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 receiving free and reduced-price meals services (FARMS students) 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 60% (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 54% 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 ("Our changing public schools," 2011). In just the last five years, from 2007 to 2012, the number of FARMS students increased by 33%.

These changing demographics are spread across the district as whole, and evident in most individual schools. As shown in Figure 4, over the last four 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 was comparable, whereas the 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 (MSDE, 2012). 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 High School Assessments) and by exams of college-level rigor (Advanced Placement 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 2009 (excluding ninth-grade repeaters). If 2009's 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 students who graduated on time in 2012, students who dropped out, and students who are still enrolled in HCPSS in the fall of 2012.

Finally, we also briefly 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.[2]

These analyses are descriptive only. That is, they do not attempt to make causal inferences. While they provide information about achievement and participation trends, they do not attempt to 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.

[2] In analyses where we are interested in trends over time by race, we focus on the 2009–10 through 2011–12 school years. For the past three years, the new race codes were collected for all HCPSS students.

Key Findings

- MSA Achievement Gaps
    - Generally, *scale score gaps* and *proficiency rate gaps* are shrinking on the math MSAs when comparing FARMS students to non-FARMS students and White or Asian students to African American and Hispanic students.
    - *Advanced proficiency rate gaps* between groups are not shrinking. This is an artifact of the way proficiency rates are calculated.
    - Overall gap trends mask considerable differences at the school level.

- HSA Participation and Performance Gaps
    - Increased proportions of all students are taking the Algebra/Data Analysis HSA earlier across all student groups.
    - The timing of when HSAs are taken is, not surprisingly, related to achievement. However, there are also differences by student group unrelated to achievement.

- Advanced Placement Participation and Performance Gaps
    - While participation on advanced placement exams for FARMS students lags behind non-FARMS students even after controlling for eighth-grade math achievement, 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 is driven by prior preparation.

- Gifted and Talented Course Participation
    - Much of the discrepancy in the proportion of FARMS students versus non-FARMS students and White or Asian students versus African American students that are placed into G/T classes can be explained by prior student performance in third-grade math and reading MSA performance.

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, which 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 on the test score distribution 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 420 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.[3]

A second type of metric emphasized in the No Child Left Behind Act is the percentage of students categorized as “proficient” or “advanced proficient.” 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

[3] The standard deviation for Grade 5 math scale scores in 2011–12 is 39. A standard deviation illustrates how much variation there is from the average.

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 in the 2011–12 school year, 84% of FARMS students fell below the advanced proficiency threshold, compared to only 45% of the non-FARMS students.

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 11 to 12 scale score points. This results in the average scale score achievement gap between FARMS and non-FARMS students remained almost unchanged over the four 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 essentially constant.

However, if we focus only on percent of student achieving advanced proficiency, the results are misleading. In 2007–08, 89% of FARMS students failed to reach advanced proficiency. By 2011–12, this figure was down to 84%, an improvement of 5 percentage points. For non-FARMS students, the analogous figures are 56% in 2007–08 and 45% in 2011–12, for an improvement of 9 percentage points. Therefore, it appears that achievement gap between FARMS and non-FARMS students is growing. This apparent growth, however, is a function of the fact that a greater share of non-FARMS students have test scores near the advanced proficiency cutoff. Note that if we looked at proficiency rates as opposed to advanced proficiency rates, it would appear as if the achievement gap is shrinking.

While we highlight these metrics' differences, one is not necessarily more important or better than the other. Rather, each provides different information. Percent advanced proficient, as a metric, is important for gauging the extent to which students meet an advanced level of knowledge and skill in a given subject area. This could be an important metric, particularly if we believe that the cutoffs used are educationally meaningful benchmarks. If so, then it is sensible to focus on helping students to achieve at that advanced level. Nevertheless, such an 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 if test scores for FARMS and non-FARMS students improved at a similar rate such that all students met the minimum level of advanced proficiency, large gaps in average achievement would persist between the two groups. Therefore, we recommend considering both metrics 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. Figure 8 shows HCPSS grade-level average trends on the MSA in mathematics in blue. Over this five-year period, increases in average performance range from a 20-plus scale score point increase in Grade 3 to a 5 scale score increase in Grade 8. These increases range from 0.14 to 0.46 of a standard deviation.[4] Trends in reading are also improving but generally not at the same pace as math trends (Figure 9).

