the exam for the first time earlier has been quicker for non-FARMS students. For the class of 2013, 61% of non-FARMS students took the exam for the first time in middle school as compared to 24% of FARMS students.[18]

Because timing of test taking is related to a student's readiness for high school math, we examine the timing of taking the test by sixth-grade math performance in Figure 25 for the class of 2014.[19] There are small gaps in the timing of test taking for FARMS and non-FARMS students in the bottom quartile of performance, with larger percentages of non-FARMS students taking the HSA in middle school and at all by the end of 2011–12. There are larger gaps in the timing of test taking for FARMS and non-FARMS students in the top quartile of sixth-grade performance. While 77% of top-performing non-FARMS students take the algebra/data analysis exam for the first time in seventh grade, only 56% of top-performing FARMS students do.[20]

We also examine differences in timing of test taking for the class of 2014 by FARMS status at the school level, focusing on middle schools in Figure 26. We conclude that there is a high degree of correlation between average prior math score and the percentage of students taking the HSA test in middle school. That is, schools whose students on average had higher prior performance generally have higher percentages of students taking the algebra/data analysis exam for the first time in middle school.

Those who take algebra earlier in their school careers have a greater probability of passing the algebra/data analysis HSA (Figure 27). The pass rate drops substantially for students who first take the algebra/data analysis HSA after Grade 9. Note, however, that there are many possible explanations for this trend, including that weaker students delay taking algebra/data analysis HSA until later in their academic careers. The most conclusive pattern we observe is that no matter the grade in which they first take the algebra/data analysis HSA, non-FARMS students pass at higher rates than FARMS students. In Figure 28, we observe the percentage of

[17] See Appendix 9 for the same graph for White and African American students.
[18] The rate of change in the percentage of students taking the algebra/data analysis HSA in middle school from the class of 2011 to the class of 2013 was statistically significant for FARMS and non-FARMS students ($p < .05$).
[19] See Appendix 10 for the same graph for White and African American students.
[20] Top-performing FARMS and non-FARMS students in sixth grade had no significant difference in their average test scores.

middle school students taking and passing the algebra/data analysis HSA based on students' sixth-grade math MSA quartile of performance. Within these quartiles of prior performance, there remain differences between FARMS and non-FARMS students in the percentage of students taking and passing the HSA.

HSA Participation and Passing Rates for All Exams: The Class of 2012

We now examine the performance of groups across all three required HSA exams. Figure 29 shows that there are only small gaps between groups in participation rates but much larger gaps in passing rates on the HSAs for the class of 2012. FARMS students pass all three HSAs at rates significantly lower than non-FARMS students. While 89% or more of both groups take all three HSAs, approximately 91% of non-FARMS students pass all three HSA exams as compared to 61% of FARMS students. As mentioned earlier, these differences do not reflect students who pass HSA exam requirements through bridge plans.

To assess the impact of prior achievement on the participation and passing patterns of FARMS and non-FARMS students in the class of 2012, we compare these rates in a model that controls for student prior achievement. Figure 30 displays the likelihood of students taking and passing the HSAs by FARMS status after controlling for prior eighth-grade performance on the math and reading MSAs. While the difference in likelihood between FARMS and non-FARMS students taking all three exams remains small and not significantly different, there is a large difference in the probabilities that FARMS and non-FARMS students will pass all three exams. At the same level of prior achievement, FARMS students are substantially less likely to pass all of the exams than non-FARMS students (74% vs. 91%).

In Figure 31, we break down the percentage of students in the class of 2012 who take and pass all three HSAs based on students' prior eighth-grade math MSA quartile of performance. Within these quartiles of prior performance, there remain significant differences between FARMS and non-FARMS students in the percentage of students taking and passing the HSA only in the two lowest-performing quartiles of prior performance ($p < .05$). Most strikingly, for those who score in the bottom quartile in eighth-grade math performance, almost three quarters of non-FARMS students pass all three HSAs and a little less than half of FARMS students pass all three HSAs. We see a similar pattern when comparing African American and White students (Appendix 11).

Figure 32 and Figure 33 show participation and passing rates on the HSAs by high school. Given the high rates of participation on the HSAs across all schools in HCPSS, there is little relationship between average eighth-grade math score and school rates of student participation in Figure 32. In contrast, Figure 33 displays more variation in school-level pass rates. This variation appears to be related to students' scores in eighth grade prior to entering high school. In other words, schools whose students enter less prepared have, on average, lower passing rates on all three exams.

School passing rates overall still mask considerable variation in passing rates within school. Figure 34 expands upon the prior figure. We see FARMS and non-FARMS students separated by prior performance and pass rates. Two things jump out from this figure. First, the difference in passing rates between FARMS and non-FARMS students within the same school is often stark. Second, there is wide variation in passing rates for FARMS students across schools—variation that appears only weakly related to incoming student scores. For instance, FARMS students who attend school 7 have passing rates similar to their peers with substantially higher incoming average achievement scores.

3. Advanced Placement (AP) Participation and Achievement Gaps in HCPSS

Academic rigor in high school coursework is related to achievement, the likelihood of graduation, and even students' four-year college graduation rates (Gamoran & Mare, 1989; Adelman, Daniel, & Berkovits, 2003). There is also research suggesting that rigorous coursework is even more important for African American and Hispanic students than White students. Where only 10% of White students who advanced beyond Algebra II received a bachelor's degree, 28% and 19% of African American and Hispanic students who advanced beyond Algebra II received a bachelor's degree (Adelman, 1999). Given the importance of a strong high school curriculum and the fact that not all students have traditionally had access to it, Advanced Placement participation and achievement provides one perspective on the academic rigor students are experiencing in high school and on their preparedness for college-level work.

Howard County has surpassed national and state trends in AP participation and passing rates (Maryland State Department of Education, 2012c). Specifically, AP participation is slightly higher in Howard County than in the rest of the district, with 23% of HCPSS high school students enrolled in any AP course in 2011–12 compared to 21% of high school students from other Maryland counties. Importantly, HCPSS has a higher success rate with those taking AP exams, with 82% of the AP exams taken in HCPSS in 2012 receiving a passing score of 3 or better while only 59% of the exams taken in other Maryland districts received passing scores (Maryland Report Card). However, these overall trends mask differences across students and schools.

Methodology

Data

The analyses below examine HCPSS students' participation in and performance on Advanced Placement exams in all subjects to assess recent patterns and trends. We categorize the many different AP exams into four core subjects: math, English, science, or social studies.

We also include an "other" category for AP exams, such as studio art, which does not fall into these categories.

These analyses focus on the class of 2012, the most recent class to graduate high school. We observe AP course-taking patterns for these students throughout high school and in the last year of middle school. This means that we use testing data from 2007–08 to 2011–12.

Participation and Performance Gaps

Figure 35 shows that 44% of students in the class of 2012 took at least one AP exam. Also, 37% of the class of 2012 passed at least one AP exam. Social studies exams were the most-taken AP exams.[21]

The overall rates for HCPSS, however, mask systematic differences for certain student populations. Asian American students in the class of 2012 far outpaced their peers in AP course taking, with 62% taking at least one exam and 55% taking and passing at least one exam. This is in contrast to low rates of participation for African American and Hispanic students; only 20% of African American students and 33% of Hispanic students take at least one AP exam.

Only 17% of FARMS students take at least one exam as compared to 49% of non-FARMS students. Figure 36 displays the likelihood of students taking and passing at least one Advanced Placement exam by FARMS status after controlling for a student's prior achievement in eighth-grade math MSA.[22] There is a 46% likelihood for a non-FARMS student to take at least one AP at the average prior achievement level as compared to a 41% likelihood for FARMS students. Interestingly, for these students, there is no FARMS gap in the likelihood of taking and passing an AP exam after controlling for prior achievement. So, while participation rates of FARMS students lag behind non-FARMS students, FARMS students who do take an AP exam are just as prepared to pass as non-FARMS students who take the exam.

Schools and Participation and Performance Gaps

School-level averages for prior performance explain some, but not all, of the school-level variation in students' participation in the AP program (Figure 37). For example, there is little difference in the percentage of students taking at least one AP between schools 4, 6, 9, and 12 high schools despite lower incoming academic achievement for students in schools 4 and 9. Similarly, a higher proportion of students take AP exams at school 11 than at school 1, despite having students entering with similar eighth-grade math scores.

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[21] Social studies AP tests include macroeconomics, microeconomics, European history, comparative government and politics, U.S. government and politics, human geography, psychology, U.S. history, and world history. The three most popular are U.S. government and politics, psychology, and world history.

[22] See Appendix 12 for same graph for white and African American students.

Breaking down participation rates for FARMS and non-FARMS students within schools, we see that there is a large divide in prior performance and AP participation rates (Figure 38). Even in schools where FARMS students have similar incoming performance to other schools' non-FARMS students, such as schools 2 and 3, FARMS students' participation rates are substantially lower. The same general school-level patterns hold true for the percentage of students passing one AP exam (Figure 39 and Figure 40).

4. Gifted and Talented (G/T) Course Placement and Participation in HCPSS

The gifted and talented program provides enrichment and acceleration for advanced-level learners in the academic content areas and in the visual and performing arts. Just as struggling students require differentiated instruction, so do high-achieving students. Those who have the ability to achieve at high levels need appropriate opportunities for learning growth. This section examines placement in G/T courses in Howard County and whether and how this varies by demographic group.

Methodology

Data

We focus on the placement of students into G/T content area courses.[23] We use administrative data to establish when a student participated in a G/T course. Placement status is school-year dependent, meaning that G/T status can change for a student from year to year.

G/T course placement occurs for the first time in fourth grade, and the majority of gifted and talented students are placed at this first opportunity. If a student participates in any G/T content course in a given school year, they are flagged as a G/T participant in that school year. This does not include students participating in school-wide enrichment programs only. There are two ways students can be placed into G/T courses: by testing or by review process. We observe the reason a student is first placed into a G/T course for the 2010–11 and 2011–12 school years, so analyses that focus on placement decisions will be limited to only those two years. The rest of the analyses, if not stated otherwise, make use of a four-year window of data (from 2008–09 to 2011–12) that captures participation in at least one G/T class. These analyses focus on elementary and middle school students in Grades 4 through 8. Note that these analyses do not account for students eligible for enrollment in a G/T course whose families chose not to participate.

[23] Students can be placed into G/T for just math or for just English and language arts, for example.

Gifted and Talented Course Participation: Trends over Time

We illustrate trends in gifted and talented course participation by grade in Figure 41. Here, we observe that between one fifth and one third of students in Grades 4 through 8 participate in the G/T courses. There is a general increase in the proportion of students who participate in G/T courses by grade level, suggesting that additional students are added through the elementary and middle school grades, between Grades 4 and 6 particularly, and few students stop participating once they have been begun the program. In 2008–09, 23% of fourth graders participated in a G/T course as compared to almost 35% of sixth graders. Also, there has been a general increase in participation in G/T courses in the elementary grades.

While Figure 41 displays all students who participate in a G/T class by grade, Figure 42 focuses on first-time G/T participation. Most students are identified and start G/T participation in Grade 4. Another approximately 8% of students are identified for the first time in each of Grades 5 and 6, and less than 5% are identified for the first time in each of Grades 7 and 8. Grade 4 also shows the largest increase in the proportion of students identified for the first time between 2008–09 and 2011–12.

To examine the breakdown of first-time G/T placement by school and student demographics, we look first at the percentage of African American or Hispanic students in a school relative to the percentage of African American or Hispanic students in G/T courses. If G/T participation were equally distributed across student groups, we would expect a school with 50% African American or Hispanic students to have 50% of its students participating in the G/T program to be African American or Hispanic.

However, students are identified for G/T participation in part due to their prior academic performance. Given that there are large gaps in student achievement by student groups, correspondingly we should expect gaps in G/T participation. In fact, Figure 43 shows that African American and Hispanic students are underrepresented in fourth-grade first-time placement into G/T courses relative to their proportion in individual schools. This pattern is more pronounced with FARMS students (Figure 44).

Gifted and Talented Course Placement Decisions: Testing Versus Review Process

As Figure 45 illustrates, most students are placed in G/T courses through the HCPSS testing process in Grades 4 and 5. In later grades, a much higher proportion of students are placed through the review process—albeit for a much smaller number of total students placed.

Figure 46 explores differences in placement decisions by FARMS status. This figure shows that the same relative proportions of FARMS and non-FARMS students were placed by testing rather than review process. Overall, though, a far smaller percentage of FARMS students are placed in G/T courses at all. Only 6% of all FARMS students are placed into G/T courses as compared to 31% of all non-FARMS students.

Much of the discrepancy in the proportion of FARMS students versus non-FARMS students whom are placed into G/T classes can be explained by prior student performance on the third-grade math and reading MSA. When we look at placement decisions by FARMS status and average prior math performance in Figure 47, we see that for those placed into G/T through testing, non-FARMS students have slightly higher prior math scores on average. This is reversed for those students placed by review, with FARMS students having slightly higher prior performance as compared to non-FARMS students.

Figure 48 shows that after controlling for prior achievement, non-FARMS students are 4% more likely to be placed into a G/T class than non-FARMS students with the same prior math achievement. [24] This figure suggests that, while there may be some bias against placing high-achieving FARMS students into the gifted program, it is not large. Of much greater concern is the underlying achievement gap between FARMS and non-FARMS students—a gap that guarantees far fewer FARMS students will be identified as gifted through the current identification method.

Conclusion

In summary, while Howard County overall shows very high performance trends in student achievement, there are significant achievement gaps that overall performance trends mask. These gaps are large and of the same magnitude as those seen across the country as a whole (Fryer & Levitt, 2004). As the district continues in its quest to be a world-class school system for all of its students, attending to these achievement and attainment gaps will be critical.

[24] See Appendix 13 for placement of White and African American students controlling for prior achievement.

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Figures

There has been over a 70% percent growth in enrollment in the last two decades in HCPSS.

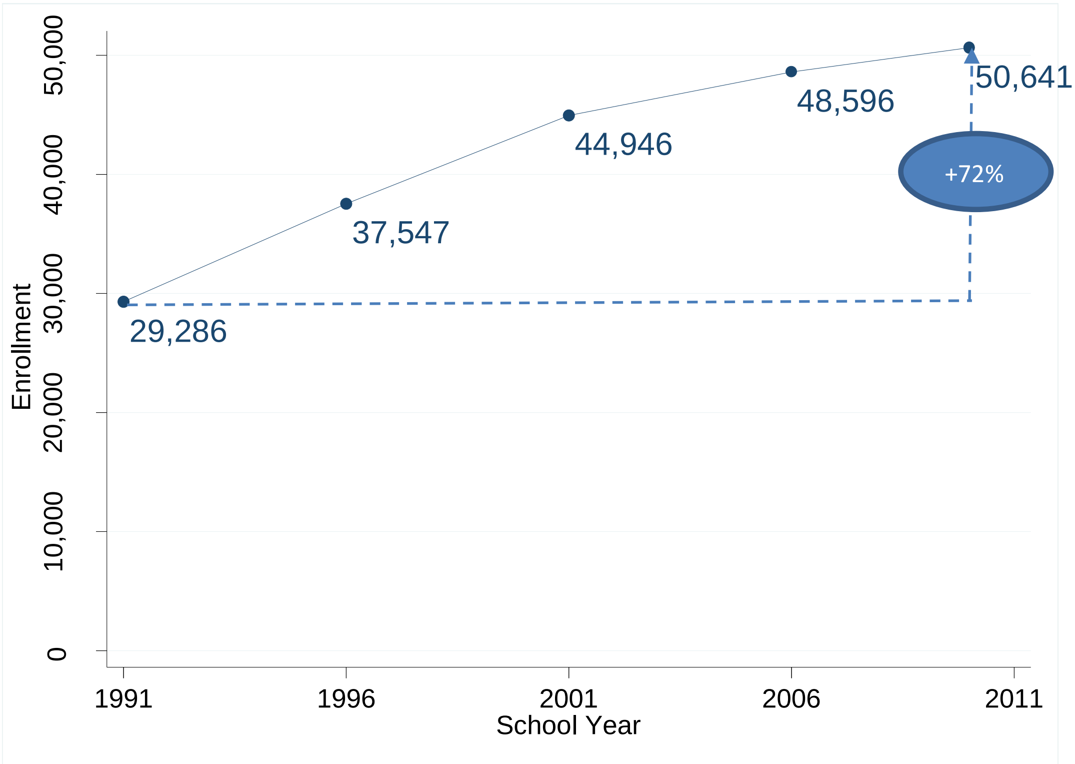


Figure 1. HCPSS enrollment: pre-K through 12th-grade

Note: The percent change from 1990–91 to 2010–2011 is labeled on the graph. Source: National Center for Education Statistics, n.d., 1990–91 v.1a, 1995–96 v.1a, 2000–01 v.1a, 2005–06 v.1a, 2009–10 v.2a.

Racial diversity has increased.

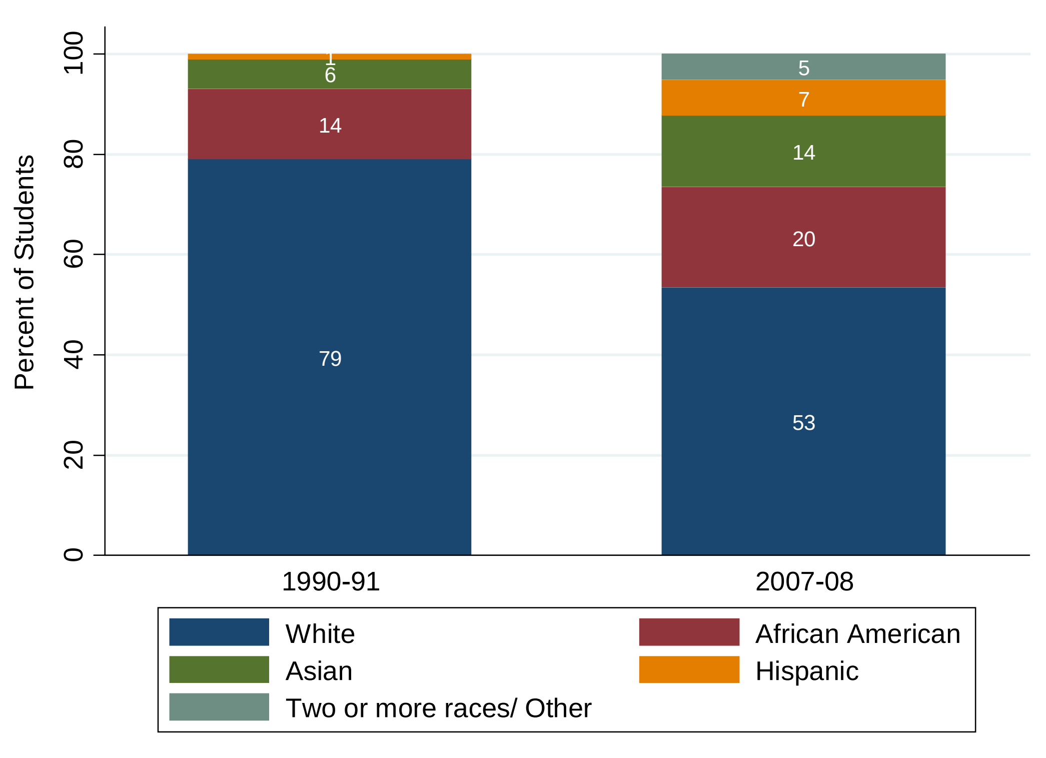


Figure 2. Racial/ethnic composition of K–12 HCPSS students

Sample sizes (total students): 1990–91= 29,286; 2007–08= 51,474.

Economic diversity is also increasing.

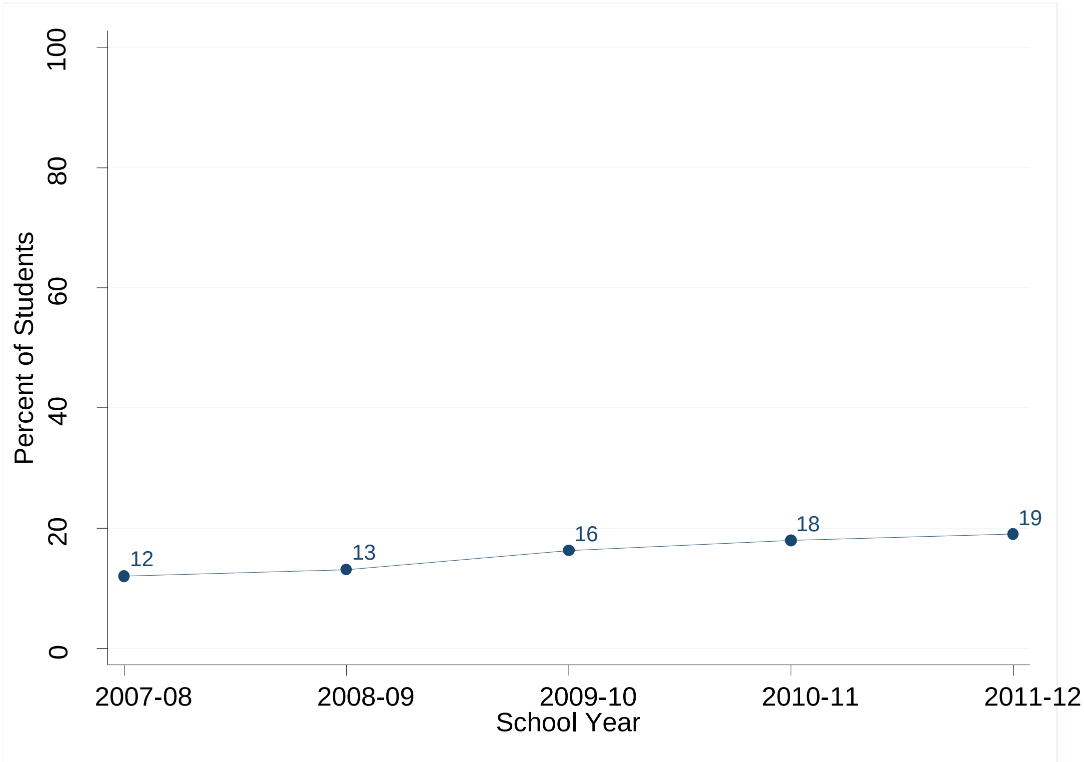


Figure 3. Percentage of free and reduced-price meals services (FARMS) students

Sample sizes (total students): 2007–08= 51,474; 2011–12= 53,332.

Almost all schools have seen an increase in the percentage of FARMS students whom they serve in the last 5 years.

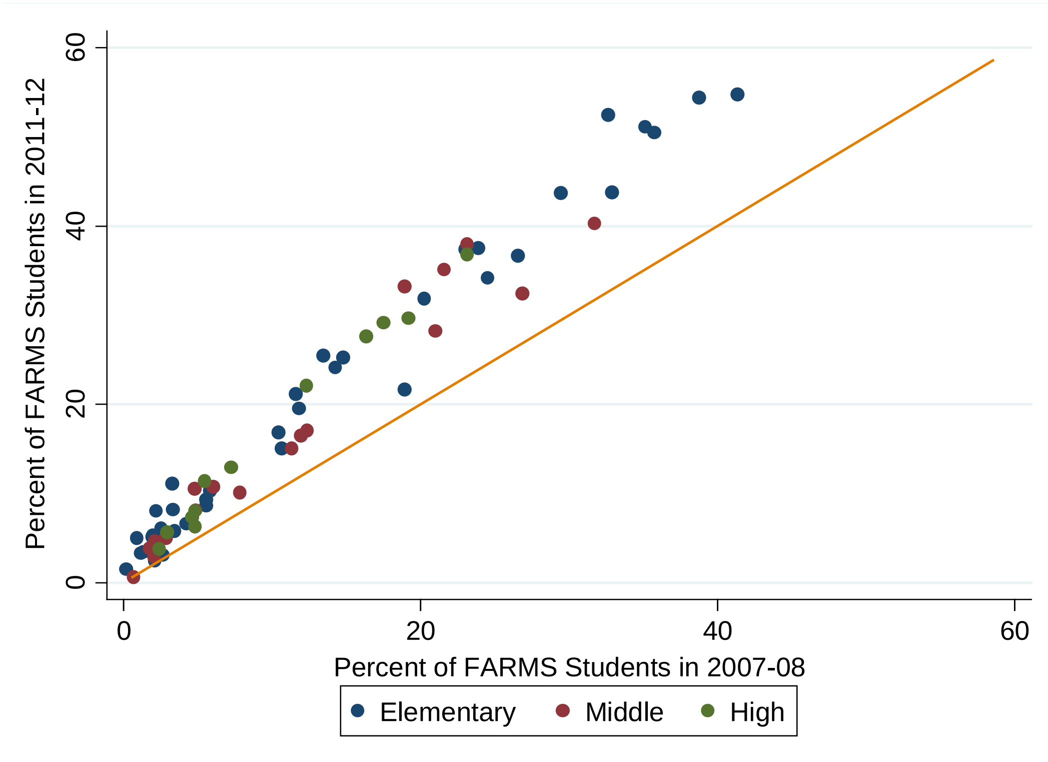


Figure 4. Schools by percentage of FARMS students in 2007–08 and 2011–12

Sample sizes (total students): 2007–08= 51,474; 2011–12= 53,332.