Using percent 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 10, in the five most recent years, the percentage of students achieving advanced proficiency in mathematics has increased across grades. Increases in the early grades have been greater; the advanced proficiency rate in mathematics for Grades 3 to 5 has improved by 12 percentage points on average. The proficiency rate in reading has also improved across grades (Figure 11).

Taken together, overall district performance appears to have trended positively over the past several years. 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 not only know how the district as a whole is performing, but 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 of excellence. 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 percent advanced proficient.[5] The district has made some small progress in decreasing gaps in scale score achievement between minority students and Asian students and between FARMS students and non-FARMS students. However, these will not translate into a narrowing of the gap in advanced proficiency rates for many years to come. In addition, the existing gaps between groups are large and educationally meaningful.

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[4] The standard deviation increases are as follows: grade 3=0.46, grade 4= 0.39; grade 5=0.22, grade 6=0.21, grade 7=0..23, and grade 8=0.14.

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

Figure 12 shows the trend in math MSA average scale scores by FARMS status and grade. 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 37 scale score points in 2012, which is approximately three quarters of a standard deviation. To give a sense of the size of this difference, three quarters of a standard deviation is the difference between a fifth-grade student at the 50th and 76th percentile in math achievement.[6]

While gaps in average scale score achievement have remained constant, we observe that gaps based on percent of students achieving advanced proficiency have increased over this period. We illustrate trends in advanced proficiency rates for FARMS and non-FARMS students in Figure 13. 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% (Figure 14 and Figure 15).

As we summarize in Figure 16, gaps between groups on the fifth-grade math MSA are different depending on metric. The largest achievement gaps, regardless of metric, are between Black and Asian students. Gaps in scale score points between all subgroups have not changed significantly between 2009–10 and 2011–12, except for the Hispanic and White students, for whom the gap has decreased.[7] In contrast, we observe gaps increasing based on the share of students meeting advanced proficiency standards between FARMS and non-FARMS students, between Black and White students, and between Black and Asian students. We also note the increasing gaps in scale score points and percent 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 4) and reading (Appendix 5).

Cohort Trends in District Performance

The 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.

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[6] Approximately 26% of students on a normal distribution fall between the mean and plus or minus three quarters of a standard deviation.

[7] Statistical significance is calculated throughout this report at the $p < .05$ level.

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, e.g., 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 17, 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. Again, we restrict our sample to those students who remain 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.[8] We utilize standardized scale scores as the metric of analysis in order to compare relative performance across grades.

Figure 17 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, particularly in the top quartile. 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 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.[9]

One potential reason for differences in achievement gaps 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. 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 average gap between FARMS and non-FARMS students' performance (on the y-axis). Based on the placement of points, we conclude that student composition does not appear to explain test score gaps at all. That is, school grade levels with relatively high percentages of FARMS students show the same range in achievement gaps as school grade levels with relatively low percentages of FARMS students.

[8] Note that there was differential attrition such that, of those students starting grade 3 in 2008, 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.
[9] The standard deviation for Grade 7 math scale scores in 2011–12 is 37.

While this set of results clearly illustrates that FARMS students are not keeping pace relative to their non-FARMS counterparts, it is important to highlight 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, e.g., 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. Appendix 6 presents the same figure comparing other demographic groups.

ELL Classification

As noted above, there are increasing gaps between ELL and non-ELL student performance on the MSAs between 2007–08 and 2011–12 across the elementary and middle school grades. However, ELL for individual students varies from year to year as students are reclassified as fluent. As a result, the gap changes mentioned above may the result of changing reclassification policies and rates.

Figure 19 tracks the percentage of students classified as ELL for the 2008 through 2010 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 the increased gaps between ELL and non-ELL students over the last five years may be the result of changing reclassification policies. Those students who remained classified as ELL have lower performance relative to their grade-level peers in 2011–12 as compared to 2007–08 (Figure 20).[10] In contrast, Figure 21 tracks the percentage of students classified as ELL for the 2008 through 2010 third-grade cohorts. These cohorts are restricted to those students who are in third grade HCPSS in their respective cohort year and remain in HCPSS during the time period studied. As the figure illustrates, each successive cohort has been reclassifying students at similar rates. The contrast between Figure 19 and Figure 21 suggests that there have only been changes to time until reclassification have been concentrated to the beginning elementary grades.

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

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.

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 achievement in the district.[11] We focus on timing on 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. High school 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 HAS 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 exam 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 2009 and, if they graduated on time, graduated in 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.

[11] 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 that did not have changes in administration during this time period.

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 that transfer 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.[12] 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 22 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.

However, this pattern does not hold across groups. Figure 23 displays the grade in which students first take the math HSA exam by graduating class and whether the student is identified as FARMS. 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 49% 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 also 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 ($p < .05$).

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 24 for the class of 2014. There are small gaps in the timing of test taking for FARMS and non-FARMS students in the bottom quartile of performance, with a larger percentage of non-FARMS students taking the HSA in middle school or 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.

[12] 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.

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.[13]

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 25 and Figure 26. In Figure 25, 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 average prior performance generally have high percentages of students taking the algebra/data analysis exam for the first time in middle school. While this may explain some of the differences in middle school participation rates across FARMS and non-FARMS students and across schools, note that there is still similar participation across schools that have students with different prior performance. For instance, the average participation rate for FARMS students is around 25% for six middle schools. However, there is over a 10 scale score point range in the prior performance of students across these schools.

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 particularly 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 their FARMS classmates.

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

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

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[13] Top-performing FARMS and non-FARMS students in sixth grade had no significant difference in their average test scores.

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 (72% to 89%).

Figure 33 and Figure 34 show participation and passing rates 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 33. In contrast, Figure 34 displays more variation in school-level pass rates. This variation appears to be related to students' scores entering eighth grade. 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 35 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 Marriotts Ridge have passing rates similar to their peers with higher incoming average achievement scores.

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 & Berkovitz, 2000). Links between student backgrounds and the academic rigor of high school coursework are also related (Hallinan, 1994). 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 their preparedness for college-level work.

Howard County has surpassed national and state trends in AP participation and passing rates (MSDE, 2012b). Specifically, AP participation is slightly higher in Howard County as compared to the rest of the district at 23% of enrolled HCPSS high school students compared to 21% of high school students from other Maryland counties. At the same time, 82% of the AP exams taken in HCPSS in 2012 received passing scores of 3 or better while only 59% of the exams taken in other Maryland districts received passing scores. However, these overall trends mask differences across students and schools.[14]

[14] Maryland Report Card.

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, like art history, which do 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 the duration of 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 37 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.[15]

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% 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 take at least one AP exam and 33% of Hispanic students.

Only 17% of FARMS students take at least one exam as compared to 49% of non-FARMS students. Figure 38 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. For students who scored at the average student level in eighth grade, 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 students who have taken an AP exam, there is no FARMS gap in the likelihood of 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 the exam are just as prepared to pass as non-FARMS students who take the exam.

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[15] 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.

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 (see Figure 40). For example, there is little difference in the percentage of students taking at least one AP between Hammond, Long Reach, Oakland Mills, and Wilde Lake high schools despite lower incoming preparation for students in Hammond and Oakland Mills High Schools. Similarly, a higher proportion of students take AP exams at River Hill High School than at Atholton, despite having students entering with similar eighth-grade math scores.

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 (see Figure 41). Even in schools where FARMS students have similar incoming performance to other schools' non-FARMS students, such as Centennial and Genelg High Schools, FARMS students' participation rates are substantially lower. The same general school-level patterns hold true for the percentage of students passing one AP exam (see Figure 42 and Figure 43).

4. Gifted and Talented Course Placement and Participation in HCPSS

The gifted and talented (G/T) 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 and those with special needs 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.[16] We use administrative data for to establish when a student participates 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 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

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

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 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. It is important to note that these analyses do not investigate students eligible for enrollment in a G/T course who choose not to participate.