There is a large difference in the average performance of FARMS and non-FARMS students on the fifth-grade math MSA.

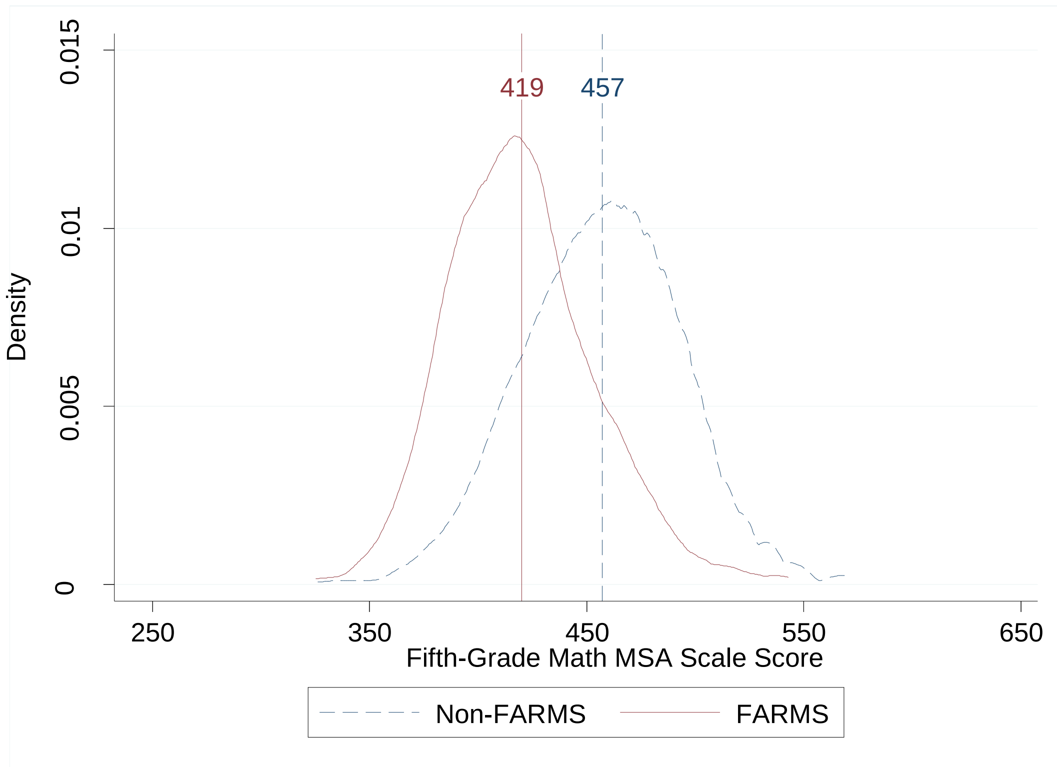


Figure 5. Distribution of performance and average performance on Grade 5 math MSA in 2011-12 by FARMS status

Note: The red distribution shows the performance of FARMS students, and the dashed blue line distribution shows the performance of non-FARMS students. The horizontal (x-axis) represents test scores, and the vertical (y-axis) represents the share of students in each group receiving a given test score. Sample sizes: FARMS students= 706; non-FARMS students= 2,972.

In 2011–12, 55% of non-FARMS students scored at or above the fifth-grade math MSA advanced proficiency cut off as compared to 16% of FARMS students.

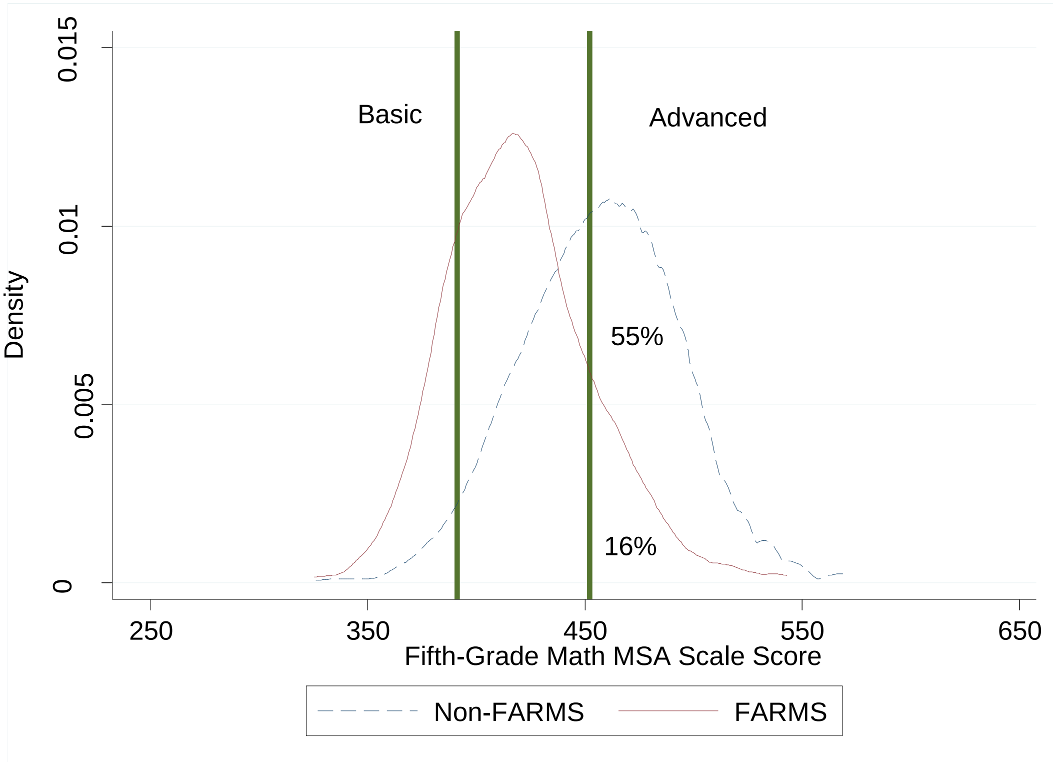
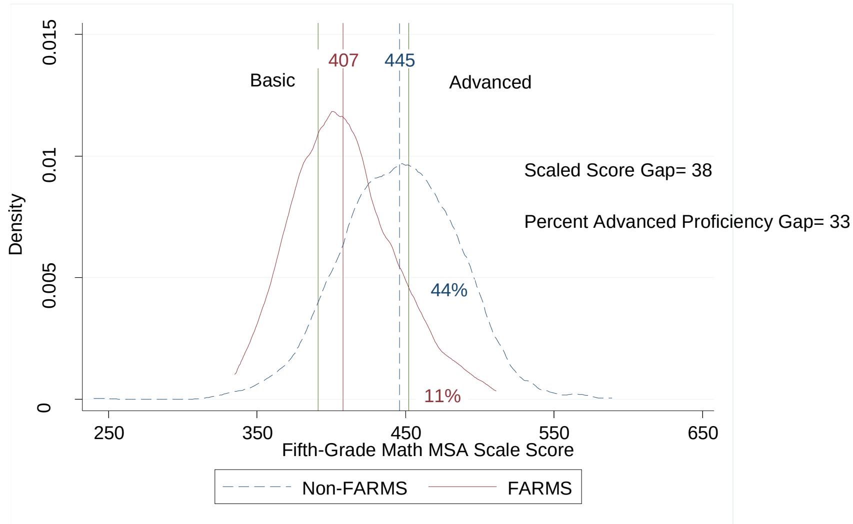


Figure 6. Distribution of performance on Grade 5 math MSA assessment relative to the grade- and subject-level proficiency threshold in 2011–12 by FARMS status

Note: The red distribution shows the performance of FARMS students, and the dashed blue line distribution shows the performance of non-FARMS students. The horizontal (x-axis) represents test scores, and the vertical (y-axis) represents the relative share of students in each group receiving a given test score. The proficiency and advanced proficiency standards are demarcated with the solid vertical green lines. Sample sizes: FARMS students= 706; non-FARMS students= 2,972.

Both FARMS and non-FARMS students have improved at similar rates on fifth-grade math MSA performance from 2007–08 to 2011–12.

2007–08



2010–12

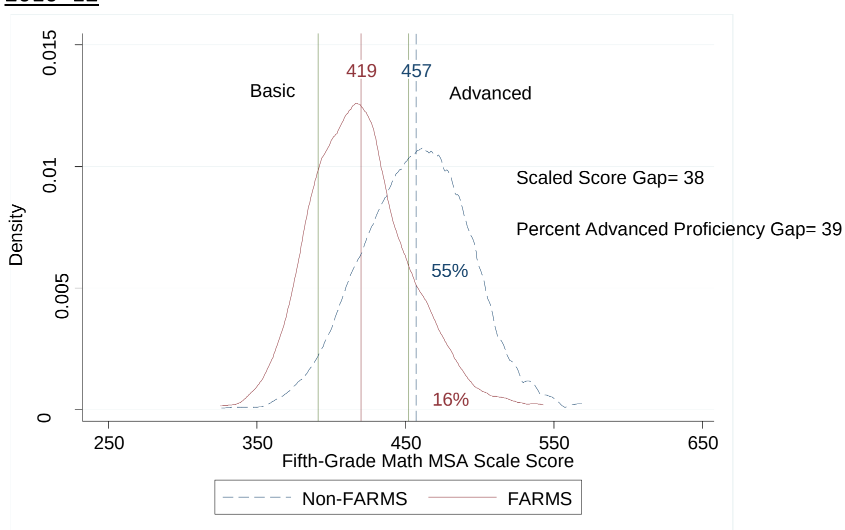


Figure 7. Distribution of performance and average performance on Grade 5 math MSA in 2007–08 (top panel) and 2011–12 (bottom panel) by FARMS status

Note: The red distribution shows the performance of FARMS students, and the dashed blue line distribution shows the performance of non-FARMS students. The horizontal (x-axis) represents test scores, and the vertical (y-axis) represents the relative share of students in each group receiving a given test score. The proficiency and advanced proficiency standards are demarcated with the solid vertical green lines. Sample sizes: FARMS students in 2007**–**08= 476; non-FARMS students in 2007**–0**8= 3,238; FARMS students in 2011–12= 706; non-FARMS students in 2011**–**12= 2,972.

The gap in advanced proficiency rates between FARMS and non-FARMS students grew on the math MSA and the gap in proficiency rates decreased from 2007–08 to 2011–12.

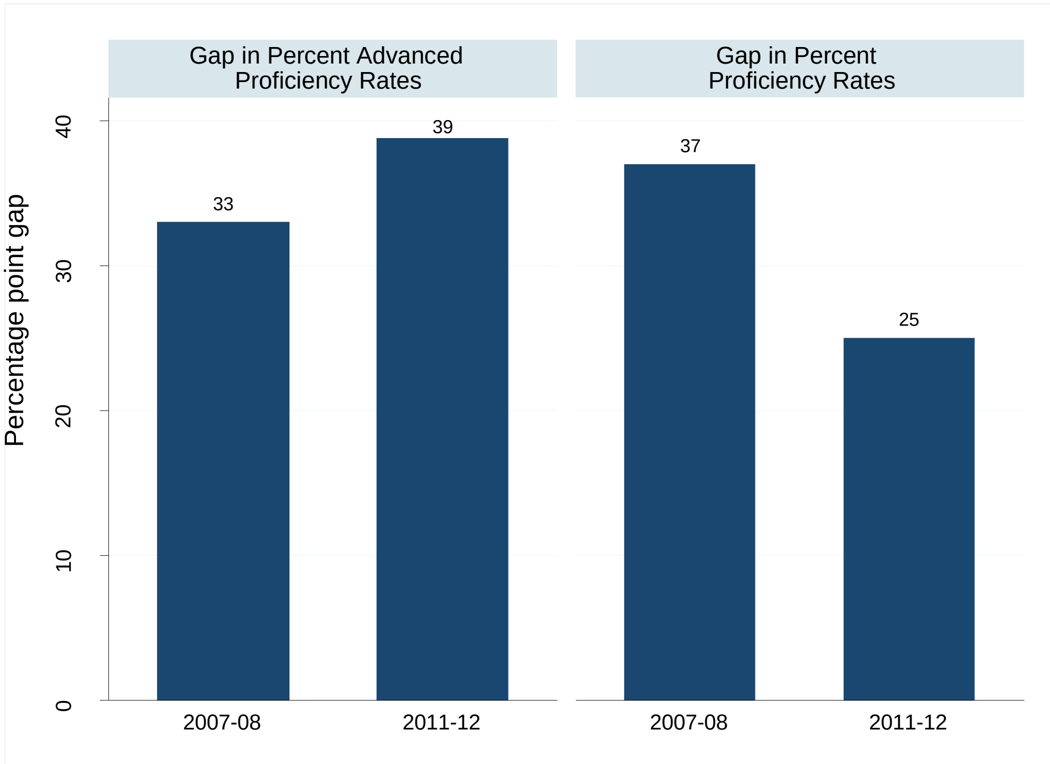


Figure 8. Grade 5 math MSA percentage point gaps in proficiency and advanced proficiency rates between FARMS and non-FARMS students

Note: See Appendix 1 for sample sizes.

Average scaled score performance on the math MSA has improved across Grades 3 through 8.

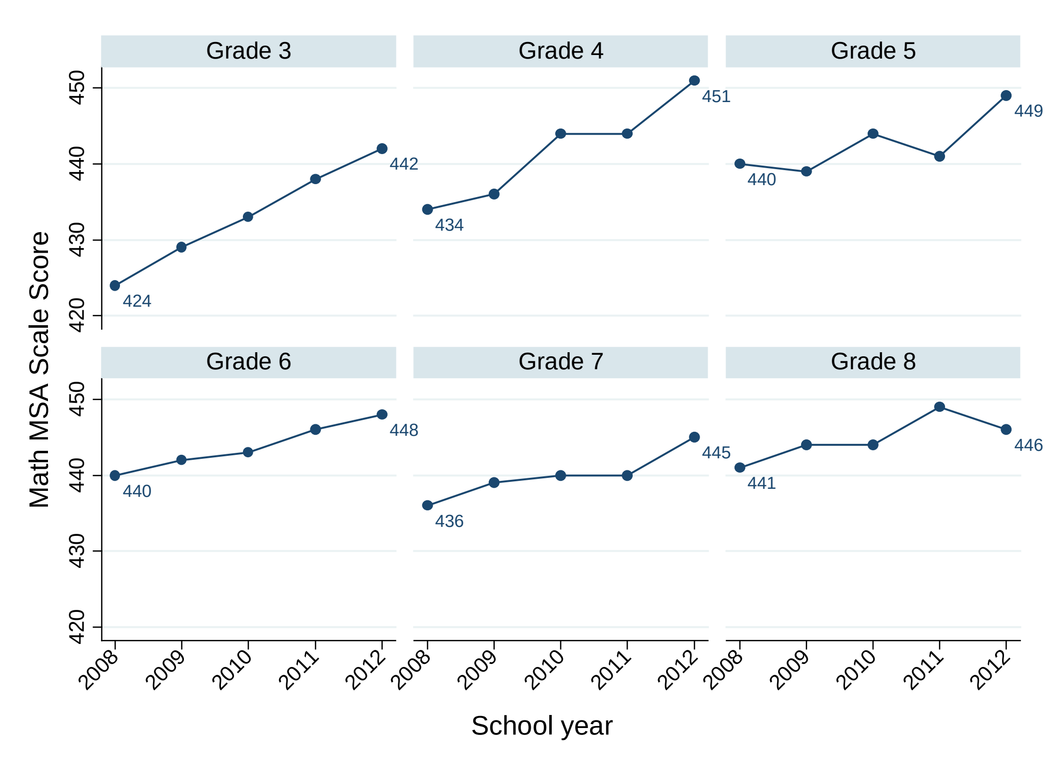


Figure 9. Trends in average math MSA performance (scale scores) by grade level

Note: See Appendix 1 for sample sizes.

Performance on the reading MSA has also improved across Grades 3 through 8.

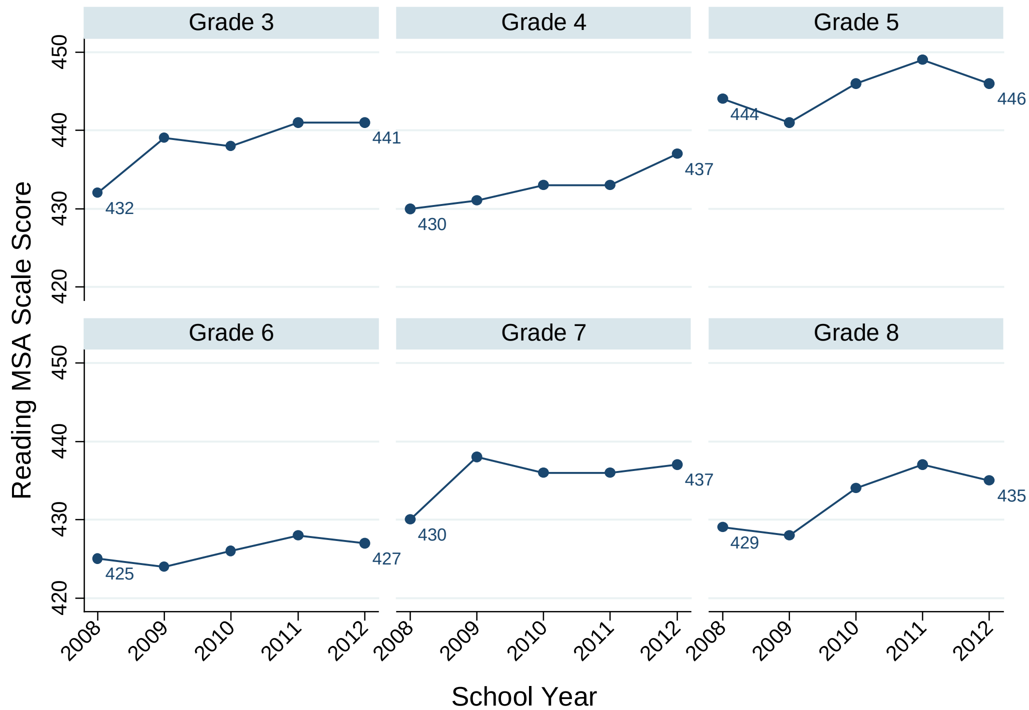


Figure 10. Trends in average reading MSA performance (scale scores) by grade level

Note: See Appendix 1 for sample sizes

The average percentage of students at or above advanced proficiency on the math MSA has improved across grades.

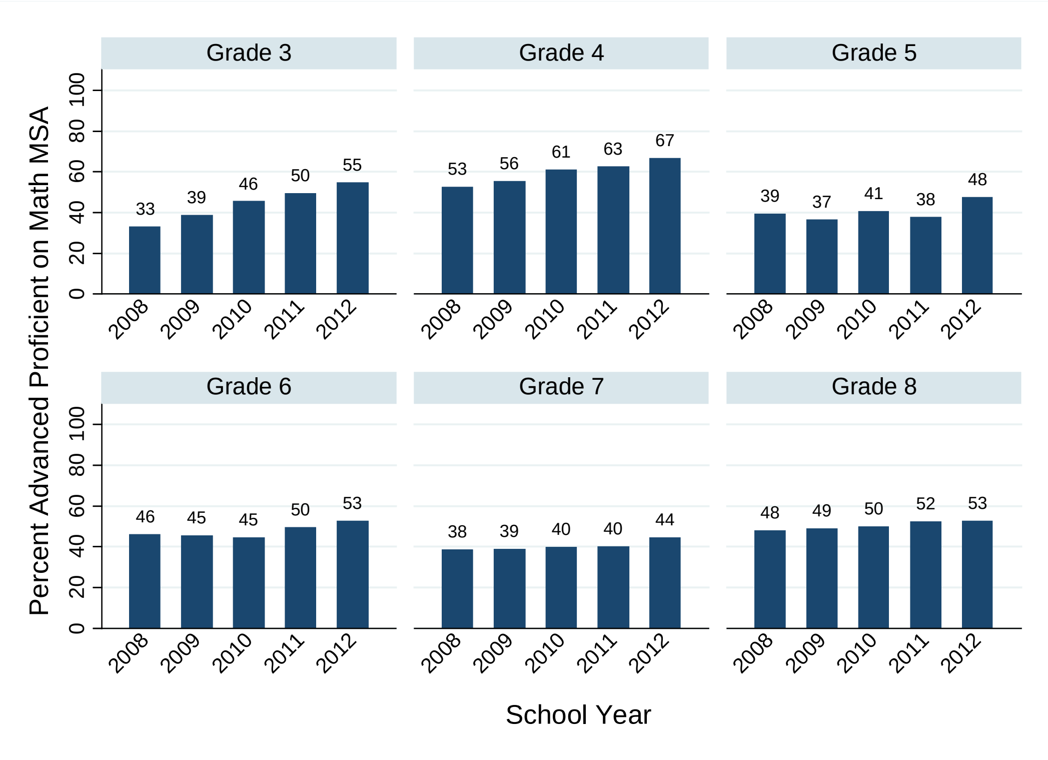


Figure 11. Trends in average math MSA performance (percent advanced proficient) by grade level

Note: See Appendix 1 for sample sizes.

The average percentage of students at or above advanced proficiency on the reading MSA has also improved.

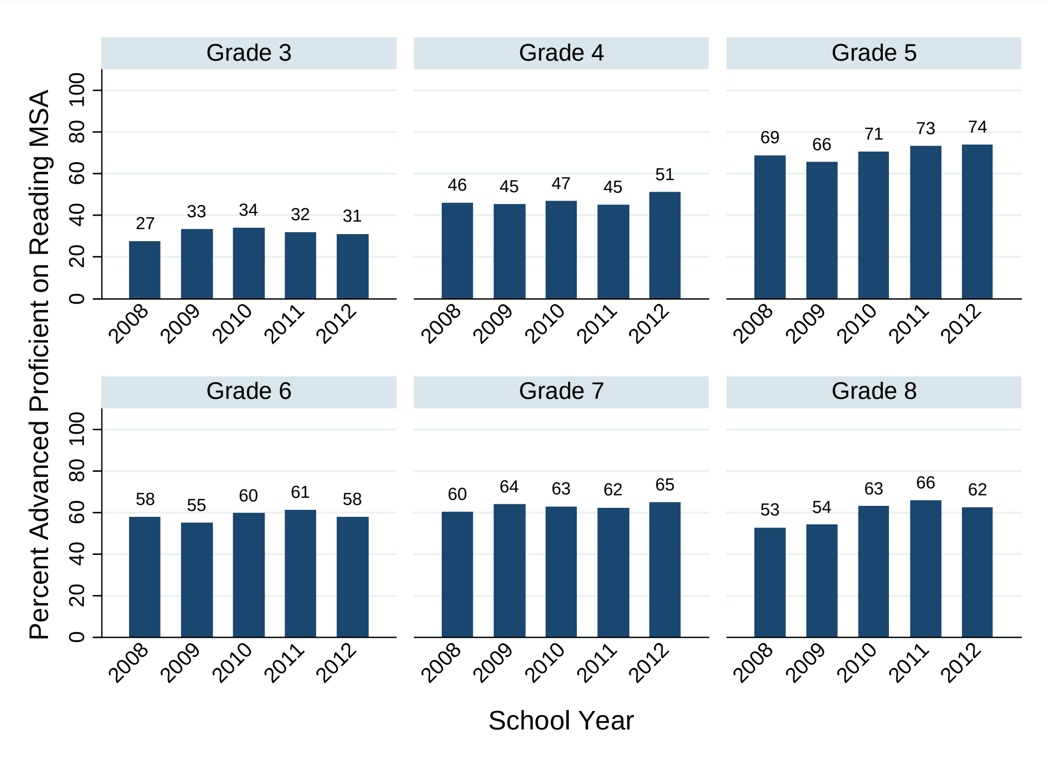


Figure 12. Trends in average reading MSA performance (percent advanced proficient) by grade level

Note: See Appendix 1 for sample sizes.

Average scaled score performance on the math MSA across Grades 3 through 8 has improved for both FARMS and non-FARMS students.