Gifted and Talented Course Participation: Trends over Time

We illustrate trends in gifted and talented course participation by grade in Figure 44. 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 identified for the program. In 2009, 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 44 displays all students who participate in a G/T class by grade, Figure 45 focuses on first-time G/T participation. Most students are identified and start G/T participation in Grade 4. Another 8% of students are identified for the first time in Grades 5 and 6, and less than 5% are identified for the first time in Grades 7 and 8. Grade 4 also shows the largest increase in the proportion of students identified for the first time between 2007–08 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 minority students in a school relative to the percentage of minority students in G/T courses. If G/T participation were equally distributed across student groups, we would expect a school with 50% minority students to have 50% of its students participating in the G/T program to be minorities. However, G/T participation is due in part to advanced student achievement. Given that there are large gaps in student achievement by student groups, correspondingly we should expect gaps in G/T participation. In fact, Figure 46 shows that non-Asian non-White students are underrepresented in G/T relative to their proportion in the school. This pattern is more pronounced with FARMS students (Figure 47).

Gifted and Talented Course Placement Decisions: Testing Versus Review Process

As Figure 48 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 49 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 in third-grade math and reading MSA performance. When we look at placement decisions into gifted by FARMS status and average prior math performance in

Figure 50, 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 51 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. At the same time, Figure 52 shows that G/T placement is no different for African American and White students after controlling for prior achievement. These graphs suggest 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 and African American and White students—a gap that guarantees many fewer FARMS students and minorities 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.

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Figures

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

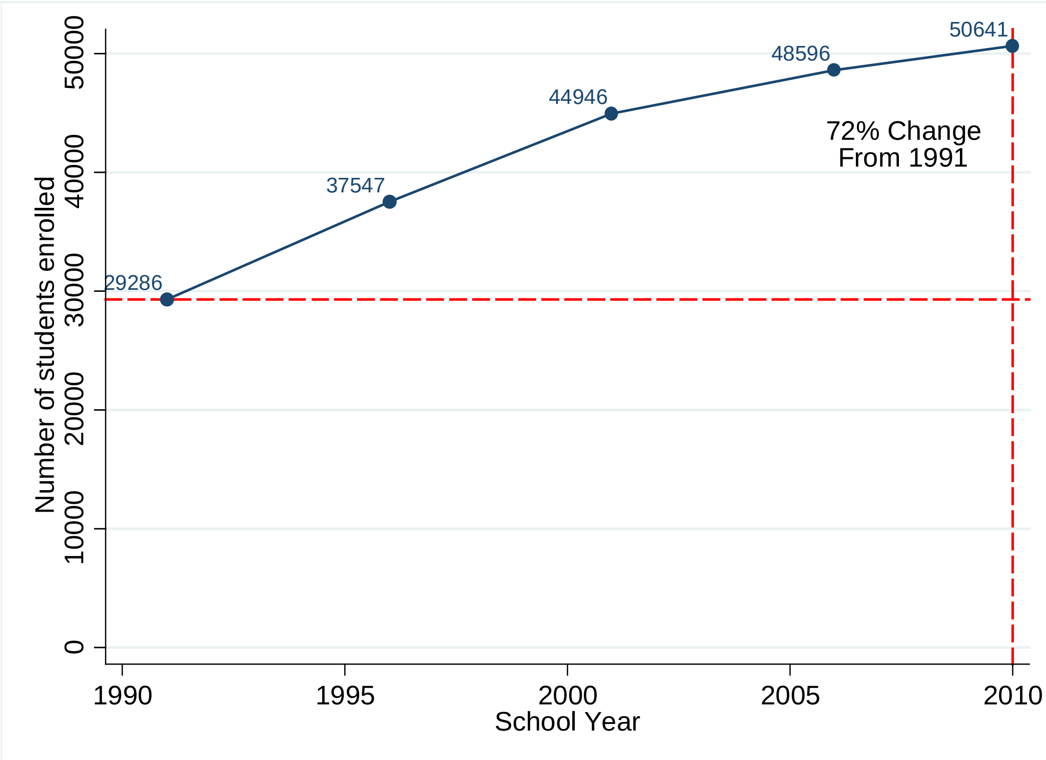


Figure 1. HCPSS enrollment: pre-K through 12th-grade students.

Note: The percent change from 1991 is labeled on the graph.
Source: Common Core of Data (CCD), "Local Education Agency Universe Survey" , 1990-91 v.1a, 1995-96 v.1a, 2000-01 v.1a, 2005-06 v.1a, 2009-10 v.2a

Racial diversity has increased.

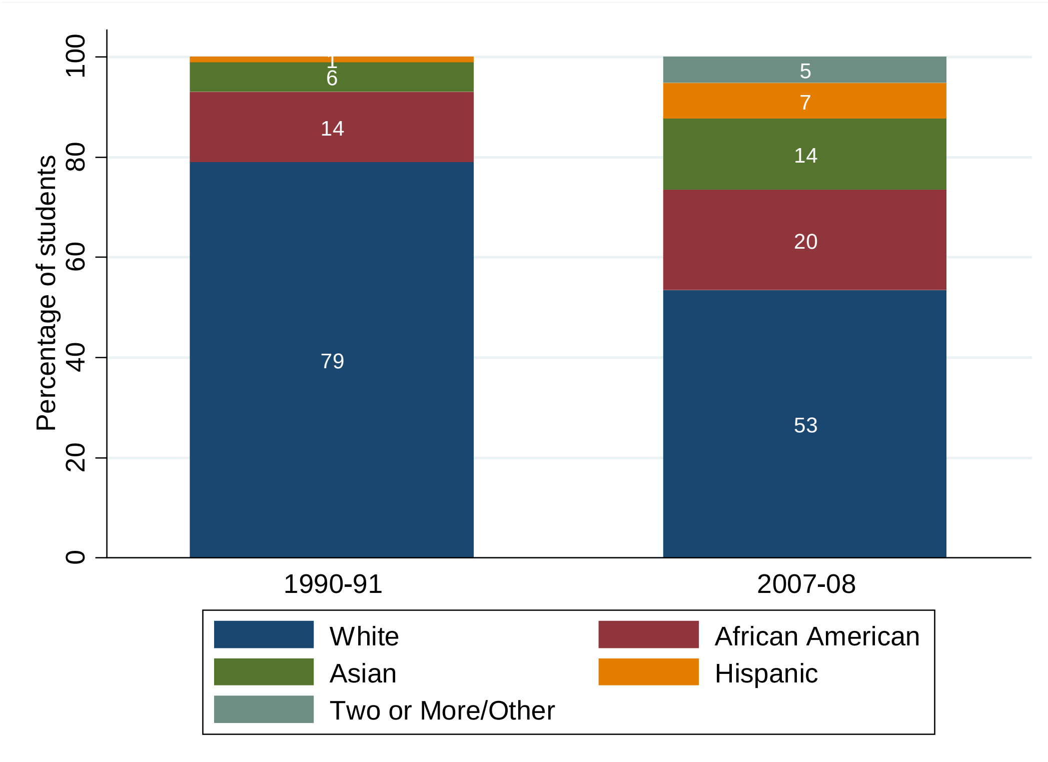


Figure 2. Racial/ethnic composition of K-12 HCPSS students

Note: Racial/ethnic composition changed in the 2010 school year.
Sample sizes (Total Students): 1991= 29,286; 2008= 51,474.

Economic diversity is also increasing.