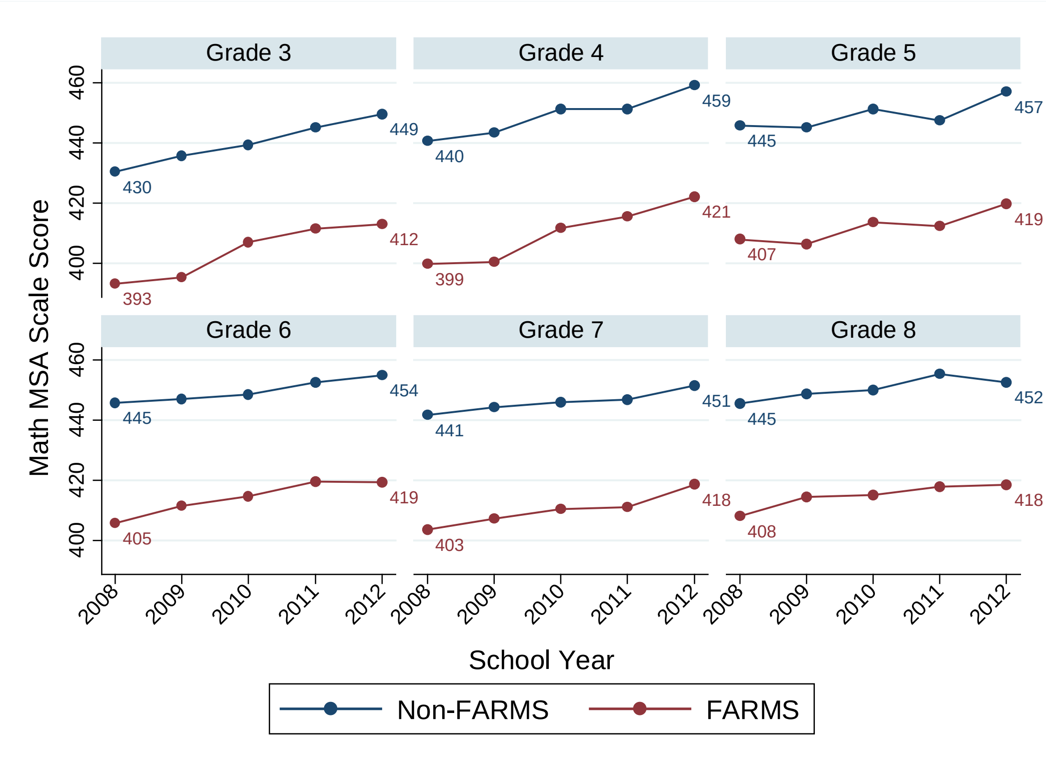


Figure 13. Trend in average math MSA scale score by FARMS status and grade

Note: See Appendix 1 for sample sizes.

The average percentage of students at or above advanced proficiency on the math MSA has improved for both FARMS and non-FARMS students.

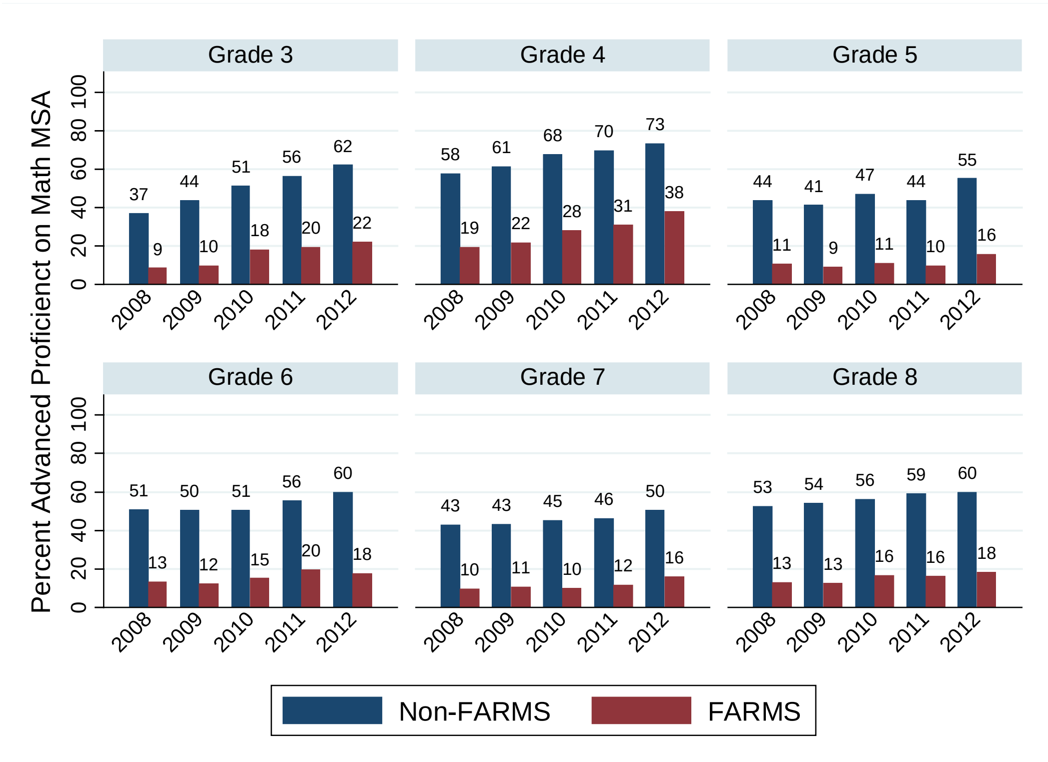


Figure 14. Trend in math MSA advanced proficiency rates by FARMS status and grade

Note: See Appendix 1 for sample sizes.

Across within-group test score deciles, FARMS and non-FARMS students exhibit significantly different performance.

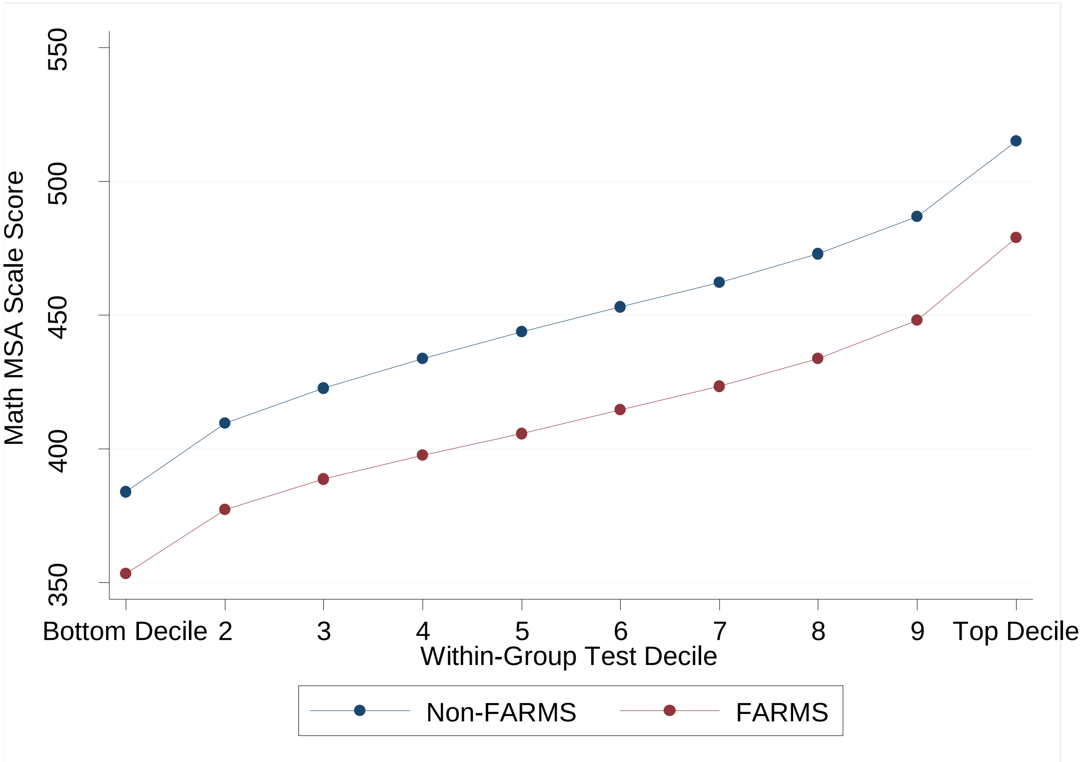


Figure 15. FARMS and non-FARMS Grade 5 math MSA scaled score performance in 2011–12 by within-group test score decile

Sample sizes: FARMS students= 706; non-FARMS students= 2,972.

Between 2009-2010 and 2011–12, these score gaps between FARMS and non-FARMS students changed very little.

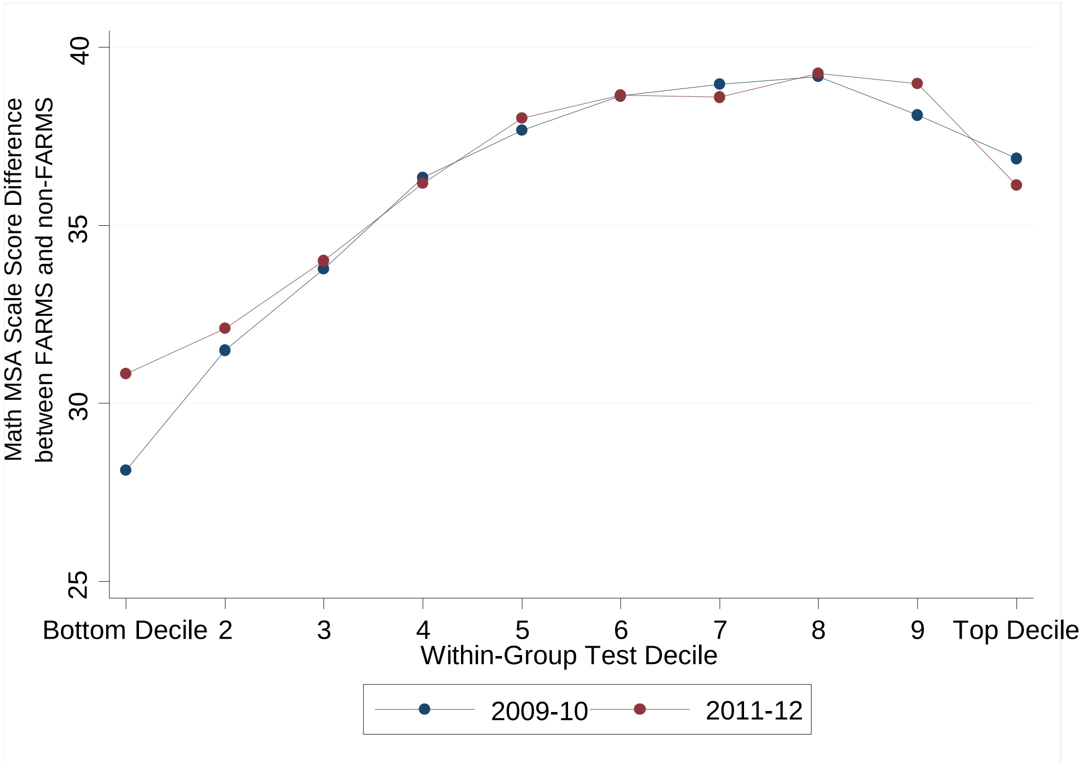


Figure 16. Differences in FARMS and non-FARMS Grade 5 math MSA scaled score performance, by year and within-group test score decile

Note: See Appendix 1 for sample sizes.

Figure 17. Summary of achievement trends based on performance on Grade 5 math MSA assessment

Test score metric	Group	2009–10	2010–11	2011–12	Statistically significant trends*
Scale score	Non-FARMS	451	447	457	↑
	FARMS	414	412	420	↑
	Not ELL	446	442	451	↑
	ELL	411	400	409	↔
	Asian	462	460	469	↑
	White	453	449	457	↑
	Hispanic	426	418	437	↑
	African American	420	417	425	↑
Advanced proficiency rates	Non-FARMS	47%	44%	55%	↑
	FARMS	11%	10%	16%	↑
	Not ELL	42%	39%	48%	↑
	ELL	10%	6%	11%	↔
	Asian	60%	51%	59%	↑
	White	50%	44%	56%	↑
	Hispanic	20%	18%	32%	↑
	African American	15%	12%	21%	↑
Scale score gaps	Farms- non-FARMS	37	35	37	↔
	ELL- non-ELL	35	42	42	↔
	Asian-White	9	11	12	↔
	Asian-Hispanic	36	42	32	↔
	Asian-African American	42	43	44	↔
	White-Hispanic	27	31	20	↓
	White-African American	33	32	32	↔
	Hispanic-African American	6	1	12	↔
Advanced proficiency gaps	Farms- non-FARMS	36%	34%	39%	↑
	ELL- non-ELL	32%	33%	37%	↔
	Asian-White	10%	7%	3%	↔
	Asian-Hispanic	40%	33%	27%	↔
	Asian-African American	45%	39%	38%	↑
	White-Hispanic	30%	26%	24%	↔
	White-African American	35%	32%	35%	↑
	Hispanic-African American	5%	6%	11%	↔

*Based on significance testing the difference between the gap in 2009–10 and 2011–12 at a $p < .05$ significance level.

Note: See Appendix 1 for sample sizes.

There is no relationship between percentage of FARMS students in a school and the size of the FARMS- non-FARMS achievement gap on the math MSA.

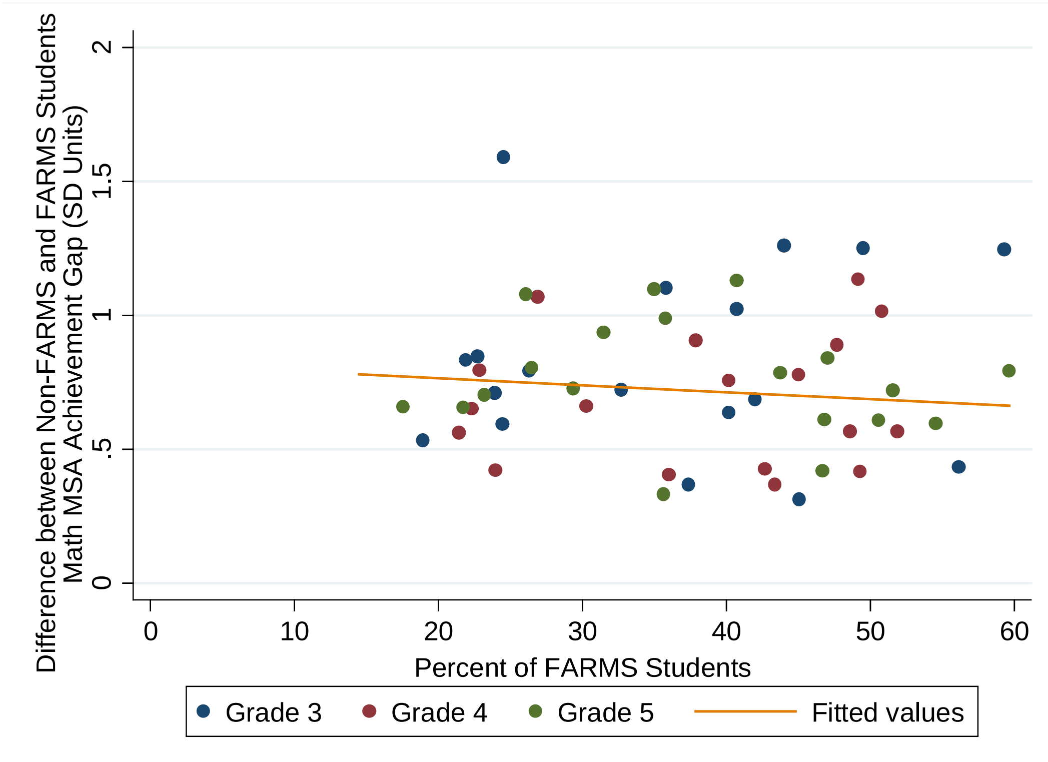


Figure 18. Relationship between the percentage of FARMS students in an elementary school's grade level and achievement gaps between FARMS and non-FARMS students on the math MSA, 2011–12

Note: Each point represents a school grade level, and each school's grade-level location in the plot is determined by the percentage of FARMS students (on the x-axis) and the average gap between FARMS and non-FARMS students (on the y-axis). Results for grades within schools with fewer than 20 FARM or non-FARMS students were suppressed. Sample sizes: Grade 3= 3,769; Grade 4=3,728; Grade 5= 3,678.

Within each of the four quartiles of third-grade performance, FARMS and non-FARMS students have similar average scale scores in Grade 3, but by Grade 7 a gap of 0.22 to 0.55 standard deviations has developed.

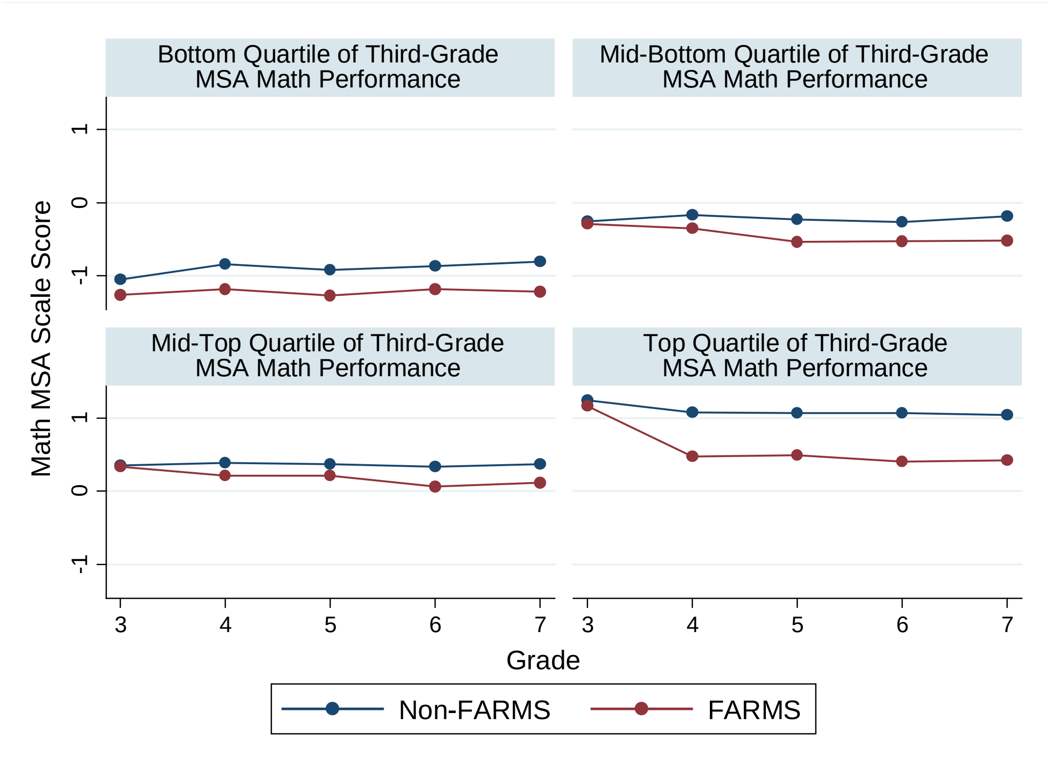


Figure 19. Average scale score trajectory on math MSA for cohort in Grade 3 in 2007–08, by FARMS status and third-grade math MSA quartiles

Notes: Only those students enrolled at HCPSS from third through eighth grade are included. If a student was ever classified as FARMS during this time period, they were considered a FARMS student. Initial performance quartile is based on third-grade performance. Sample sizes: Non-FARMS Q1=325; Non-FARMS Q2= 566; Non-FARMS Q3= 665; Non-FARMS Q4= 689; FARMS Q1=212; FARMS Q2=122; FARMS Q3=66; FARMS Q4=31.

The amount of time students entering school remain classified as ELL has declined.

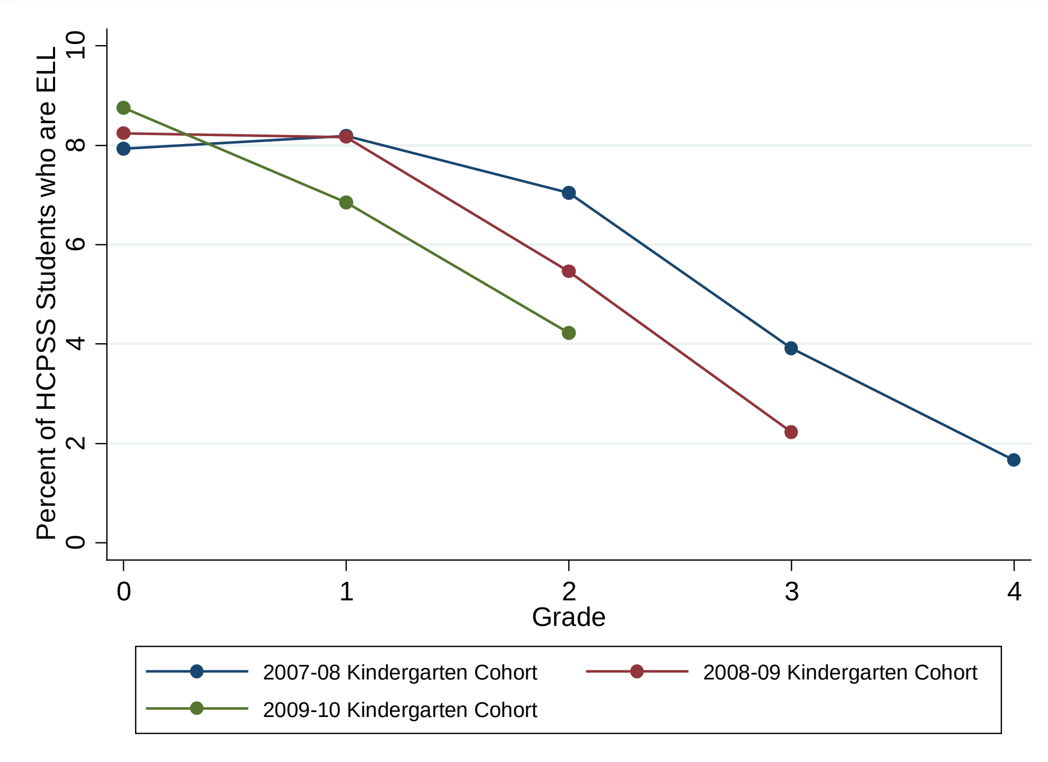


Figure 20. Percentage of students currently classified as ELL by kindergarten cohort

Note: Each cohort consists of students who were in kindergarten at HCPSS and remained at HCPSS through second grade (2009–10 cohort), third grade (2008–09 cohort) and fourth grade (2007–08 cohort) respectively. Sample sizes (total students by kindergarten cohort): 2007–08= 2,710; 2008–09= 2,877; 2009–10= 3,049.

Those students who remained classified as ELL perform at a lower level relative to their grade-level peers in 2011–12 as compared to 2007–08.

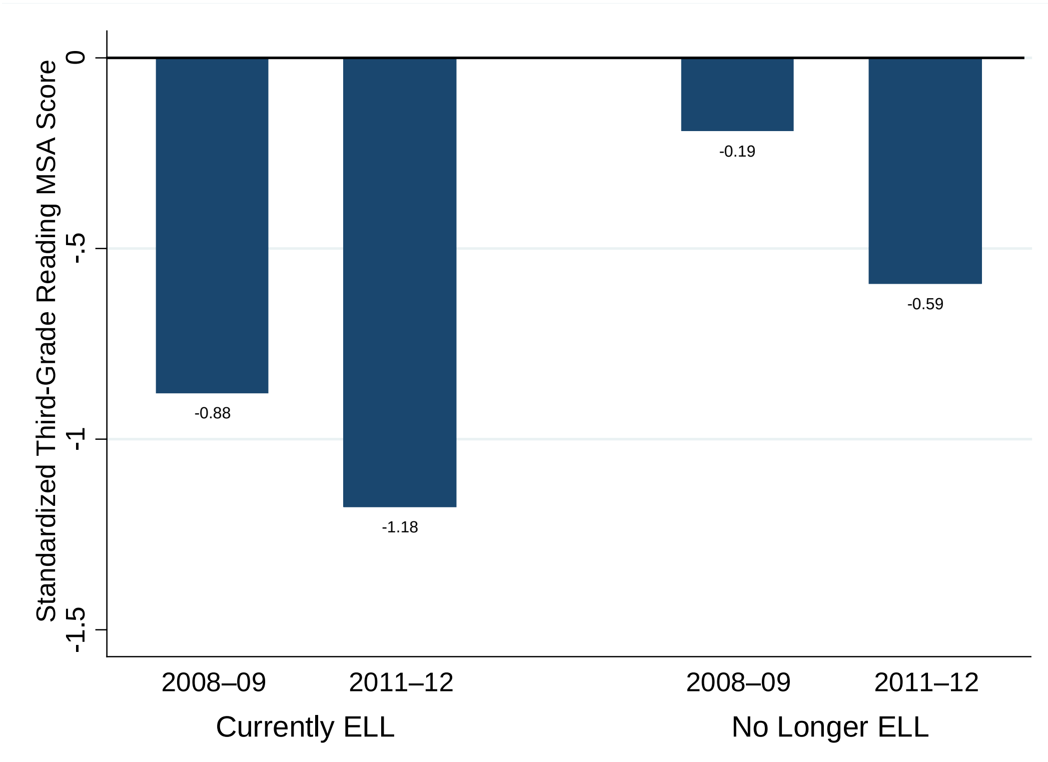


Figure 21. Third-grade reading MSA performance by ELL status and year

For ELL students in the third grade, time to reclassification exhibits no clear pattern.

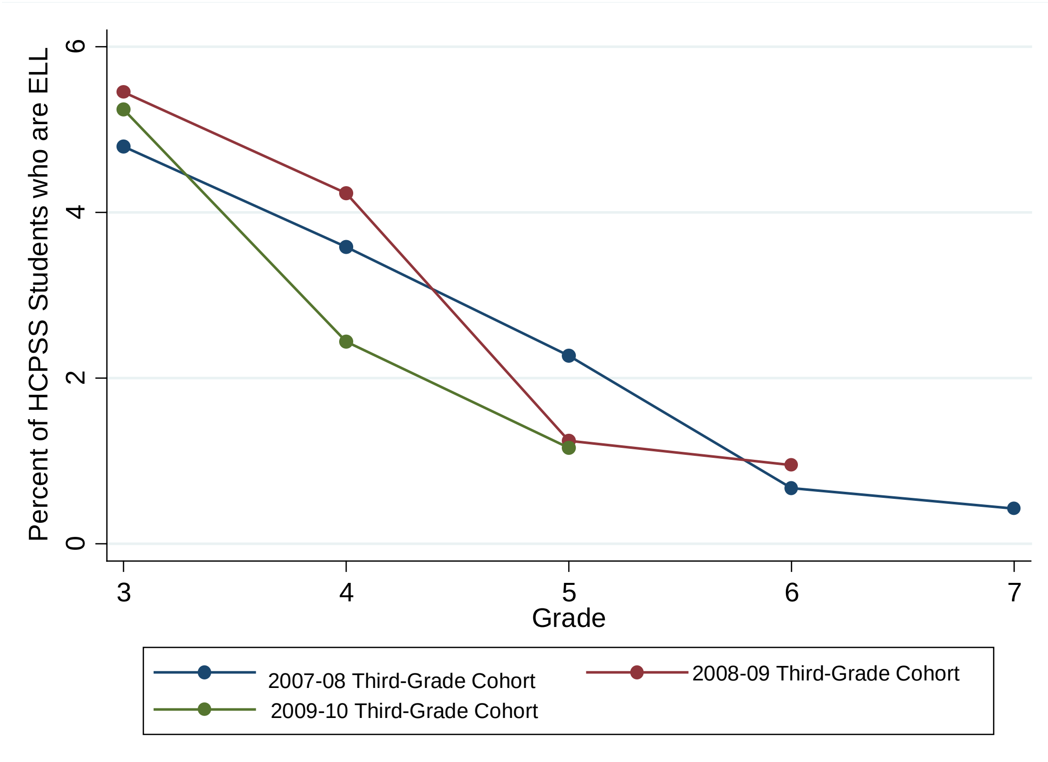


Figure 22. Percentage of students currently classified as ELL by third-grade cohort

Note: Each cohort consists of students who were in third grade at HCPSS and remained at HCPSS through fifth grade (2009–10 cohort), sixth grade (2008–09 cohort) and seventh grade (2007–08 cohort) respectively. Sample sizes (total students by third-grade cohort): 2007–08= 2,815; 2008–09= 3,044; 2009–10= 3,277.

The percentage of students who have not taken the algebra/data analysis HSA by the end of ninth grade is decreasing.

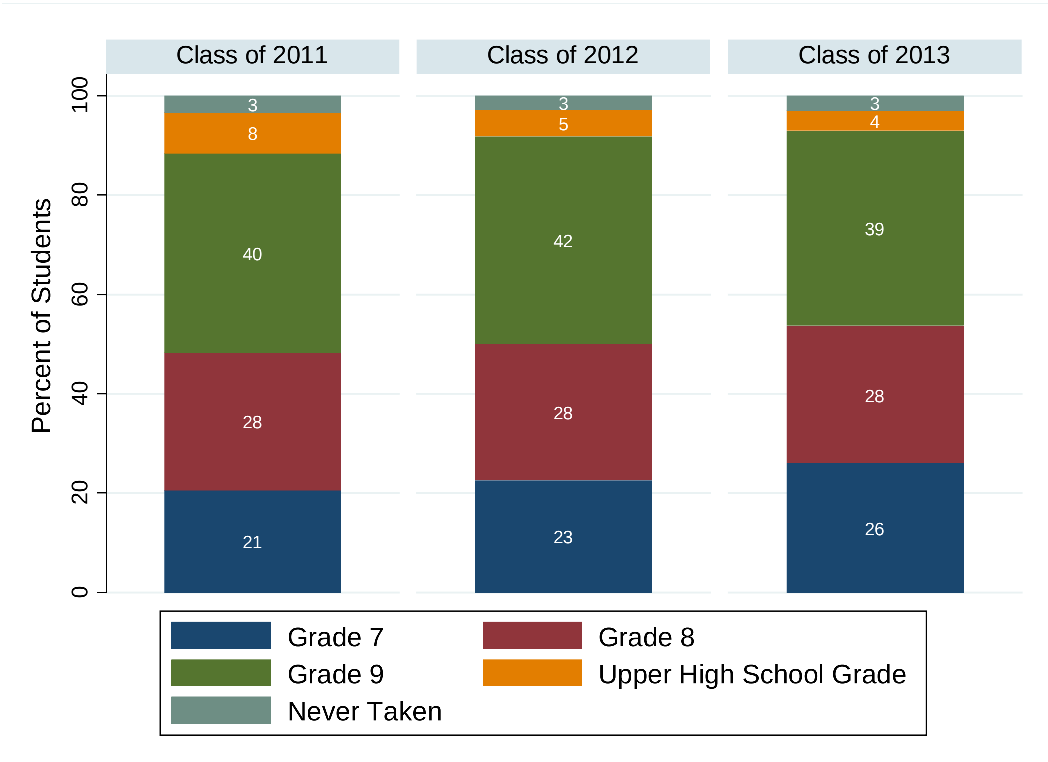


Figure 23. Grade in which the algebra/data analysis HSA is first taken by graduating class

Note: The change from the class of 2011 to the class of 2013 is statistically significant at $p < .05$. Sample sizes: 2010–11=4,317; 2011–12=4,067; 2012–13=4,295.

There are gaps in participation and the timing of participation by FARMS status.

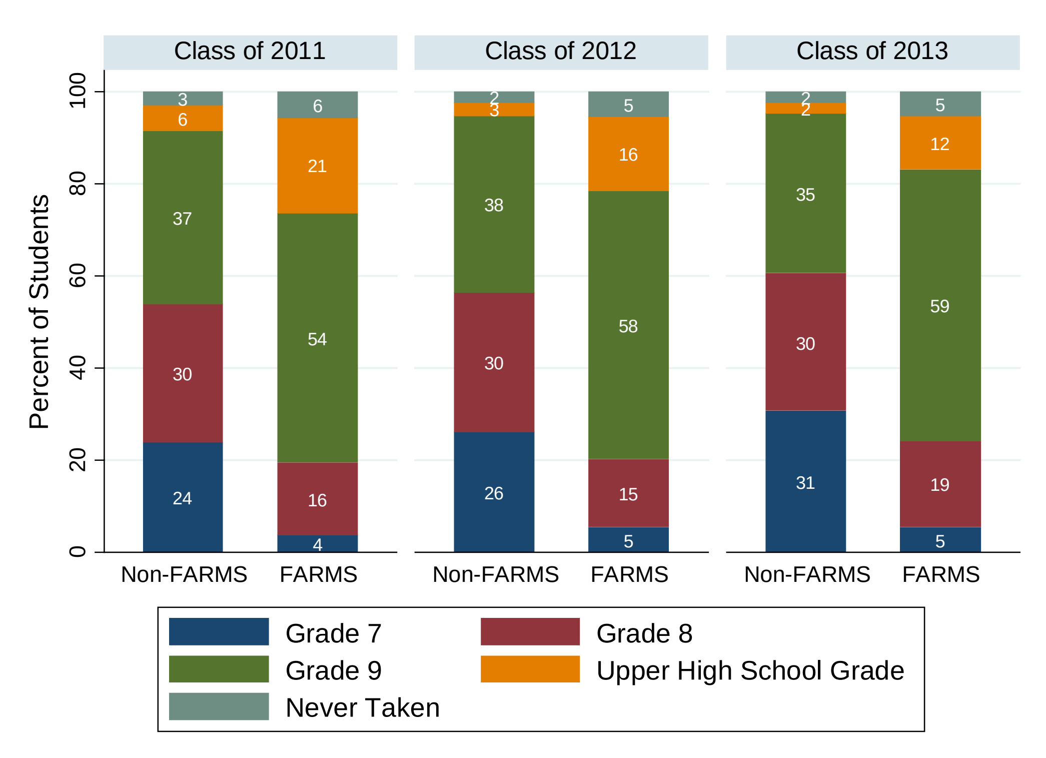


Figure 24. Grade in which the algebra/data analysis HSA is first taken by graduating class and FARMS status

Sample sizes: 2010–11 FARMS=706; 2010–11 non-FARMS= 3,611; 2011–12 FARMS =720; 2011–12 non-FARMS=3,352; 2012–13 FARMS=810; 2012–13 non-FARMS=3,485.

These gaps remain even after controlling for sixth-grade math MSA performance.

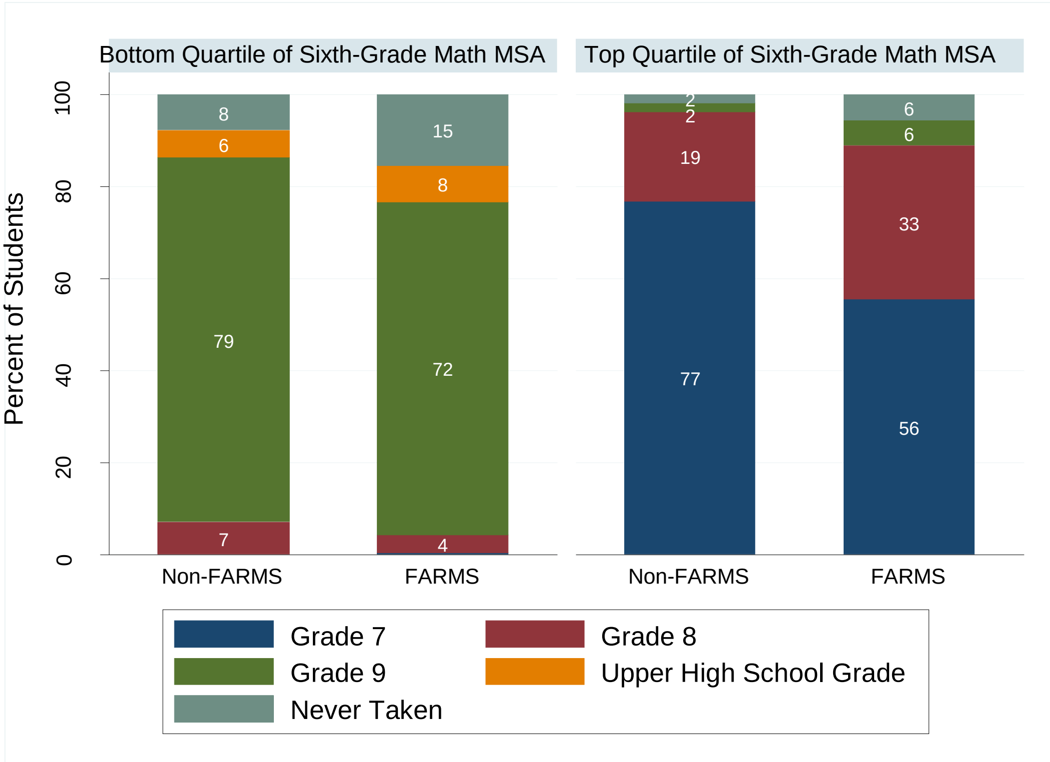


Figure 25. Grade in which the algebra/data analysis HSA is first taken by sixth-grade prior math MSA performance and FARMS status, class of 2014

Note: The class of 2014 has two or more school years (2012–13 and 2013–14) to take any HSA exam. Samples based on students with prior sixth-grade math MSA performance data. Sample sizes: bottom quartile non-FARMS=476; bottom quartile FARMS=273; top quartile non-FARMS=799; top quartile FARMS=36.

There is a strong correlation between average sixth-grade math MSA score and the percentage of students taking the HSA test in middle school.

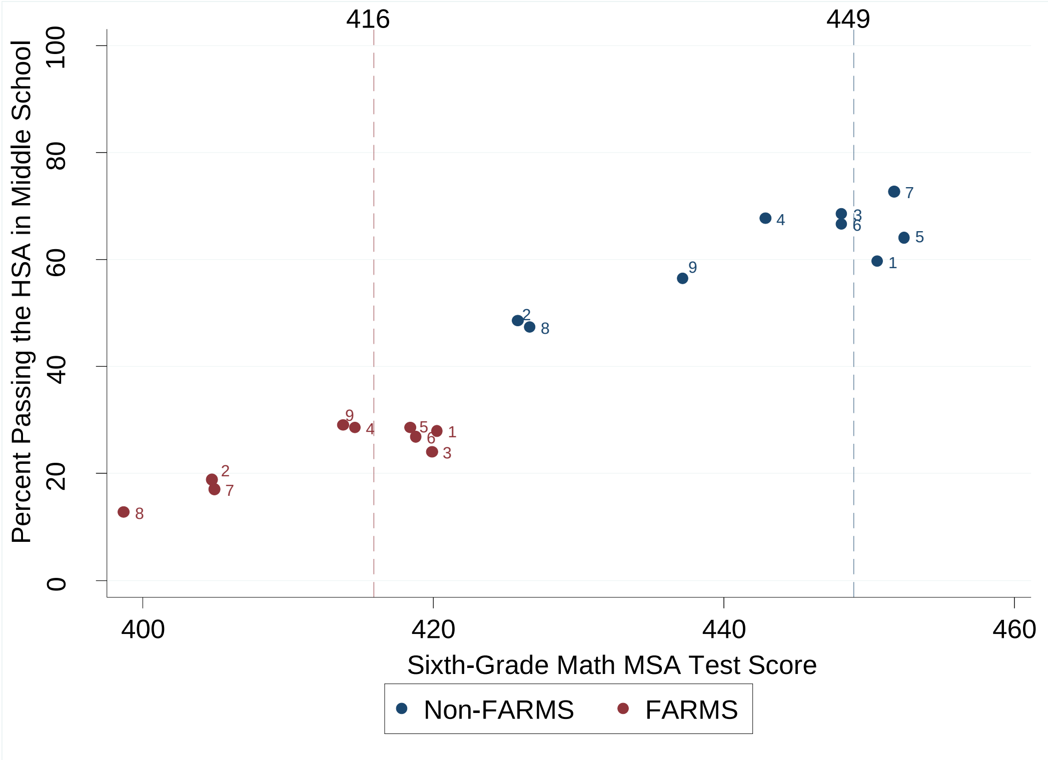


Figure 26. Percentage of middle school students taking the algebra/data analysis HSA in the class of 2014 by prior sixth-grade math MSA score

Note: Each red dot represents FARMS students in a school and each blue dot represents non-FARMS students in a school. Each school's locations in the plot are determined by average prior sixth-grade math MSA score (on the x-axis), average percentage of students taking the HSA in middle school (on the y-axis) and FARMS status. Results for schools with fewer than 20 FARMS or non-FARMS students were suppressed. Sample based on students with prior sixth-grade math MSA performance data. Sample size: 3,192.

Those who take algebra earlier in their school careers have a greater probability of passing the algebra/data analysis HSA.

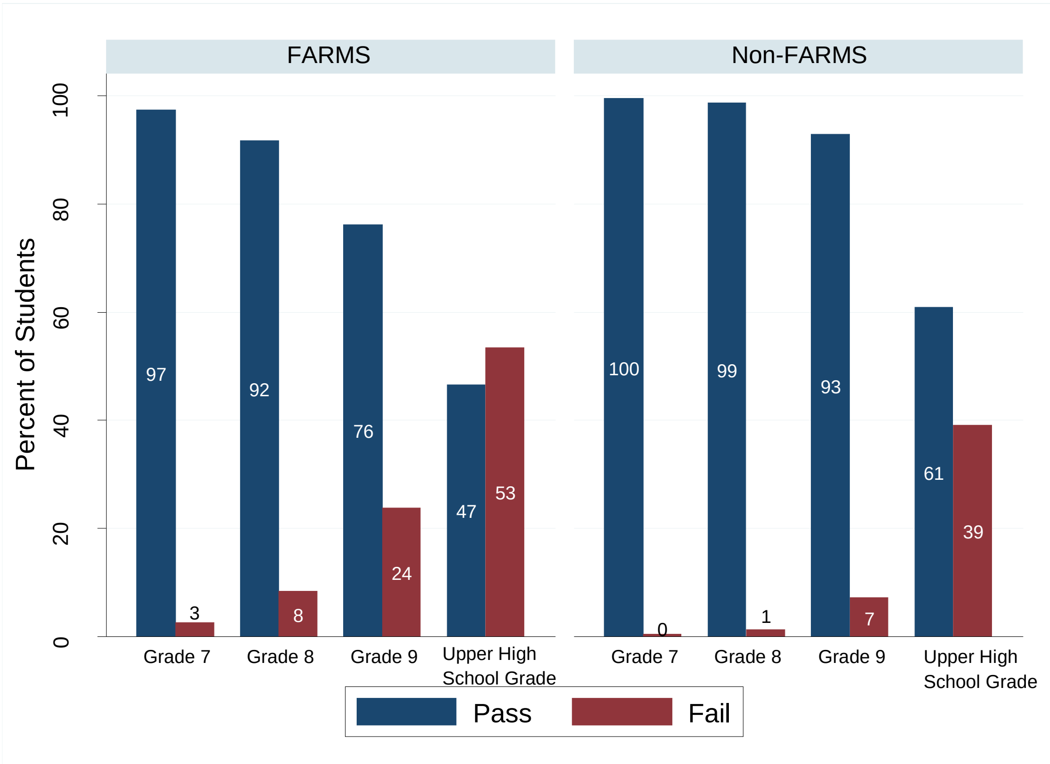


Figure 27. Percentage of students class of 2012 students passing their first algebra/data analysis HSA by grade

Sample sizes: FARMS Grade 7=39; FARMS Grade 8=108; FARMS Grade 9=433; FARMS upper high school grade=131; Non-FARMS Grade 7=876; Non-FARMS Grade 8=1,015; Non-FARMS Grade 9=1,301; Non-FARMS upper high school grade=115.

There are differences in the percentage of middle school students taking and passing the algebra/data analysis HSA between FARMS and non-FARMS students within prior sixth-grade test score quartile.

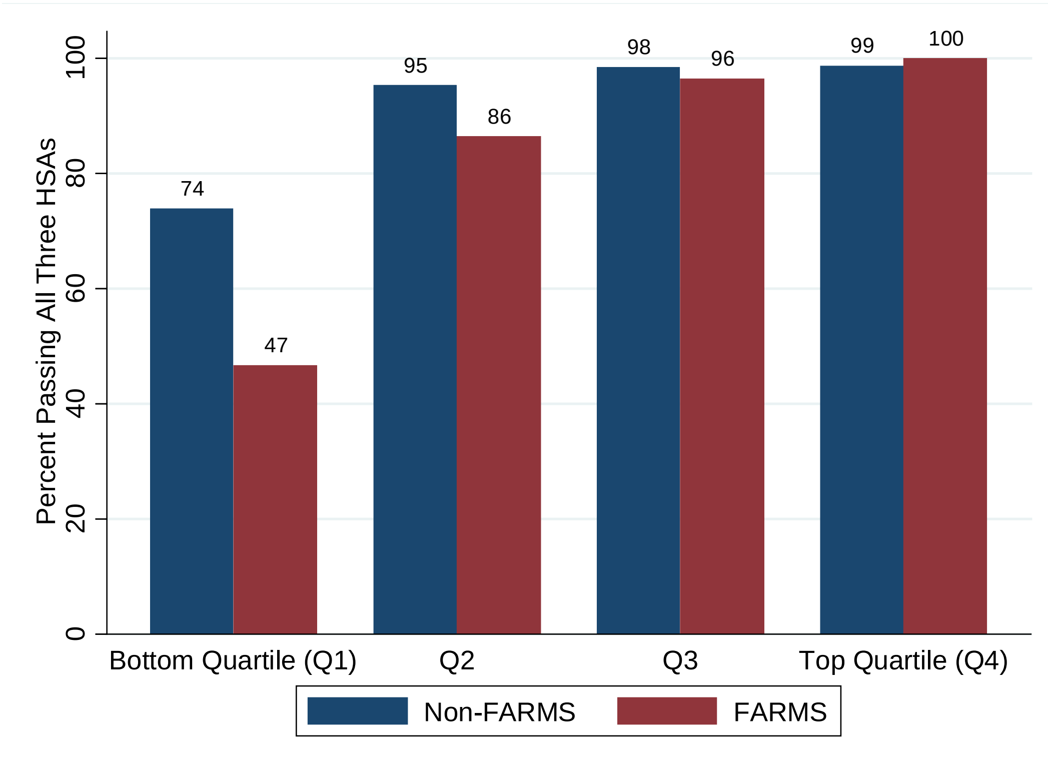


Figure 28. Percentage of class of 2014 students taking and passing the algebra/data analysis HSA in middle school by prior sixth-grade math MSA quartile

Note: Differences between FARMS and non-FARMS are significant for Q1 and Q2 at $p < .05$ after controlling for average differences in prior achievement within quartile. Sample sizes= Q1 non-FARMS=476; Q1 FARMS=273; Q2 non-FARMS=648; Q2 FARMS=129; Q3 non-FARMS=773; Q3 FARMS=58; Q4 non-FARMS=799; Q4 FARMS=36.

Large percentages of HCPSS students are taking and passing the HSAs.

	Percent taking algebra/data analysis HSA	Percent taking all three exams	Percent passing all three exams	Total students
FARMS eligibility				
Never FARMS eligible	98%	96%	91%	3,352
Ever FARMS eligible	94%	89%	61%	720
Race/ethnicity				
African American	97%	93%	71%	855
Asian American	98%	96%	90%	586
Hispanic	94%	91%	74%	304
White, not Hispanic	97%	96%	92%	2,100
Two or more races/other	99%	96%	91%	227
Special education status				
Not special education	99%	97%	89%	3,778
Special education	75%	71%	44%	294
ELL status				
Not ELL	97%	96%	87%	3,908
ELL	90%	79%	53%	164
Total	**97%**	**95%**	**86%**	**4,067**

Figure 29. Participation and passing rates on HSAs, class of 2012

Note: All first-time ninth-graders in 2008–09 who do not transfer out of the district are included in this table. Special education students are all students who are classified as special education during high school. ELL students are all students who are classified as ELL during high school.

Controlling for prior eighth-grade math MSA achievement, there were small differences in the probability of taking all three HSAs between FARMS and non-FARMS students and larger differences in the probability of passing.