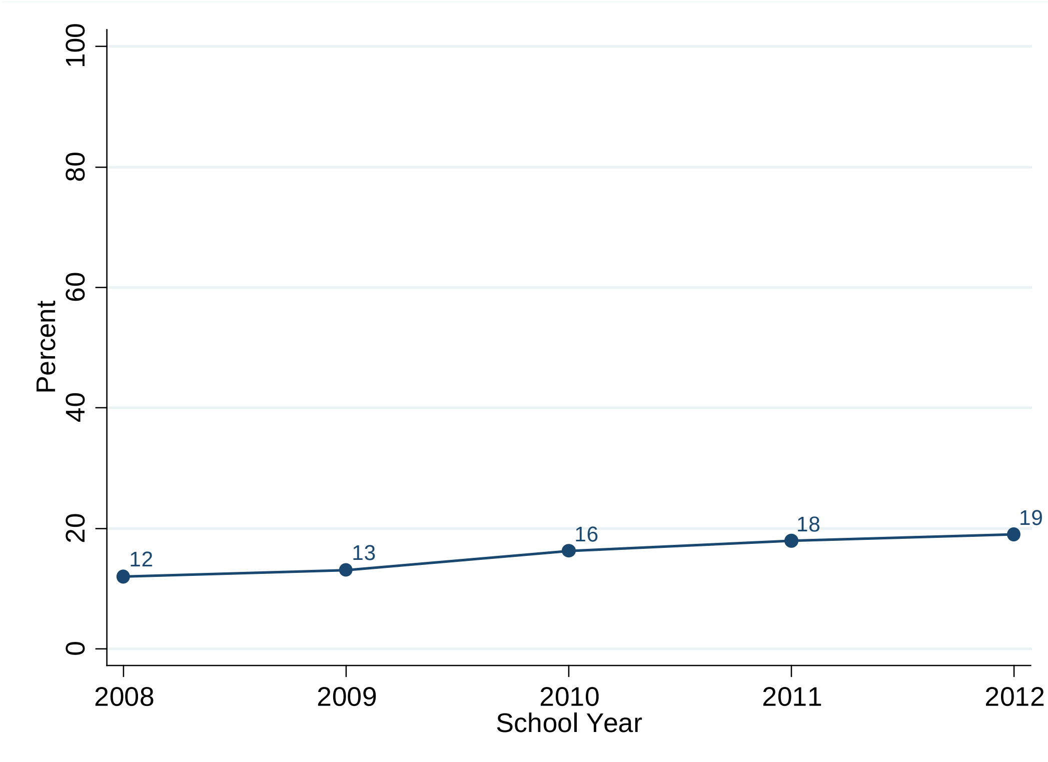


Figure 3. Percentage of Free and Reduced Meals Services (FARMS) students, by school year

Sample sizes (Total Students): 1991= 29,286; 2012= 53,332.