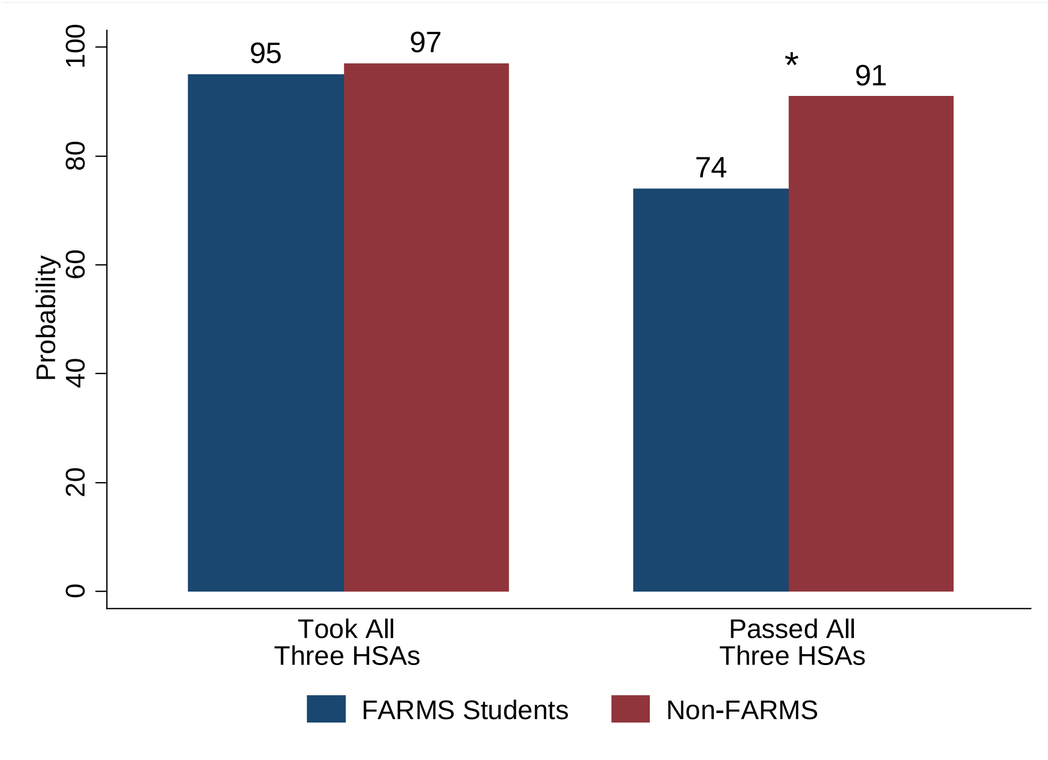


Figure 30. Participation and performance on HSAs controlling for prior eighth-grade math and reading MSA achievement, class of 2012

Note: * indicates statistically significant difference between FARMS and non-FARMS students at $p < .05$. Sample based on students with prior eighth-grade math MSA performance data. Sample size: 3,330.

There are significant differences between the percentages of FARMS and non-FARMS students taking and passing the HSAs in the bottom two quartiles of eighth-grade math MSA performance.

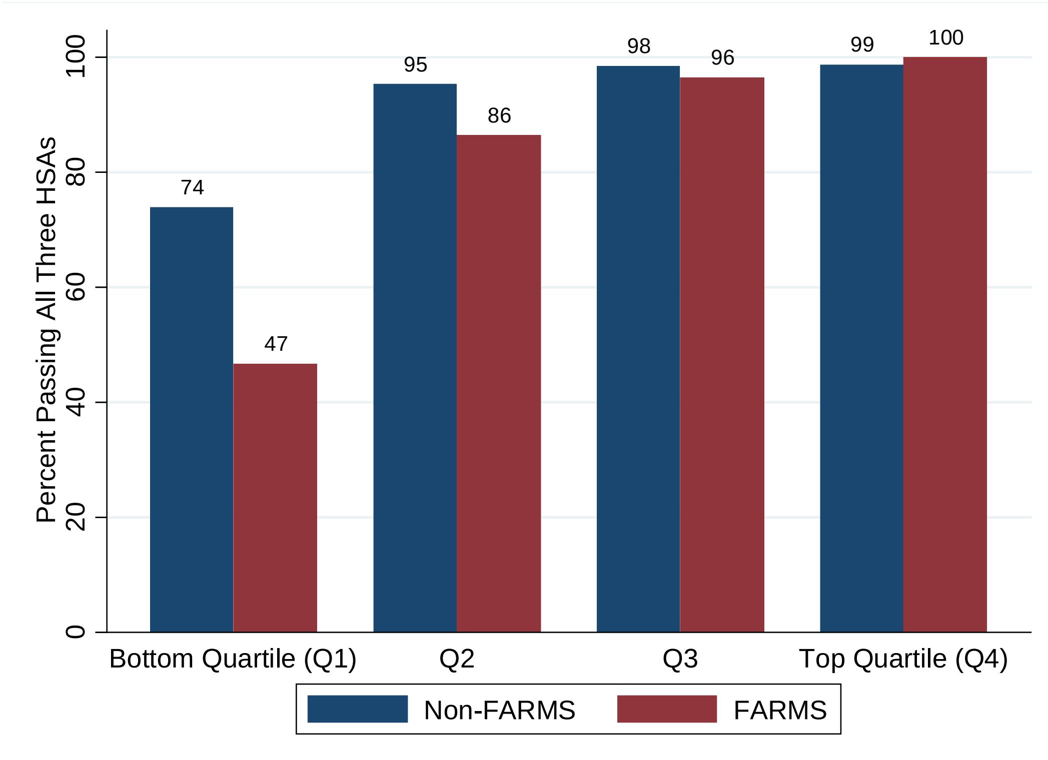


Figure 31. Percentage of non-FARMS and FARMS students passing all three HSAs by prior eighth-grade math MSA quartile, class of 2012

Note: Differences between FARMS and non-FARMS are significant for Q1 and Q2 at $p < .05$ after controlling for average differences in prior achievement within quartile. Sample based on students with prior eighth-grade math MSA performance data. Sample sizes: Q1 non-FARMS=498; Q1 FARMS=274; Q2 non-FARMS=660; Q2 FARMS=125; Q3 non-FARMS=846; Q3 FARMS=57; Q4 non-FARMS=837; Q4 FARMS=33.

Across schools, almost all students took all three required HSAs regardless of prior performance.

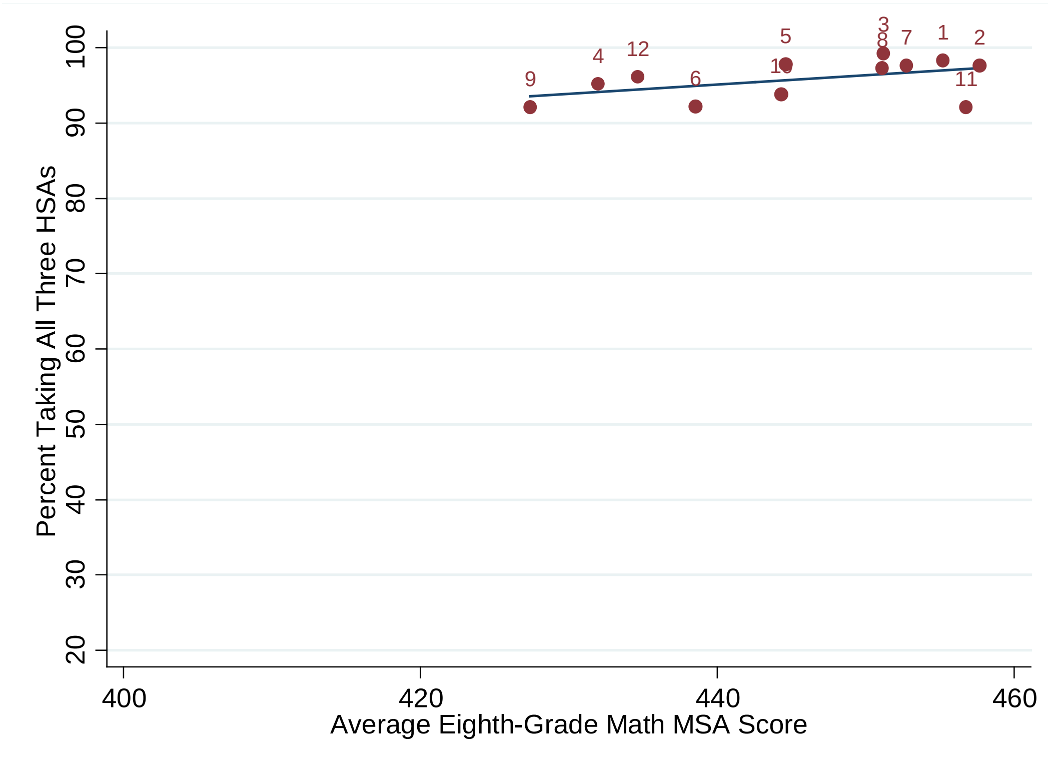


Figure 32. Percentage of high school students taking all three HSAs by prior eighth-grade math MSA score, class of 2012

Note: Each point represents a high school, and each school's location in the plot is determined by its students' average prior eighth-grade performance in math (on the x-axis) and the percentage of students taking all three HSA exams (on the y-axis). Sample based on students with prior eighth-grade math MSA performance data. Sample size: 3,330.

However, prior performance is related to the percentage of students passing all three HSAs by school.

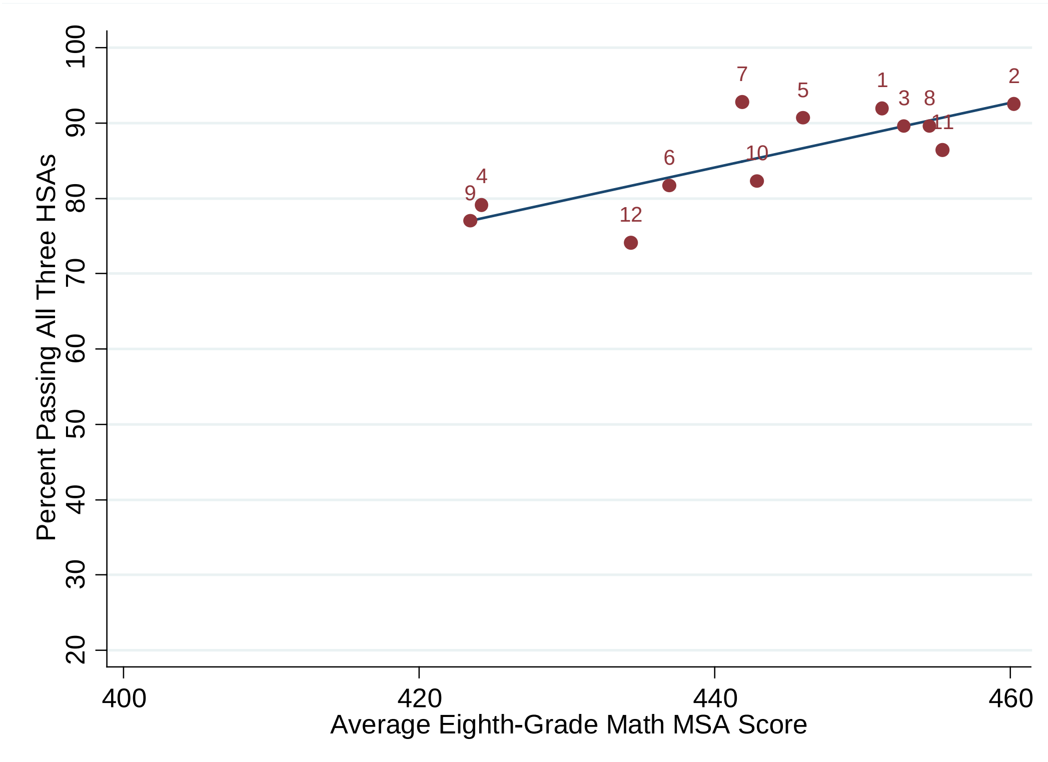


Figure 33. Percentage of high school students passing all three HSAs by prior eighth-grade math MSA score, class of 2012

Note: Each point represents a high school, and each school's location in the plot is determined by its students' average prior eighth-grade performance in math (on the x-axis) and the percentage of students taking and passing all three HSA exams (on the y-axis). Schools with less than 20 FARMS students not shown in the figure. Sample based on students with prior eighth-grade math MSA performance data. Sample size: 3,330.

Gaps in passing rates by FARMS and non-FARMS students are partially explained by prior performance.

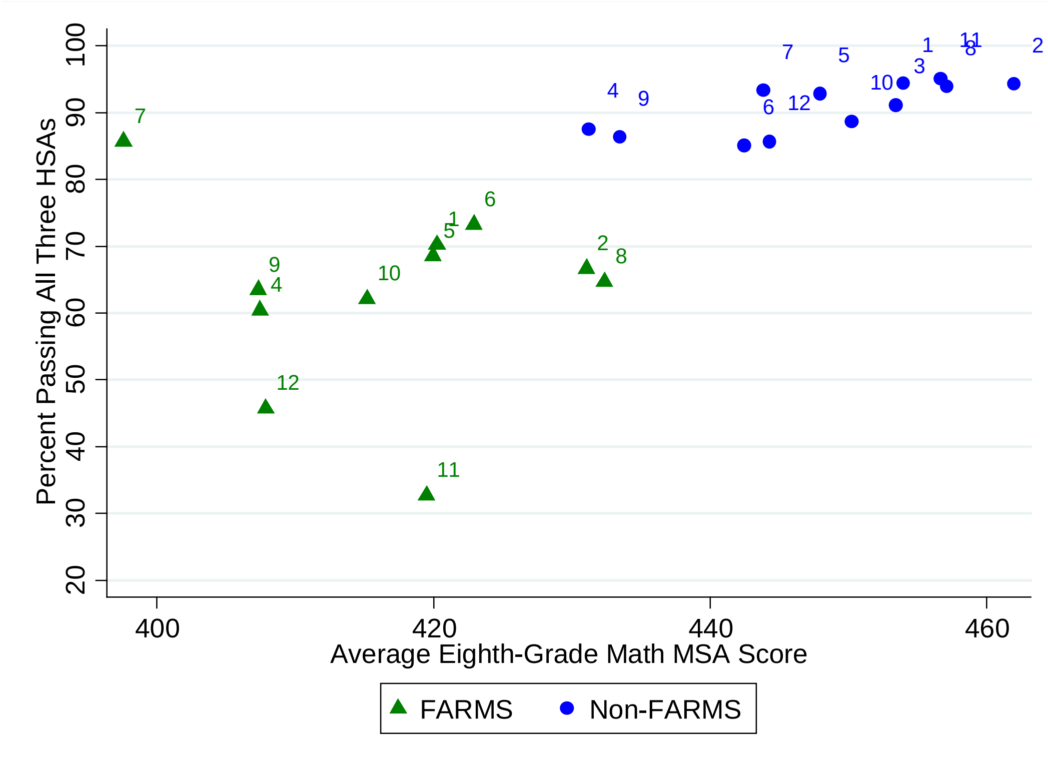


Figure 34. Percentage of high school students passing all three HSAs by prior eighth-grade math MSA score, class of 2012

Note: Each blue dot represents the non-FARMS student averages for a high school and each green triangle represents the FARMS student averages for each high school. Sample based on students with prior eighth-grade math MSA performance data. Schools with less than 20 FARMS students not shown in the figure. Sample size: 3,330.

Participation in Advanced Placement exams varies dramatically by group.

	Percentage taking at least one AP exam	Percentage taking and passing at least one AP exam	Total students
FARMS Eligibility			
Never FARMS eligible	49%	43%	3352
Ever FARMS eligible	17%	12%	720
Race/ethnicity			
African American	20%	15%	855
Asian American	62%	55%	586
Hispanic	33%	27%	304
White, not Hispanic	49%	43%	2100
Two or more race/ other	46%	40%	211
Special Education Status			
Not special education	46%	40%	3778
Special education	10%	7%	294
ELL Status			
Not ELL	45%	38%	3908
ELL	22%	17%	164
Total	**44%**	**37%**	**4067**

Figure 35. Participation and passing rates on Advanced Placement exams, class of 2012

Note: All first-time ninth-graders in 2008–09 who do not transfer out of the district are included in this table. Special education students are all students who are classified as special education during high school. ELL students are all students who are classified as ELL during high school.

Even after controlling for eighth-grade math MSA performance, FARMS students are less likely to take AP exams as compared to non-FARMS students.

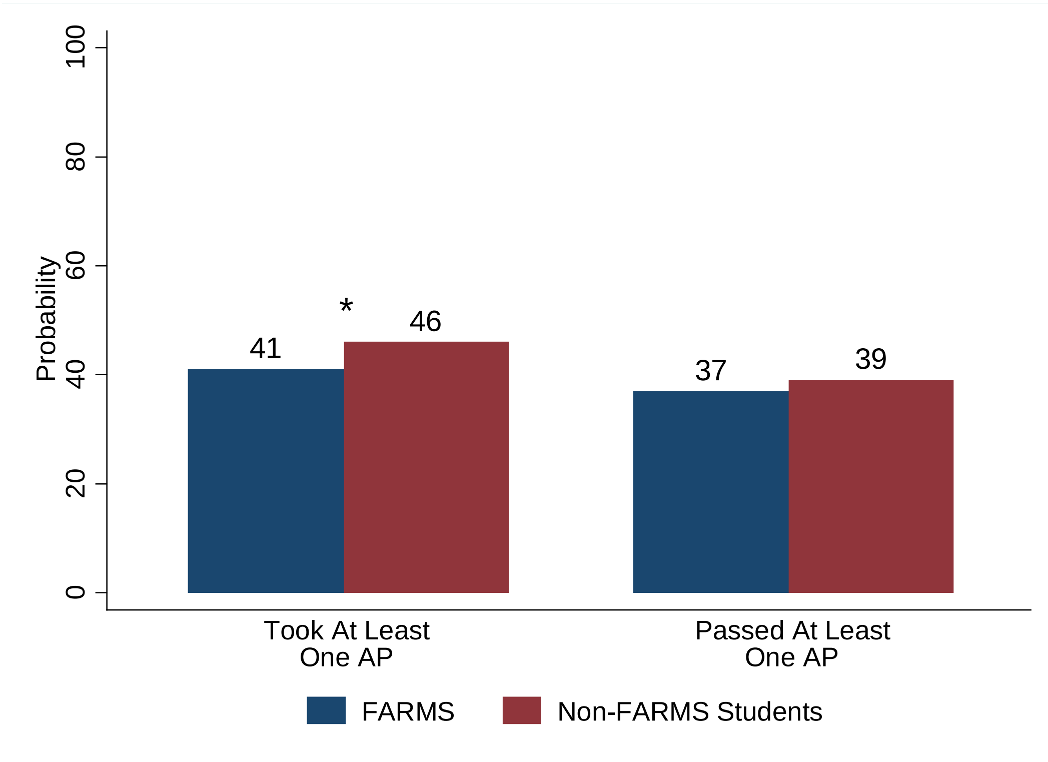


Figure 36. AP participation and pass rates controlling for prior math MSA performance, class of 2012

Note: * indicates statistically significant difference between FARMS and non-FARMS students at $p < .05$. Sample based on students with prior eighth-grade math MSA performance data. Sample size: 3,330.

The differences in the percentage of students taking at least one AP exam by school is related to incoming prior achievement.

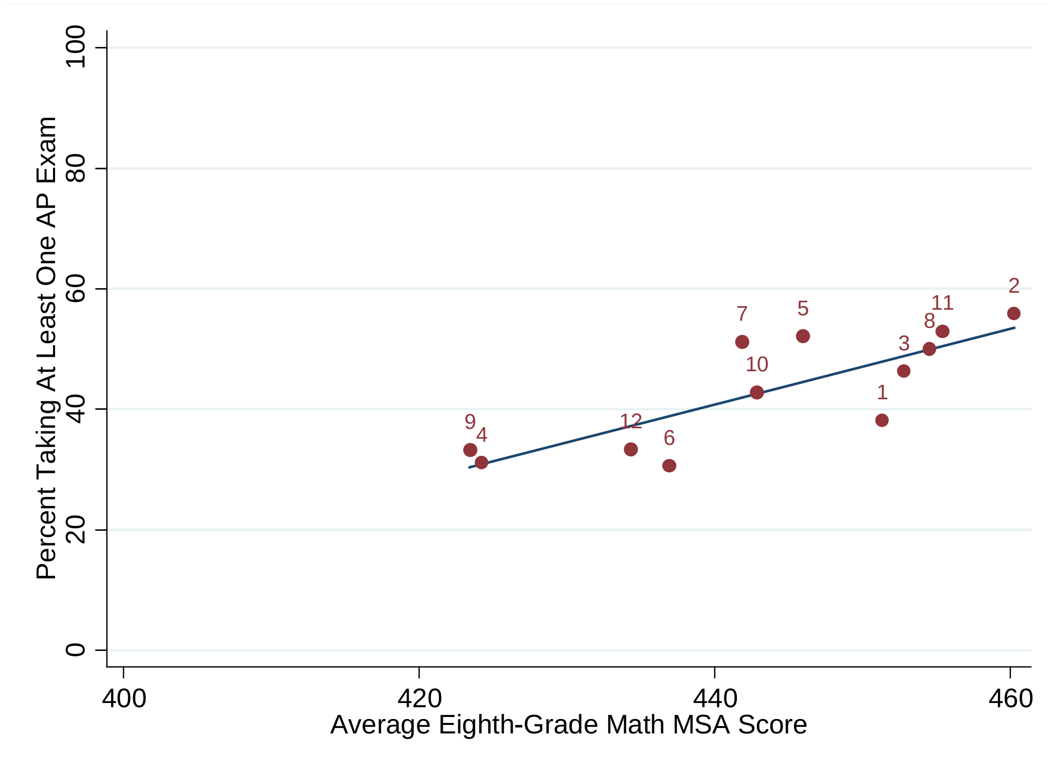


Figure 37. Percentage of high school students taking at least one AP exam by school and prior eighth-grade score, class of 2012

Note: Each point represents a high school, and each school's location in the plot is determined by its students' average prior eighth-grade performance in math (on the x-axis) and the percentage of students taking at least one AP exam (on the y-axis). Schools with less than 20 FARMS students not shown in the figure. Sample based on students with prior eighth-grade math MSA performance data. Sample size: 3,330.

Gaps in AP participation rates by FARMS and non-FARMS students by school are partially explained by prior performance.

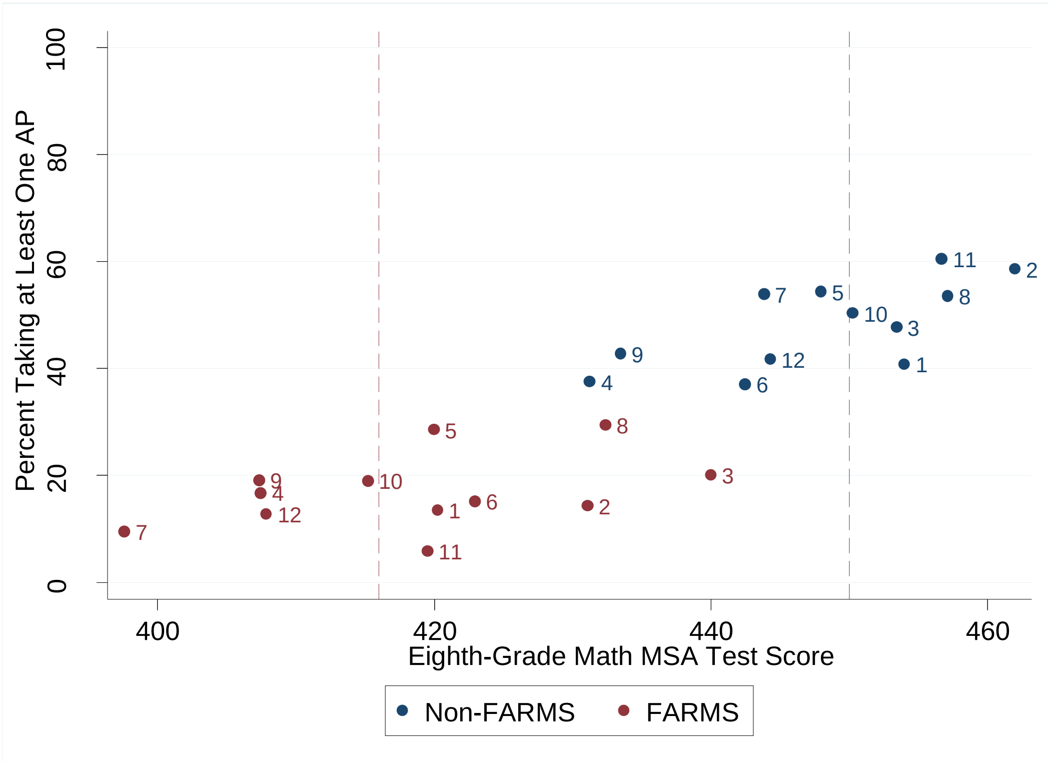


Figure 38. Percentage of high school students taking at least one AP exam by school and prior and eighth-grade score, class of 2012

Note: Each blue dot represents the non-FARMS student averages for a high school and each red dot represents the FARMS student averages for each high school. Schools with less than 20 FARMS students not shown in the figure. Sample based on students with prior eighth-grade math MSA performance data. Sample size: 3,330.

The differences in the percentage of students passing at least one AP exam by school is also related to incoming prior achievement.

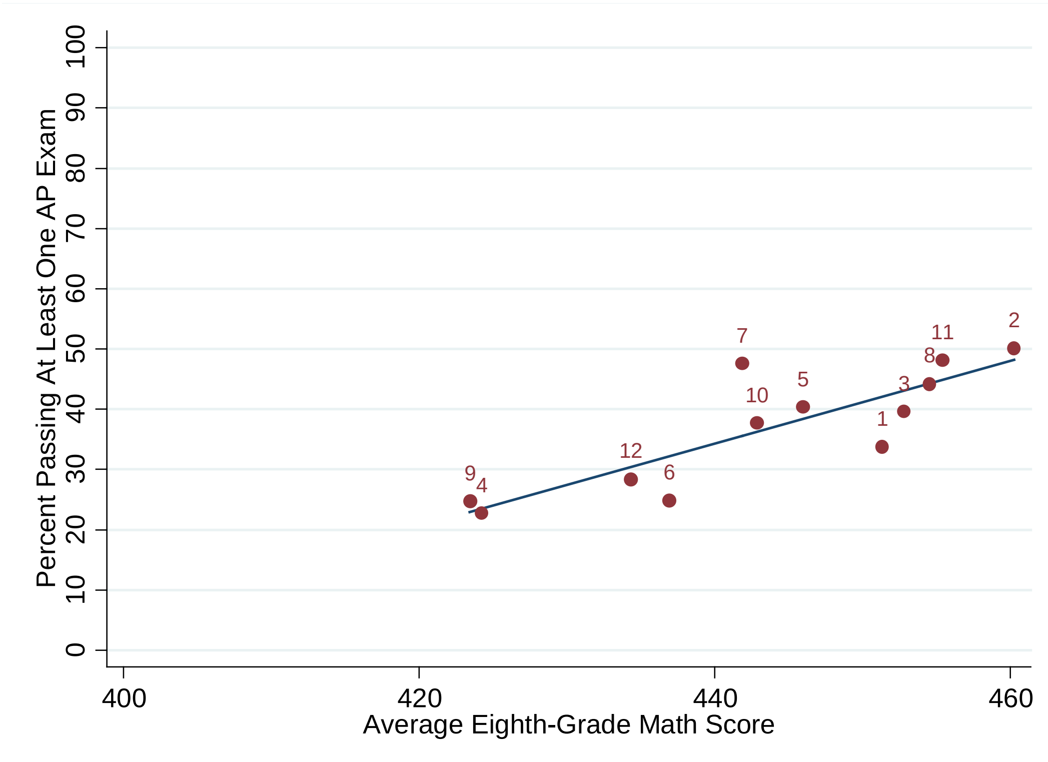


Figure 39. Percentage of high school students taking and passing at least one AP exam by school and prior eighth-grade math MSA score, class of 2012

Note: Each point represents a high school, and each school's location in the plot is determined by its students' average prior eighth-grade performance in math (on the x-axis) and the percentage of students taking and passing at least one AP exam (on the y-axis). Schools with less than 20 FARMS students not shown in the figure. Schools with less than 20 FARMS students not shown in the figure. Sample based on students with prior eighth-grade math MSA performance data. Sample size: 3,330.

The differences in the percentage of students taking at least one AP exam by school is partially explained by incoming prior achievement.

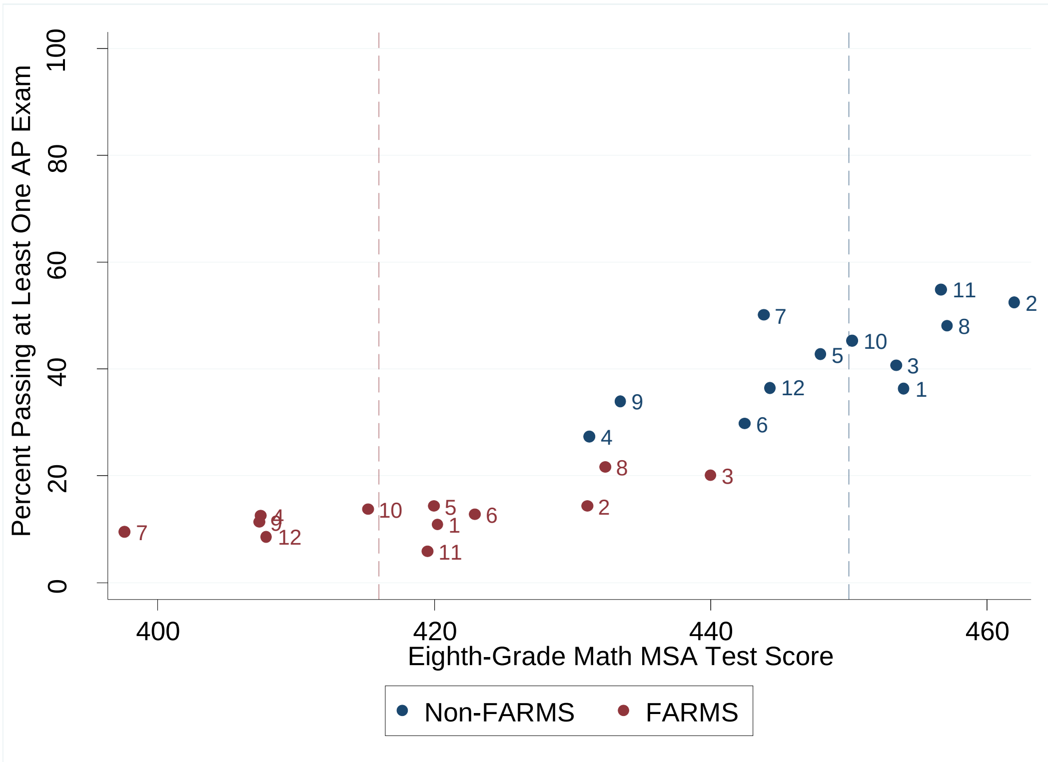


Figure 40. Percentage of high school students taking and passing at least one AP exam by school and FARMS status and prior eighth-grade math MSA score, class of 2012

Note: Each blue dot represents the non-FARMS student averages for a high school and each red dot represents the FARMS student averages for each high school. Schools with less than 20 FARMS students not shown in the figure. Sample based on students with prior eighth-grade math MSA performance data. Sample size: 3,330.

Participation in gifted and talented coursework has increased across the early grades.

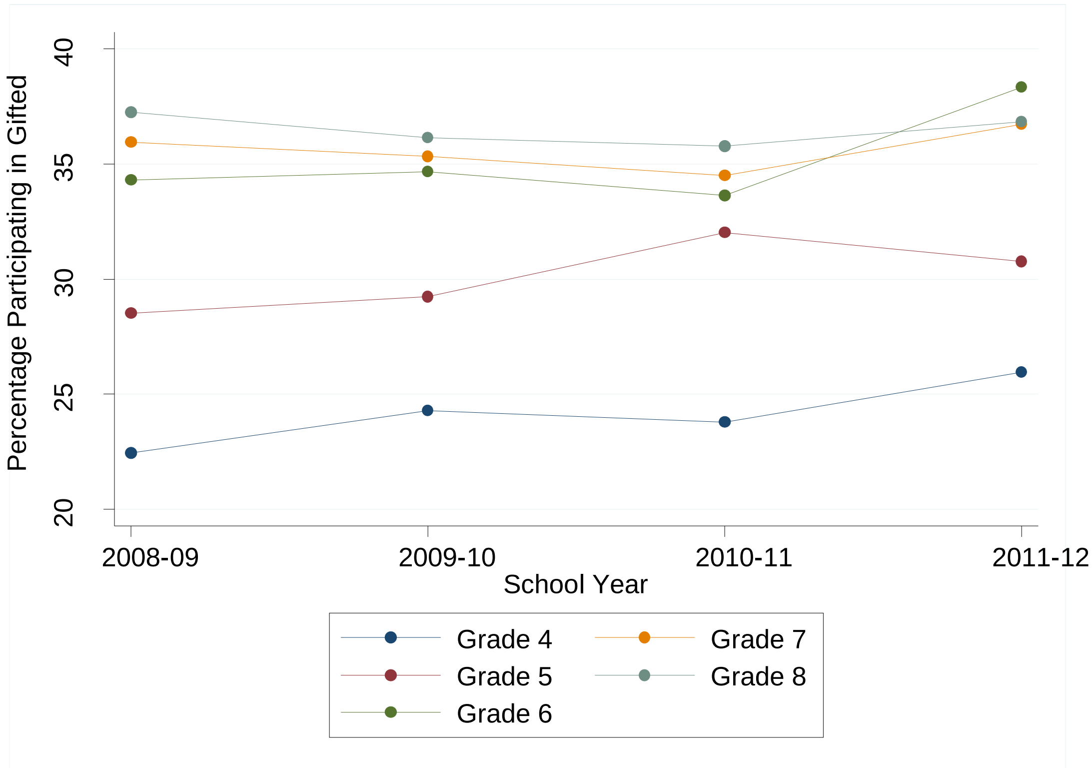


Figure 41. Trends in overall gifted participation by grade

Most of the upward trend is due to more first-time placements in fourth grade.

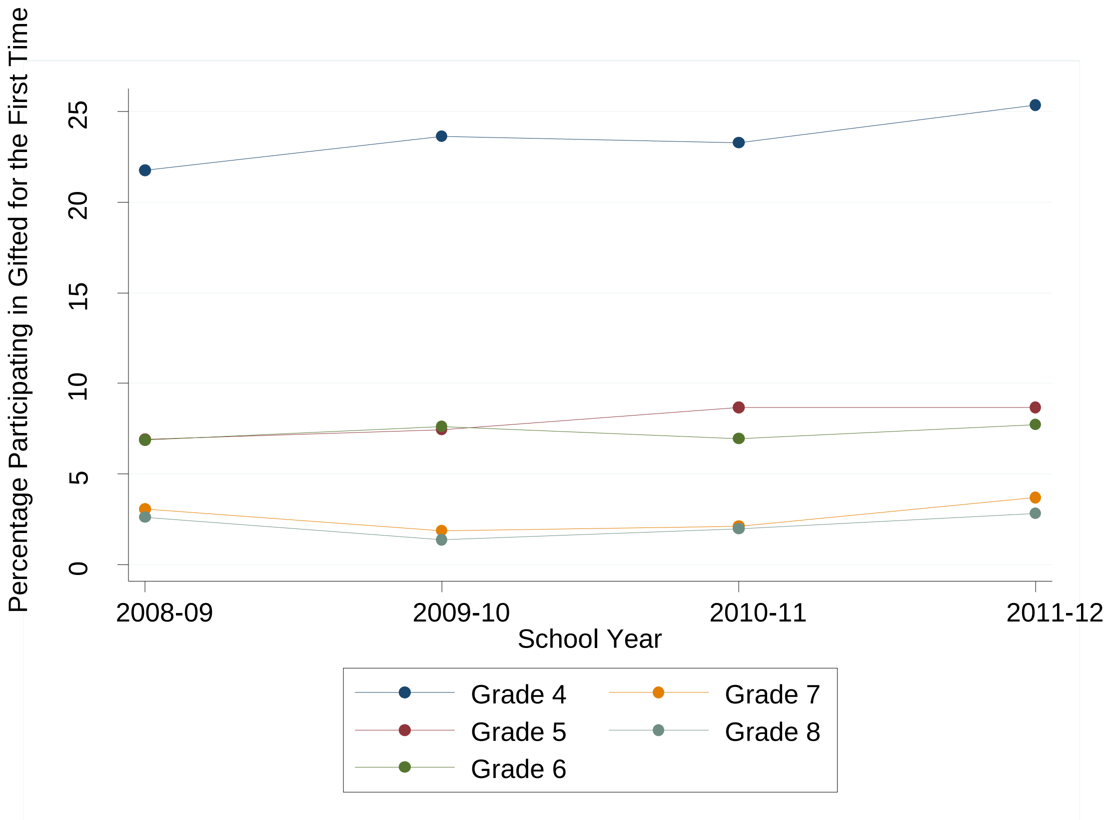


Figure 42. Trends in first year of gifted participation by grade

The gifted program participants are not generally representative of schools' student demographics.

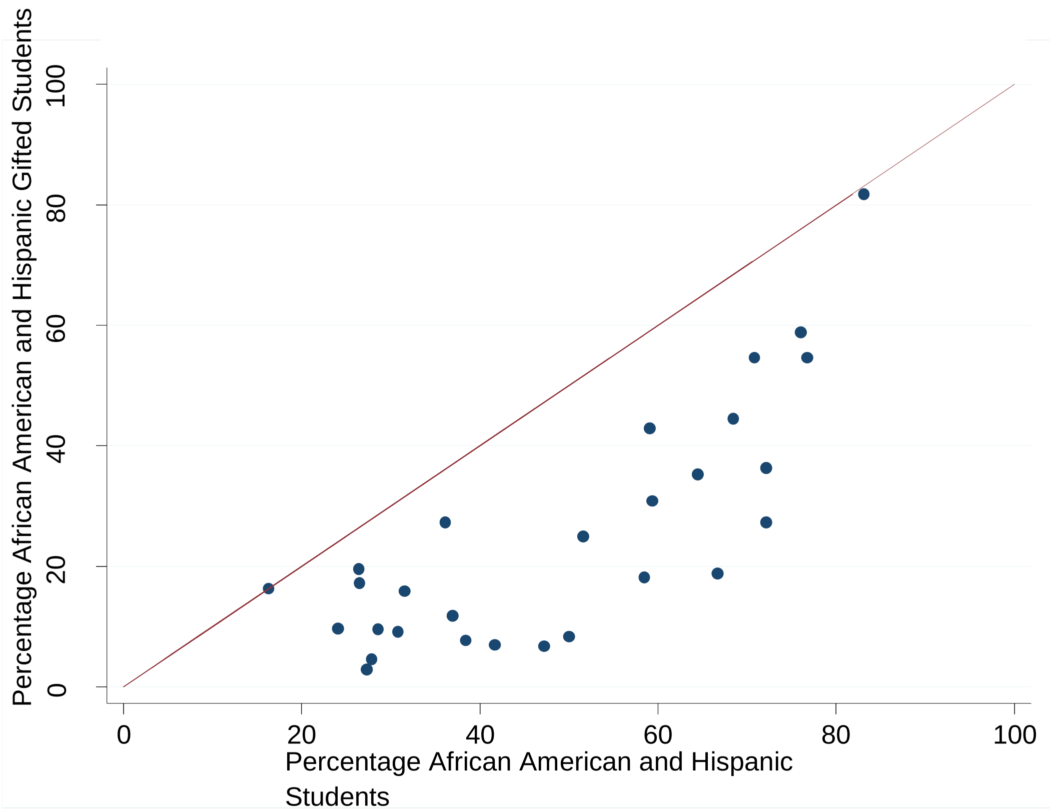


Figure 43. Gifted population versus school population, fourth-grade first-time placement in 2011–12 elementary schools

Note: Each point represents an elementary school and each school's location in the plot is determined by the percentage of African American and Hispanic students in the fourth grade (on the x-axis) and the percentage of students who are African American or Hispanic and placed into gifted in fourth grade (on the y-axis). Sample size: 3,914.

The gifted program participants are not generally representative of schools' student demographics (continued).

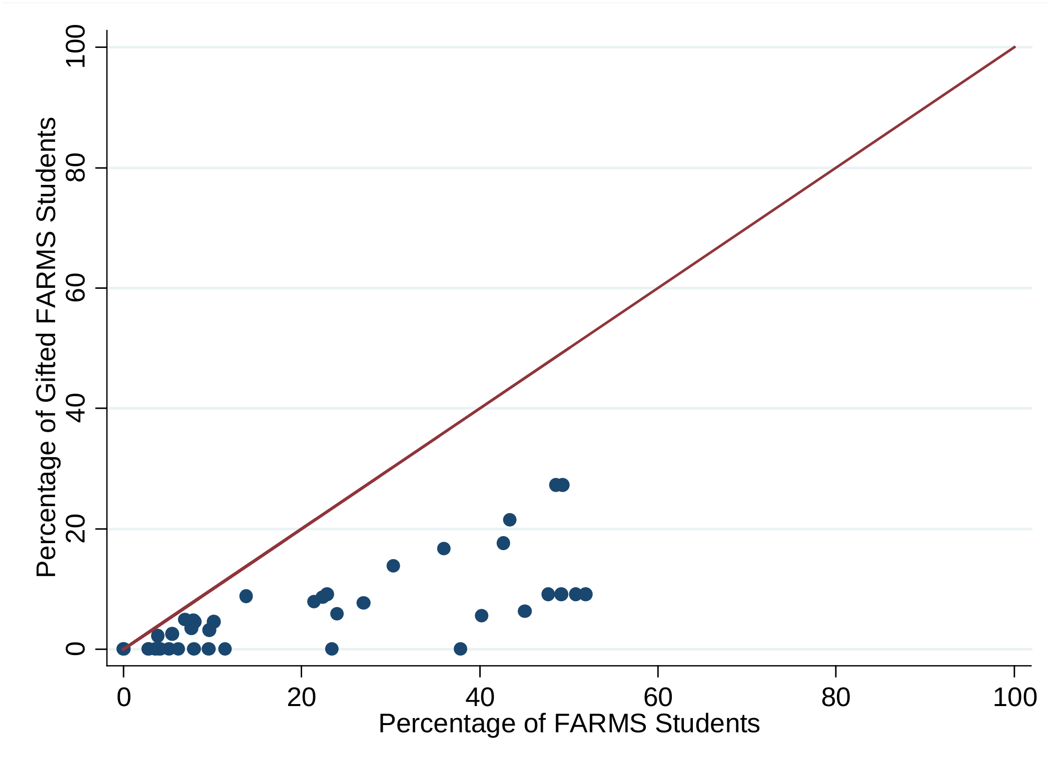


Figure 44. Gifted population versus school population, fourth-grade first-time placement in 2011–12 elementary schools

Each point represents an elementary school and each school's location in the plot is determined by the percentage of African FARMS students in the fourth grade (on the x-axis) and the percentage of students who are FARMS and placed into gifted in fourth grade (on the y-axis).Sample size: 3,914.

Most students are placed into gifted by testing. However, placement by review is more common in middle school.

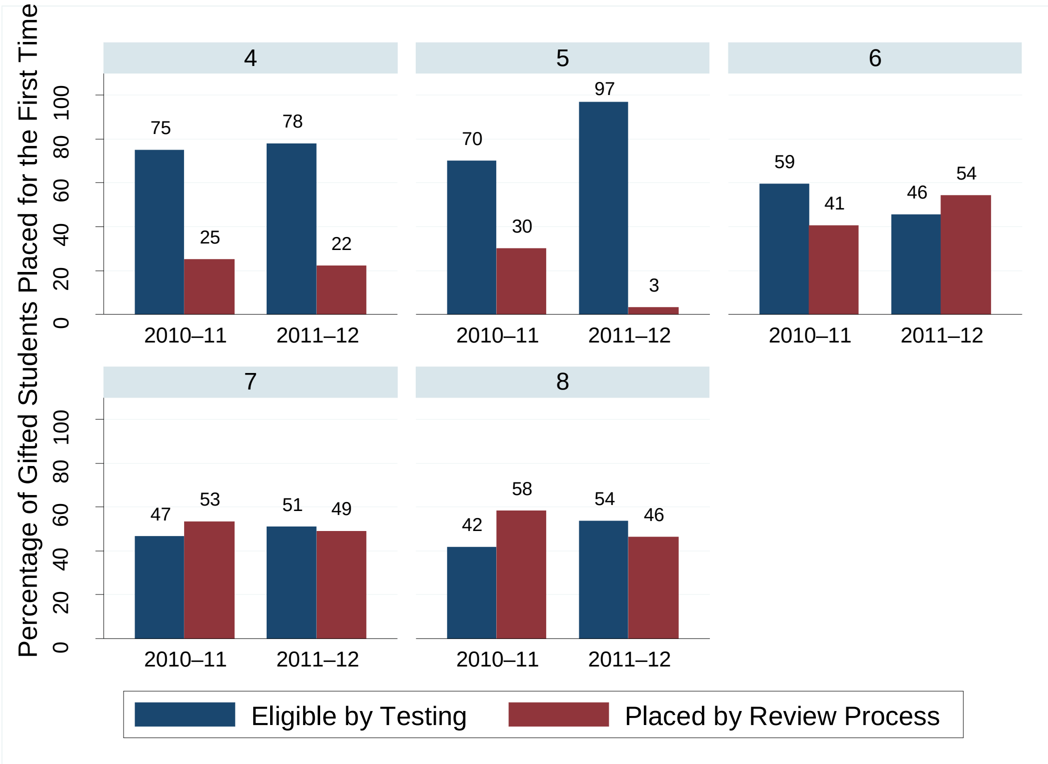


Figure 45. Trends in the type of gifted placement decisions by grade

Sample sizes (total students in grade): Grade 4, 2010–11=3,800; Grade 5, 2010–11=3,852; Grade 6, 2010–11=3,774; Grade 7, 2010–11=4,075; Grade 8,201-11=3,990; Grade 4, 2011–12=3,914; Grade 5, 2011–12=3,857; Grade 6, 2011–12=3,920; Grade 7, 2011–12=3,844; Grade 8, 2011–12=4,133.

A far smaller proportion of FARMS students than non-FARMS students are placed into the gifted program.

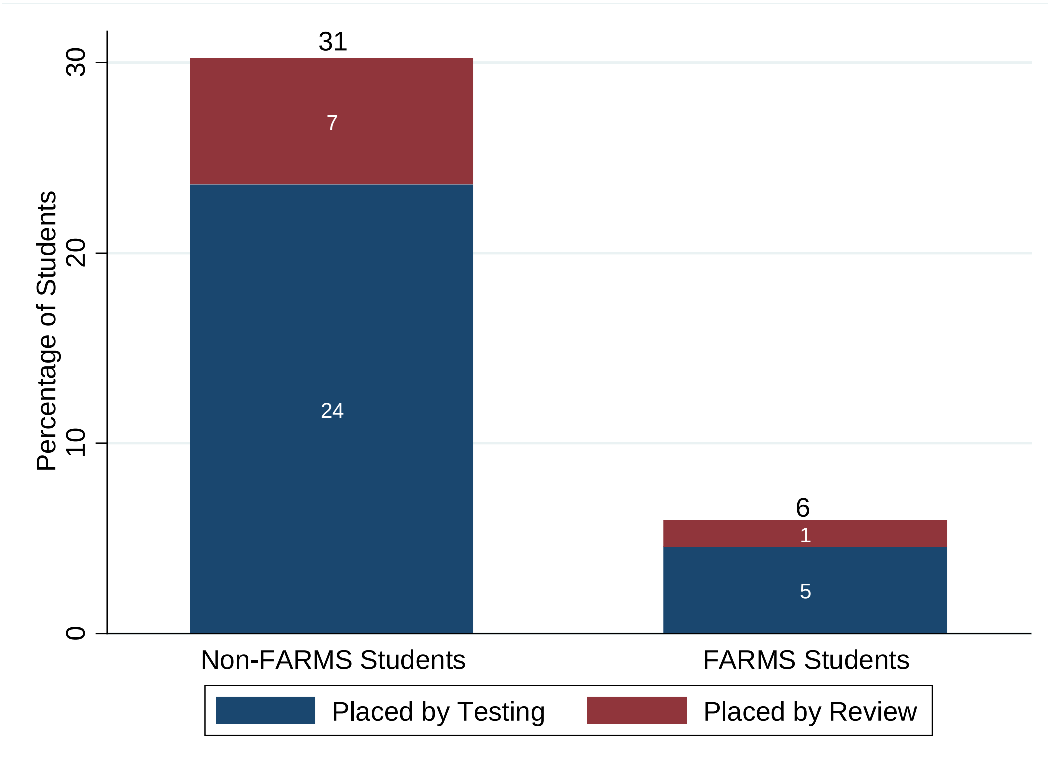


Figure 46. Percentage of students placed into testing by placement process and FARMS Student

Sample sizes: 2011–12 Grade 4 FARMS students: 790; 2011–12 Grade 4 non-FARMS students: 3,125.

For those placed into G/T through testing, non-FARMS students have slightly higher prior math scores on average.

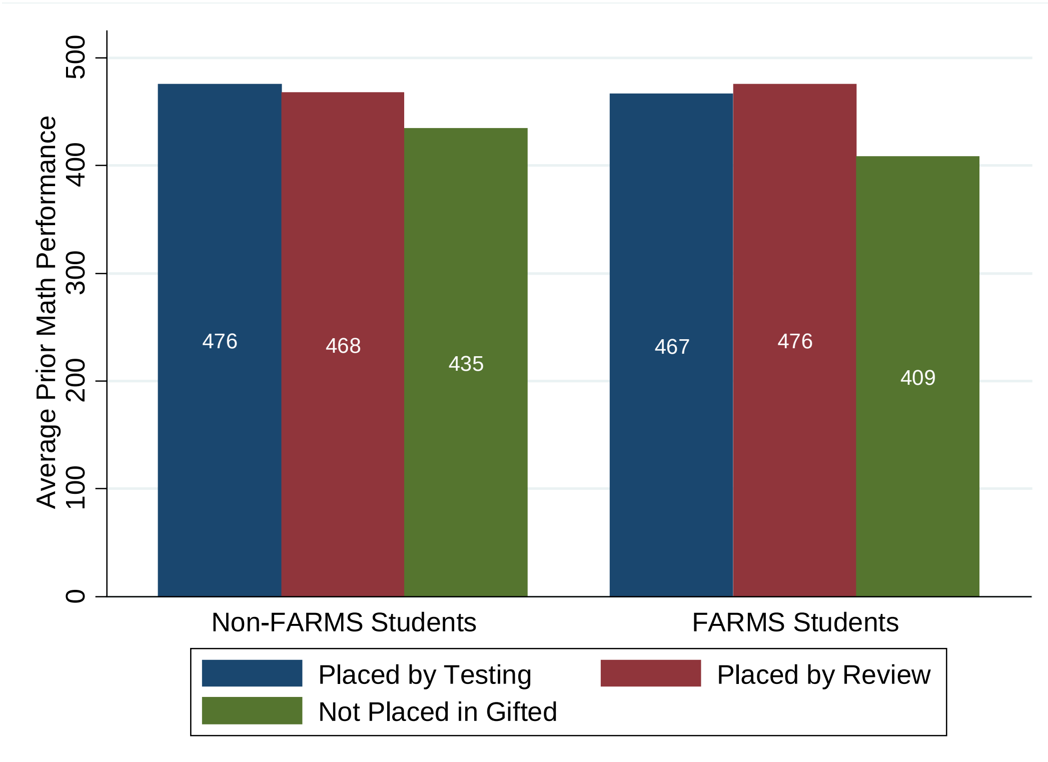


Figure 47. Average prior third-grade math MSA performance by placement process and FARMS status

Sample sizes: 2011–12 Grade 4 FARMS students: 790; 2011–12 Grade 4 non-FARMS students: 3,125.

There are differences in the probability of first-time placement into gifted in fourth grade controlling for prior achievement.

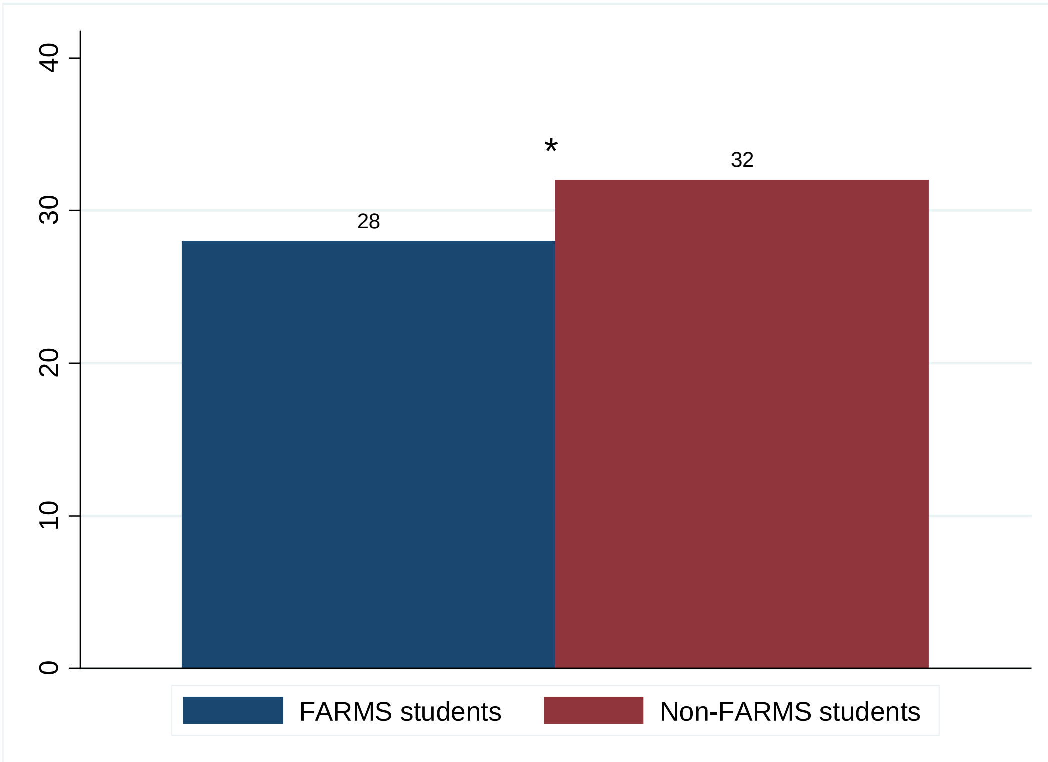


Figure 48. Fourth-grade first-time placement into gifted math for FARMS and non-FARMS students, controlling for prior third-grade math MSA achievement

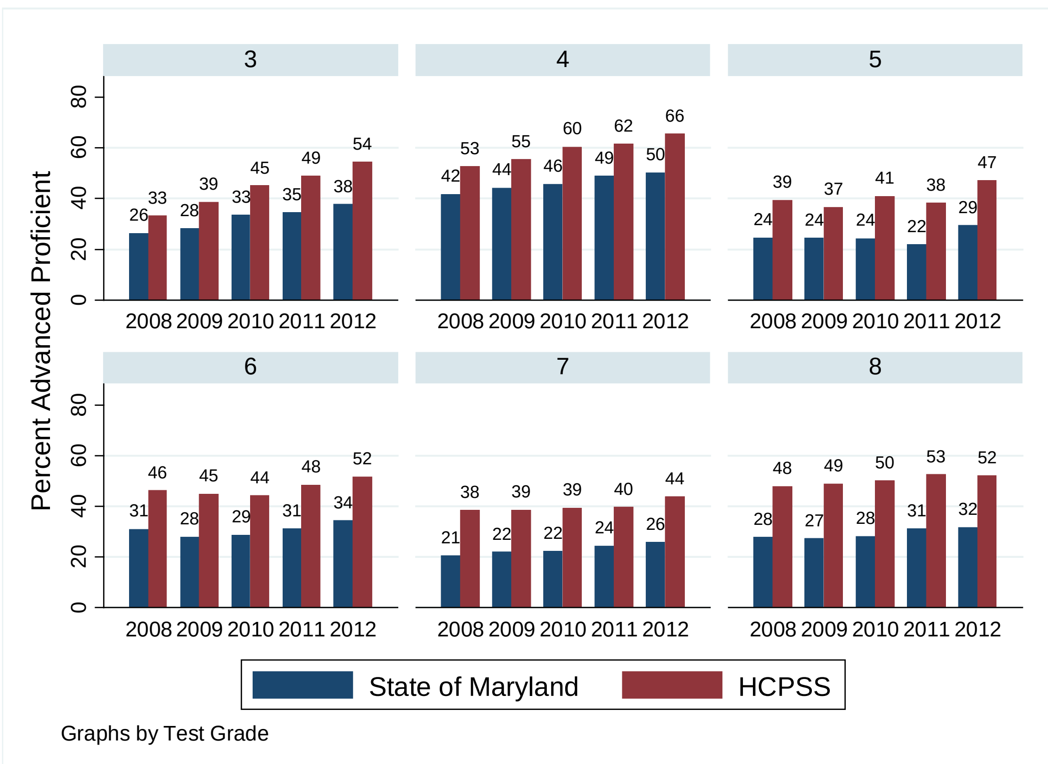
Note: * indicates statistical significance at $p < .05$ comparing the difference between student poverty status in probability of placement into gifted. Sample sizes: 6,840 2010–11 and 2011–12 students in Grade 4.

Appendices

Appendix 1. Sample sizes for test score trends

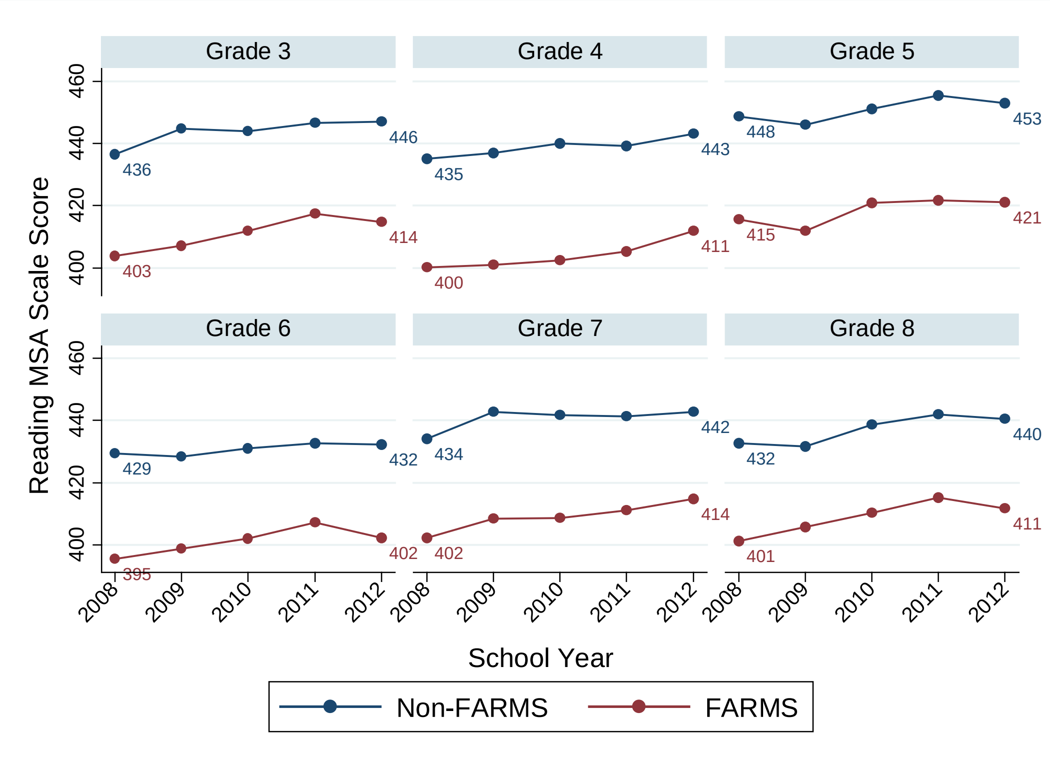
Grade	2007–08	2008–09	2009–10	2010–11	2011–12
3	3,356	3,483	3,483	3,651	3,769
4	3,622	3,444	3,554	3,599	3,728
5	3,714	3,765	3,556	3,727	3,678
6	3,771	3,682	3,804	3,557	3,726
7	4,092	3,810	3,745	3,867	3,645
8	3,885	4,095	3,915	3,862	3,942

Appendix 2. Trend in average math MSA performance (percent advanced proficient) comparing HCPSS and the state by grade level

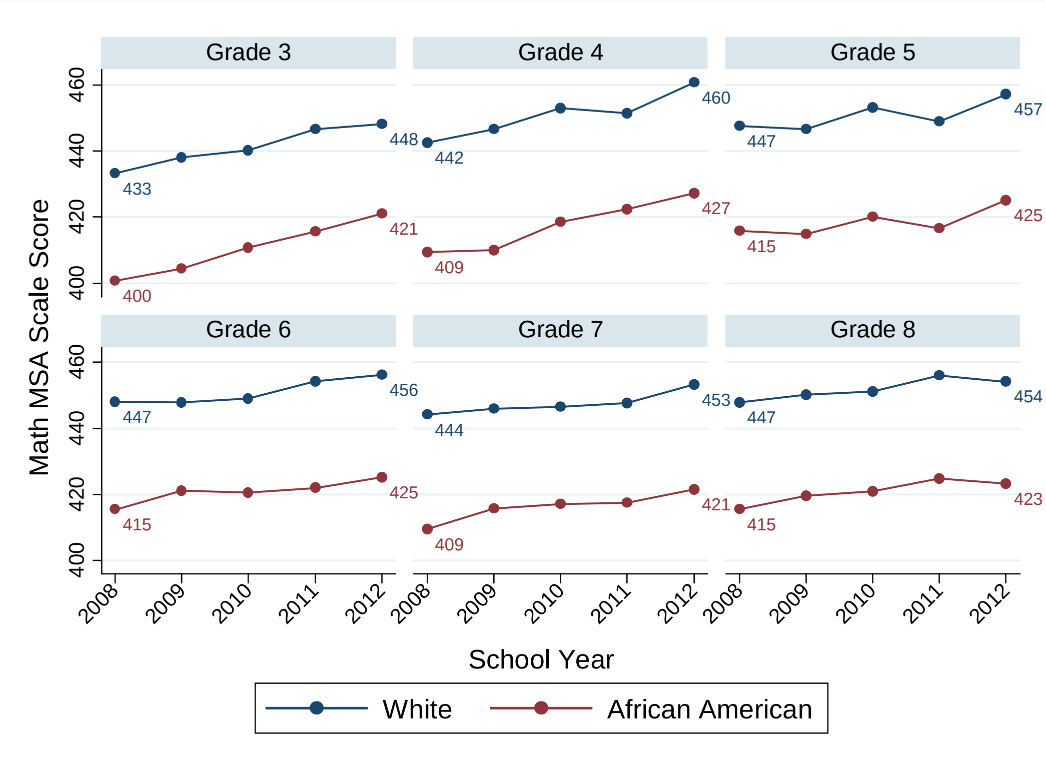


Note: Maryland average excludes HCPSS.
Source: Maryland State Report Card. Retrieved from http://www.mdreportcard.org/Assessments.aspx?K=99AAAA.

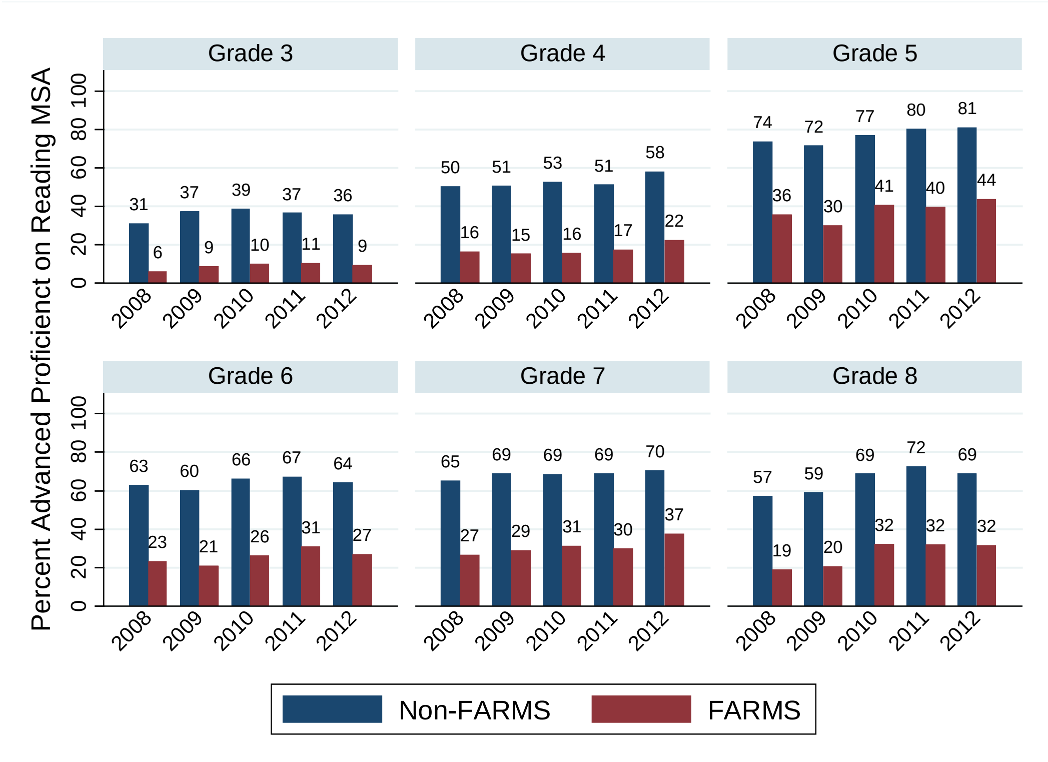
Appendix 3. Trend in average reading MSA scale score by FARMS status and grade



Appendix 4. Trend in average math MSA scale score for White and African American students by grade



Appendix 5. Trend in reading MSA advanced proficiency rates by FARMS status and grade



Appendix 6. Summary of achievement trends based on performance on the math MSA, Grades 3–4 and 6–8

Grade 3						
Group	2009–10 Average scale scores	2011–12 Average scale scores	Trends in scale scores*	2009–10 Advanced proficiency rates	2011–12 Advanced proficiency rates	Trends in Advanced proficiency rates*
Non-FARMS	439	449	↑	51%	62%	↑
FARMS	407	413	↑	18%	22%	↔
Not ELL	435	444	↑	47%	56%	↑
ELL	405	400	↔	17%	12%	↔
Asian	451	460	↑	64%	73%	↑
White	440	448	↑	52%	61%	↑
Hispanic	419	428	↑	30%	36%	↑~
African American	411	421	↑	22%	32%	↑
Grade 4						
Group	2009–10 Average scale scores	2011–12 Average scale scores	Trends in scale scores*	2009–10 Advanced proficiency rates	2011–12 Advanced proficiency rates	Trends in Advanced proficiency rates*
Non-FARMS	451	459	↑	68%	73%	↑
FARMS	412	422	↑	27%	38%	↑
Not ELL	447	454	↑	63%	68%	↑
ELL	408	399	↓	24%	20%	↔
Asian	462	469	↑	78%	80%	↔
White	453	460	↑	70%	76%	↑
Hispanic	420	428	↑	38%	46%	↑~
African American	419	427	↑	35%	43%	↑
Grade 6						
Group	2009–10 Average scale scores	2011–12 Average scale scores	Trends in scale scores*	2009–10 Advanced proficiency rates	2011–12 Advanced proficiency rates	Trends in Advanced proficiency rates*
Non-FARMS	449	455	↑	51%	60%	↑
FARMS	415	419	↑	15%	18%	↔
Not ELL	444	449	↑	45%	53%	↑
ELL	408	414	↔	17%	14%	↔
Asian	462	466	↑	65%	73%	↑
White	449	456	↑	51%	62%	↑
Hispanic	429	426	↔	31%	27%	↔
African American	421	425	↑	19%	24%	↑
Grade 7						

Group	2009–10 Average scale scores	2011–12 Average scale scores	Trends in scale scores*	2009–10 Advanced proficiency rates	2011–12 Advanced proficiency rates	Trends in Advanced proficiency rates*
Non-FARMS	446	451	↑	45%	50%	↑
FARMS	411	419	↑	10%	16%	↑
Not ELL	441	446	↑	40%	45%	↑
ELL	410	406	↔	15%	17%	↔
Asian	460	465	↑	62%	67%	↔
White	447	453	↑	46%	52%	↑
Hispanic	425	430	↑~	20%	28%	↑
African American	417	422	↑	15%	18%	↔
Grade 8						
Group	2009–10 Average scale scores	2011–12 Average scale scores	Trends in scale scores*	2009–10 Advanced proficiency rates	2011–12 Advanced proficiency rates	Trends in Advanced proficiency rates*
Non-FARMS	450	453	↑	56%	60%	↑
FARMS	415	419	↑	16%	18%	↔
Not ELL	445	447	↑	50%	53%	↑
ELL	419	417	↔	25%	23%	↔
Asian	463	465	↔	70%	72%	↔
White	451	454	↑	59%	62%	↔
Hispanic	429	433	↔	29%	36%	↑
African American	421	423	↔	22%	24%	↔

*Based on significance testing the difference between the gap in 2009–10 and 2011–12 at a $p < .05$ significance level.

Appendix 7. Summary of achievement trends based on performance on the reading MSA, Grades 3–8

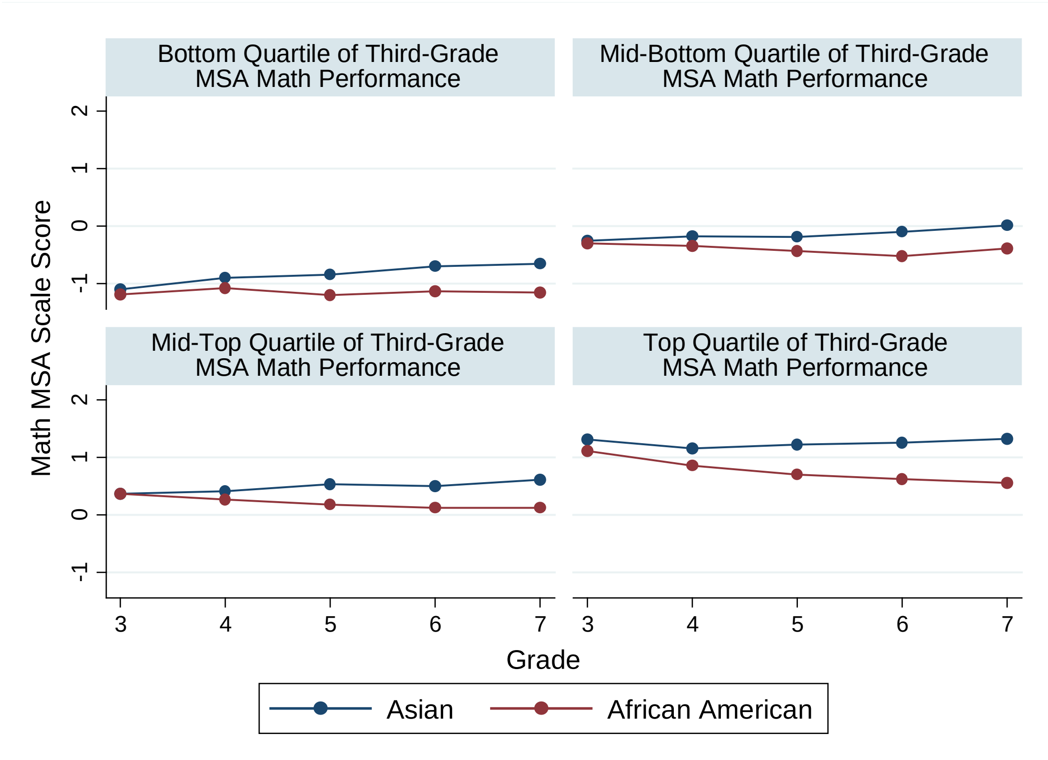
Grade 3						
Group	2009–10 Average scale scores	2011–12 Average scale scores	Trends in scale scores*	2009–10 Advanced proficiency rates	2011–12 Advanced proficiency rates	Trends in Advanced proficiency rates*
Non-FARMS	444	447	↑	39%	36%	↓
FARMS	412	415	↔	10%	9%	↔
Not ELL	440	442	↑	32%	36%	↑
ELL	403	400	↔	--	--	--
Asian	447	451	↑	42%	41%	↔
White	447	448	↔	41%	36%	↓
Hispanic	424	424	↔	20%	17%	↔
African American	418	422	↑	16%	15%	↔
Grade 4						
Group	2009–10 Average scale scores	2011–12 Average scale scores	Trends in scale scores*	2009–10 Advanced proficiency rates	2011–12 Advanced proficiency rates	Trends in Advanced proficiency rates*
Non-FARMS	440	443	↑	53%	58%	↑
FARMS	402	412	↑	16%	22%	↑
Not ELL	436	439	↑	49%	53%	↑
ELL	395	383	↓	--	--	↓~
Asian	447	447	↔	59%	60%	↔
White	442	446	↑	46%	62%	↑
Hispanic	413	417	↔	23%	27%	↔
African American	410	418	↑	24%	31%	↑
Grade 5						
Group	2009–10 Average scale scores	2011–12 Average scale scores	Trends in scale scores*	2009–10 Advanced proficiency rates	2011–12 Advanced proficiency rates	Trends in Advanced proficiency rates*
Non-FARMS	451	453	↑	77%	81%	↑
FARMS	421	421	↔	41%	44%	↔
Not ELL	448	448	↔	73%	76%	↑
ELL	397	391	↔	9%	7%	↔
Asian	451	460	↑	74%	84%	↑
White	455	454	↔	81%	83%	↑~
Hispanic	434	434	↔	57%	58%	↔
African American	427	428	↔	50%	53%	↔
Grade 6						

Group	2009–10 Average scale scores	2011–12 Average scale scores	Trends in scale scores*	2009–10 Advanced proficiency rates	2011–12 Advanced proficiency rates	Trends in Advanced proficiency rates*
Non-FARMS	431	432	↔	66%	64%	↔
FARMS	402	402	↔	26%	27%	↔
Not ELL	427	428	↔	61%	59%	↔
ELL	392	380	↓	9%	6%	↔
Asian	436	437	↔	69%	67%	↔
White	432	433	↔	68%	66%	↔
Hispanic	415	410	↓	43%	35%	↓
African American	410	410	↔	38%	37%	↔
Grade 7						
Group	2009–10 Average scale scores	2011–12 Average scale scores	Trends in scale scores*	2009–10 Advanced proficiency rates	2011–12 Advanced proficiency rates	Trends in Advanced proficiency rates*
Non-FARMS	442	443	↔	69%	70%	↔
FARMS	409	415	↑	31%	37%	↑
Not ELL	438	439	↔	64%	66%	↔
ELL	390	387	↔	12%	8%	↓
Asian	453	450	↔	76%	75%	↔
White	442	444	↑~	70%	73%	↑~
Hispanic	420	427	↑	43%	53%	↑
African American	419	419	↔	43%	44%	↔
Grade 8						
Group	2009–10 Average scale scores	2011–12 Average scale scores	Trends in scale scores*	2009–10 Advanced proficiency rates	2011–12 Advanced proficiency rates	Trends in Advanced proficiency rates*
Non-FARMS	439	441	↑	69%	69%	↔
FARMS	410	412	↔	32%	32%	↔
Not ELL	435	436	↑	64%	63%	↔
ELL	387	389	↔	--	--	--
Asian	446	446	↔	74%	73%	↔
White	439	442	↑	71%	71%	↔
Hispanic	420	424	↔	44%	46%	↔
African American	420	420	↔	42%	42%	↔

*Based on significance testing the difference between the gap in 2009–10 and 2011–12 at a $p < .05$ significance level. ~ signifies significance at the $p < .1$ significance level.

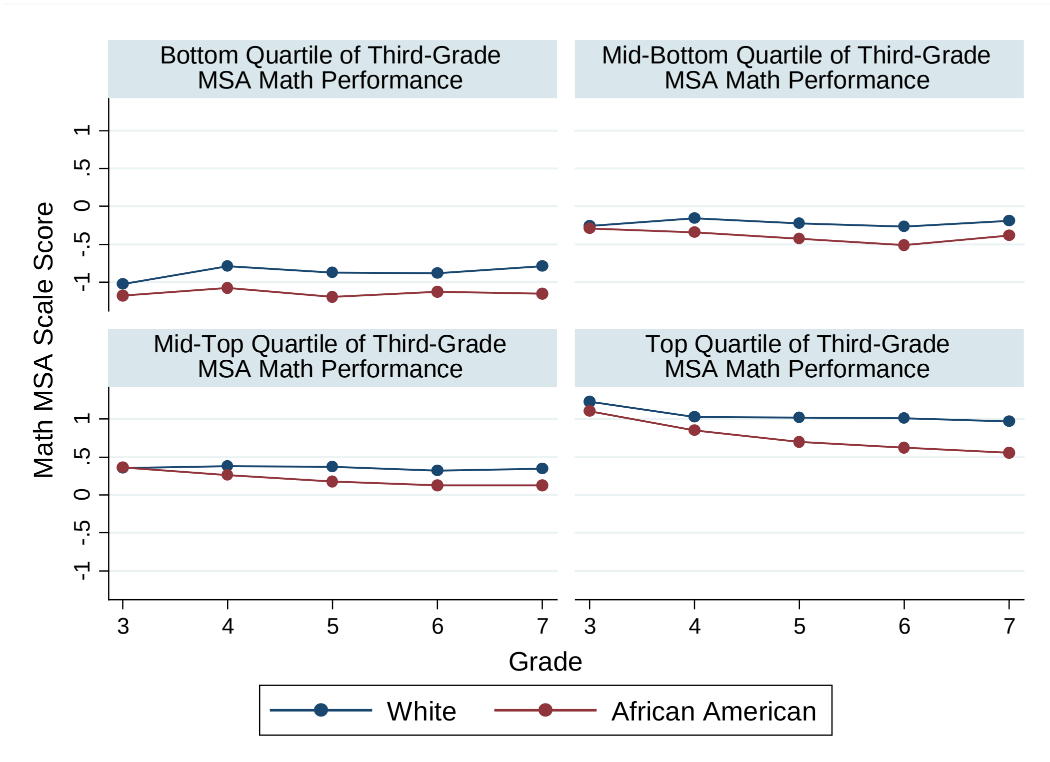
Appendix 8. Average scale score trajectory on math MSA for cohort in Grade 3 in 2007–08

A. Average scale score trajectory on math MSA for cohort in Grade 3 in 2007–08 by African American and Asian students' third-grade math MSA quartiles



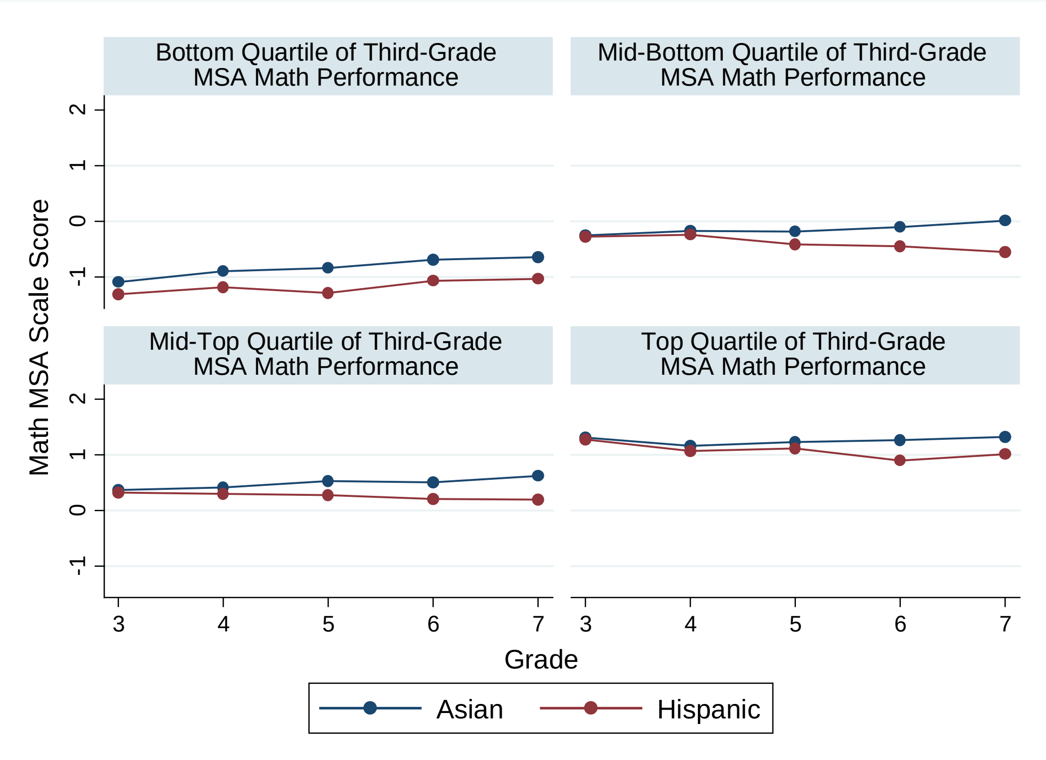
Notes: Only those students enrolled at HCPSS from third through eighth grade are included. Initial performance quartile is based on third-grade performance. Sample sizes: Asian Q1 =58; Asian Q2=80; Asian Q3=117; Asian Q4=171; African American Q1 =207; African American Q2=138; African American Q3=85; African American Q4=42.

B. Average scale score trajectory on math MSA for cohort in Grade 3 in 2007–08 by African American and White students' third-grade math MSA quartiles



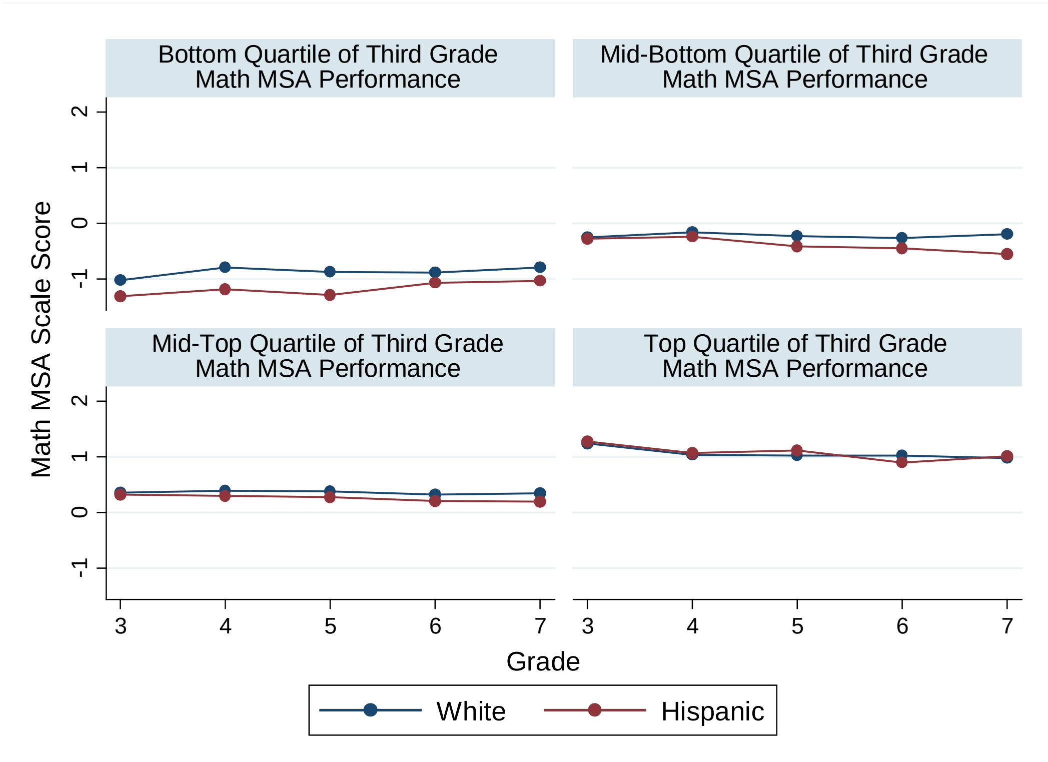
Notes: Only those students enrolled at HCPSS from third through eighth grade are included. Initial performance quartile is based on third-grade performance. Sample sizes: White Q1 =170; White Q2=371; White Q3=438; White Q4=430; African American Q1 =207; African American Q2=138; African American Q3=85; African American Q4=42.

C. Average scale score trajectory on math MSA for cohort in Grade 3 in 2007–08 Hispanic and Asian students' third-grade math MSA quartiles



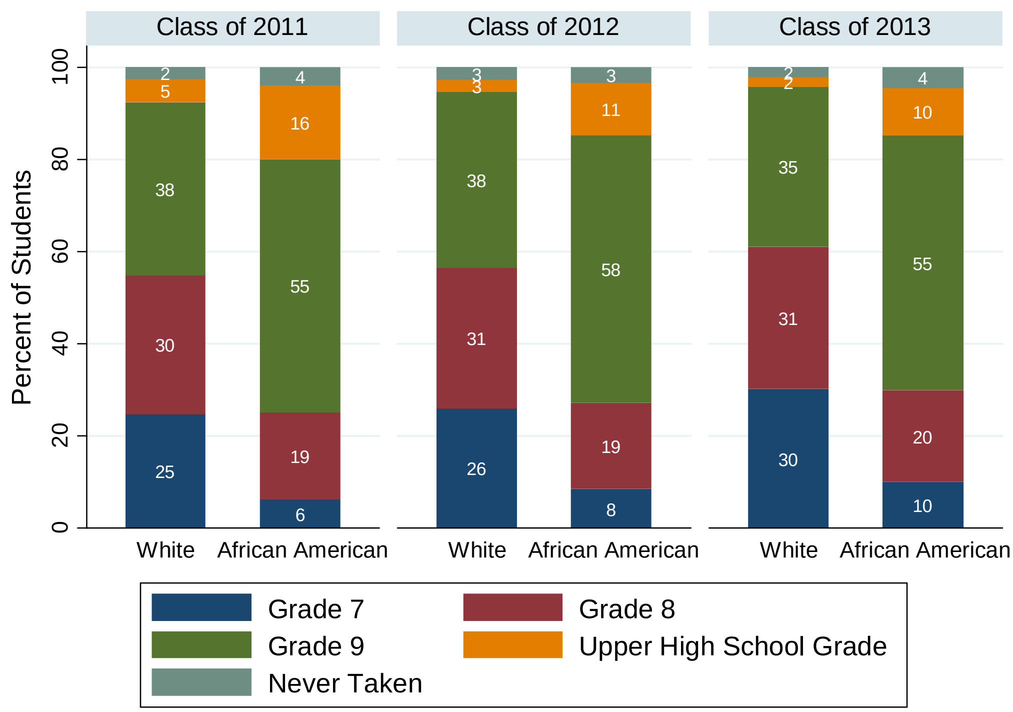
Notes: Only those students enrolled at HCPSS from third through eighth grade are included. Initial performance quartile is based on third-grade performance. Sample sizes: Asian Q1 =58; Asian Q2=80; Asian Q3=117; Asian Q4=171; Hispanic Q1 =65; Hispanic Q2=52; Hispanic Q3=40; Hispanic Q4=32.

D. Average scale score trajectory on math MSA for cohort in Grade 3 in 2007–08 Hispanic and White students' third-grade math MSA quartiles

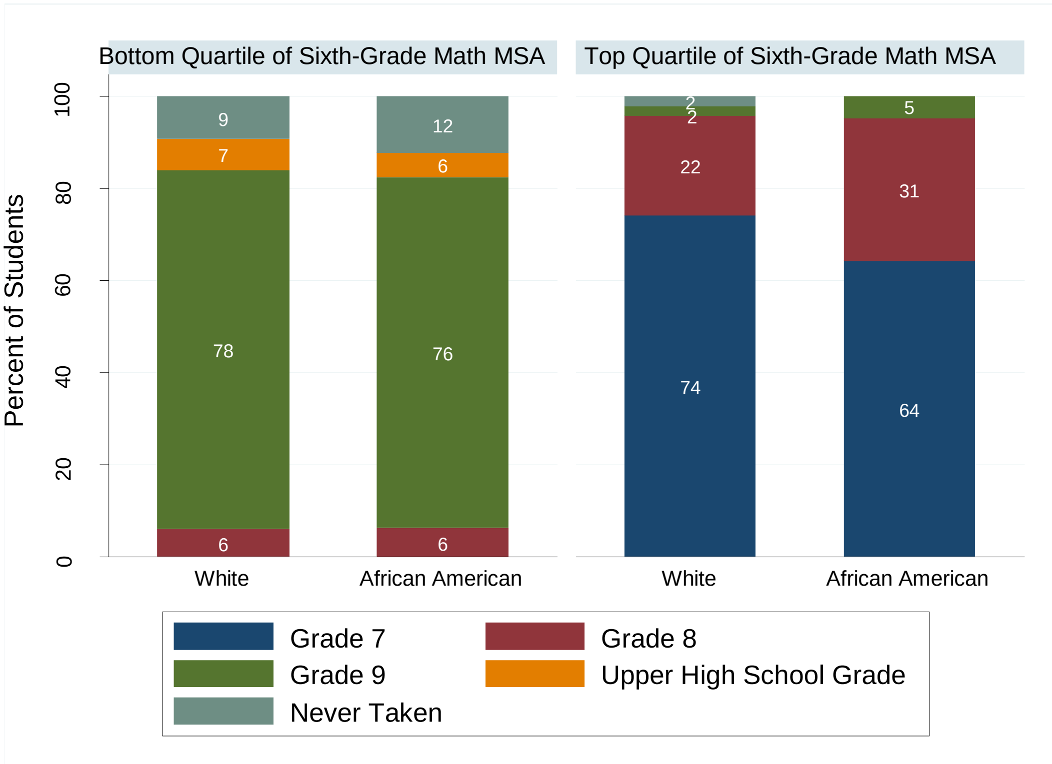


Notes: Only those students enrolled at HCPSS from third through eighth grade are included. If a student was ever classified as FARMS during this time period, they were considered a FARMS student. Initial performance quartile is based on third-grade performance. Sample sizes: White Q1 =170; White Q2=371; White Q3=438; White Q4=430; Hispanic Q1 =65; Hispanic Q2=52; Hispanic Q3=40; Hispanic Q4=32.

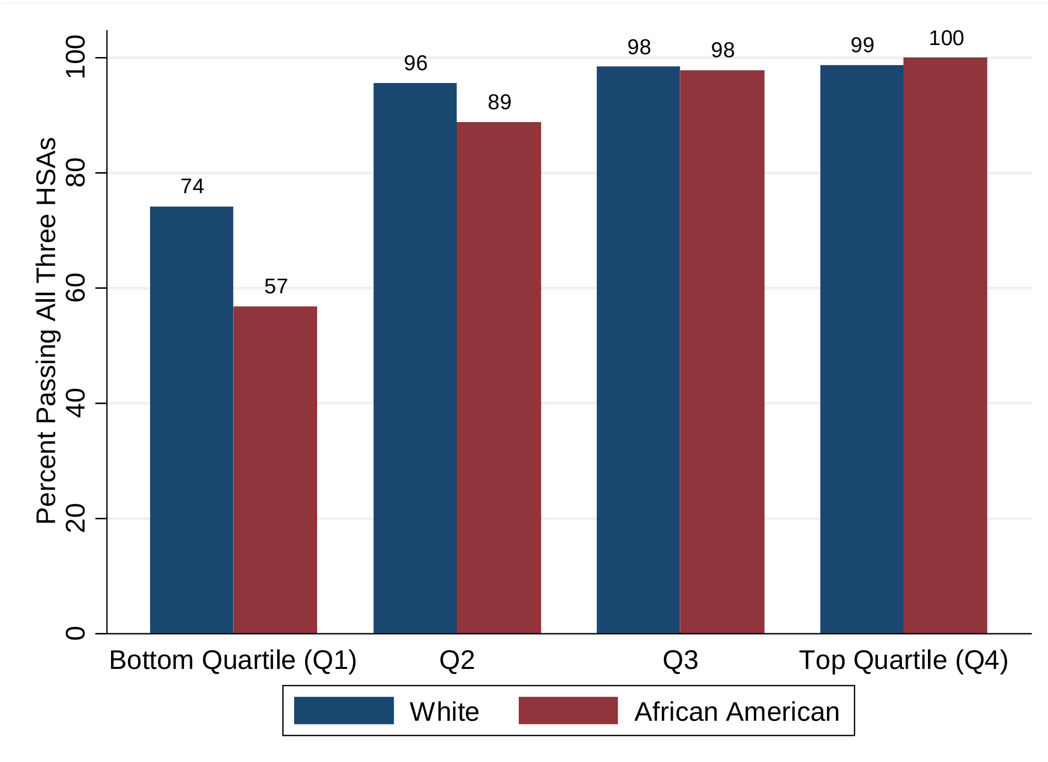
Appendix 9. Grade in which the algebra/data analysis HSA is first taken by graduating class and race



Appendix 10. Grade in which the algebra/data analysis HSA is first taken by sixth-grade prior math MSA performance and race, class of 2014

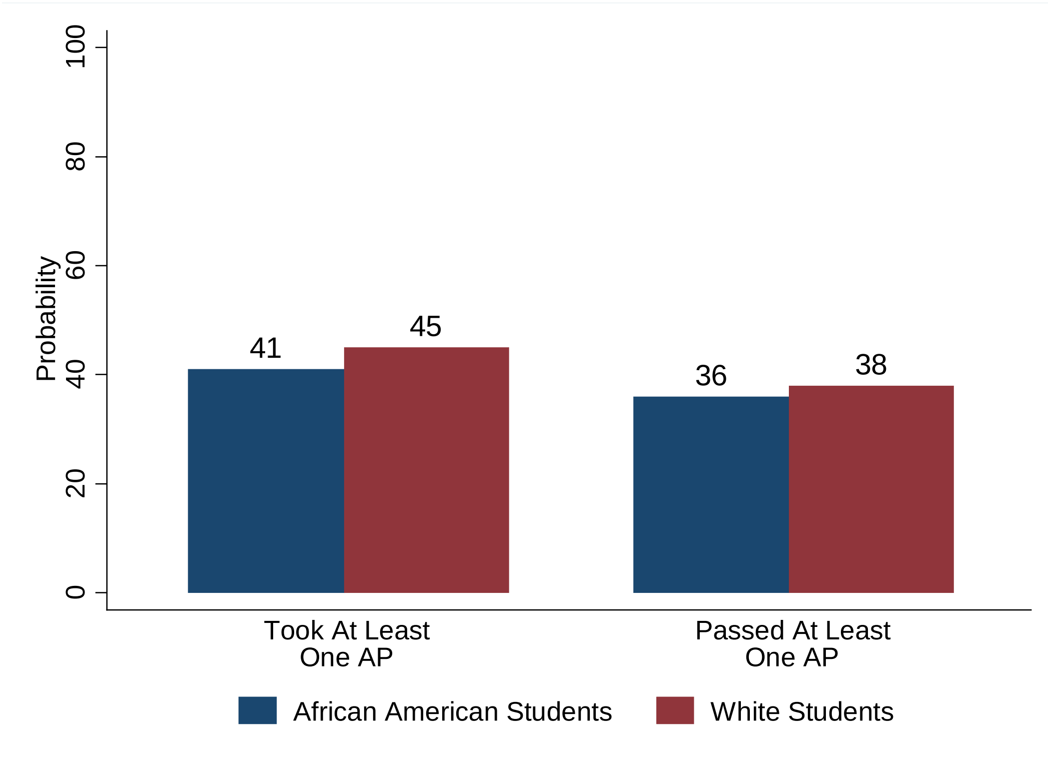


Appendix 11. Percentage of African American and White students passing all three HSAs by prior eighth-grade math MSA quartile, class of 2012



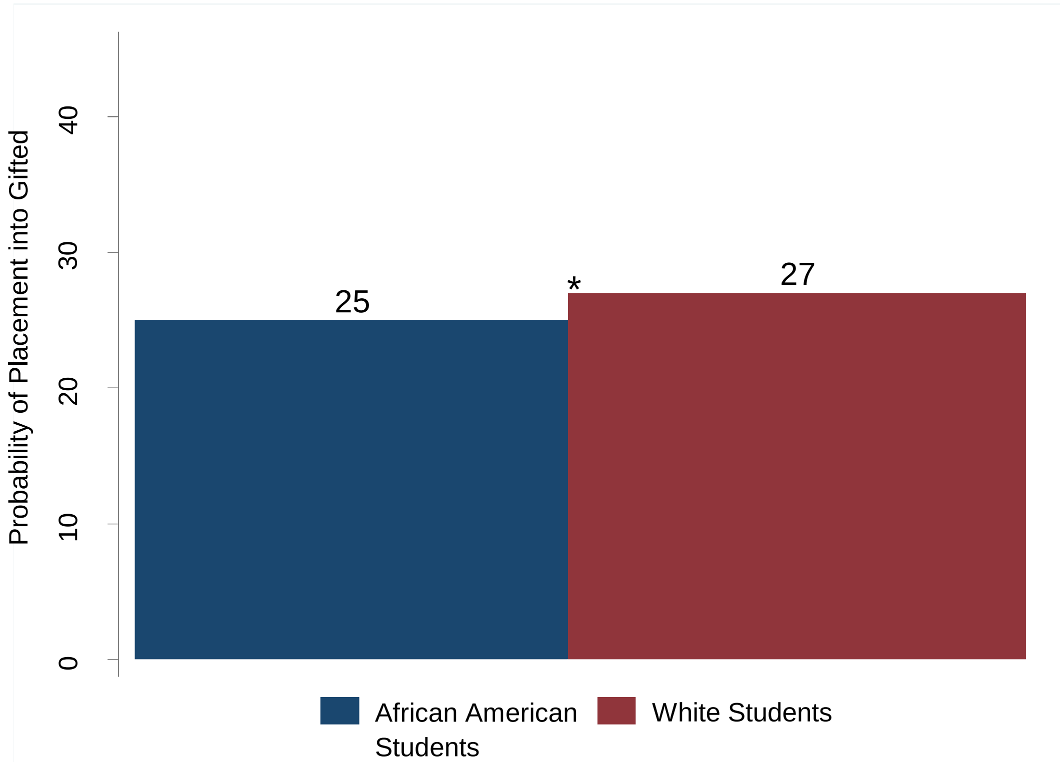
Note: Differences between African American and White students are significant for Q1 and Q2 at $p < .05$ after controlling for average differences in prior achievement within quartile. Sample based on students with prior eighth-grade math MSA performance data. Sample sizes: Q1 White=290; Q1 African American =322; Q2 White =452; Q2 African American =152; Q3 White =568; Q3 African American =92; Q4 White =539; Q4 African American =48.

Appendix 12. AP participation and pass rates controlling for prior math MSA performance, class of 2012



Note: No statistically significant differences at $p < .05$ comparing the difference between student characteristics in probability of taking and passing an AP exam. Sample based on students with prior eighth-grade math MSA performance data. Sample size: 2,467 African American and White students.

Appendix 13. Fourth-grade first-time placement into gifted math for African American and White students, controlling for prior third-grade math MSA achievement



Note: * indicates statistical significance at $p < .05$ comparing the difference between African American and White students in probability of placement into gifted. Sample based on students with prior fourth-grade math MSA performance data. Sample sizes: 6,840 2010–11 and 2011–12 students in Grade 4.