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

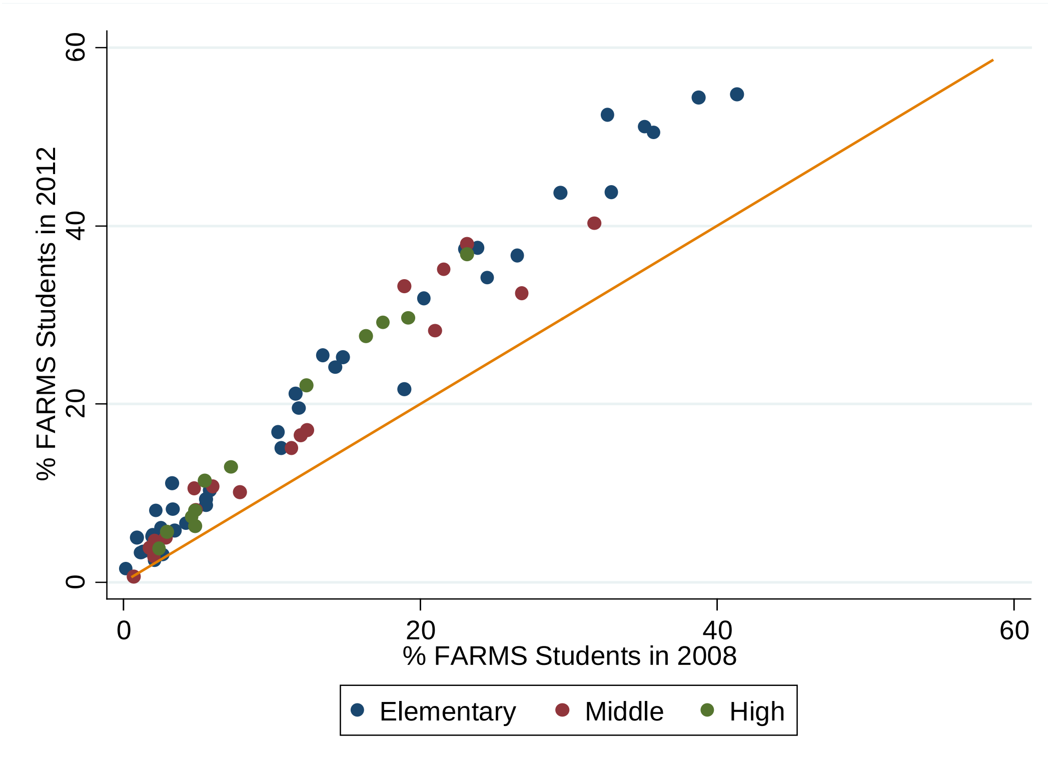


Figure 4. Schools by Percentage of FARMS Students in 2008 and 2012

Sample Sizes (Total Students): 2008= 51,474; 2012= 53,332.

There is a large average difference in the performance of FARMS and non-FARMS students on the fifth-grade math MSA in 2011-12.

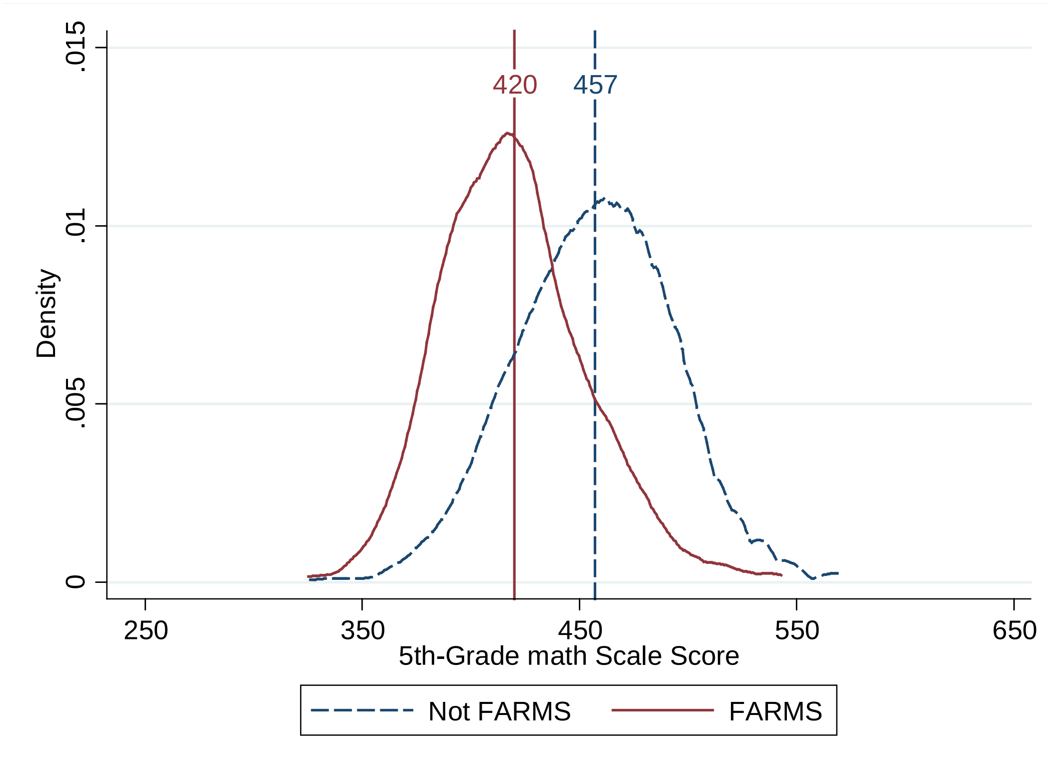


Figure 5. Distribution of performance and average performance on grade 5 mathematics MSA in 2011-12 by FARMS status

Note: The red distribution shows the performance of FARMS students, and the blue dashed-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.
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 non-FARMS students.

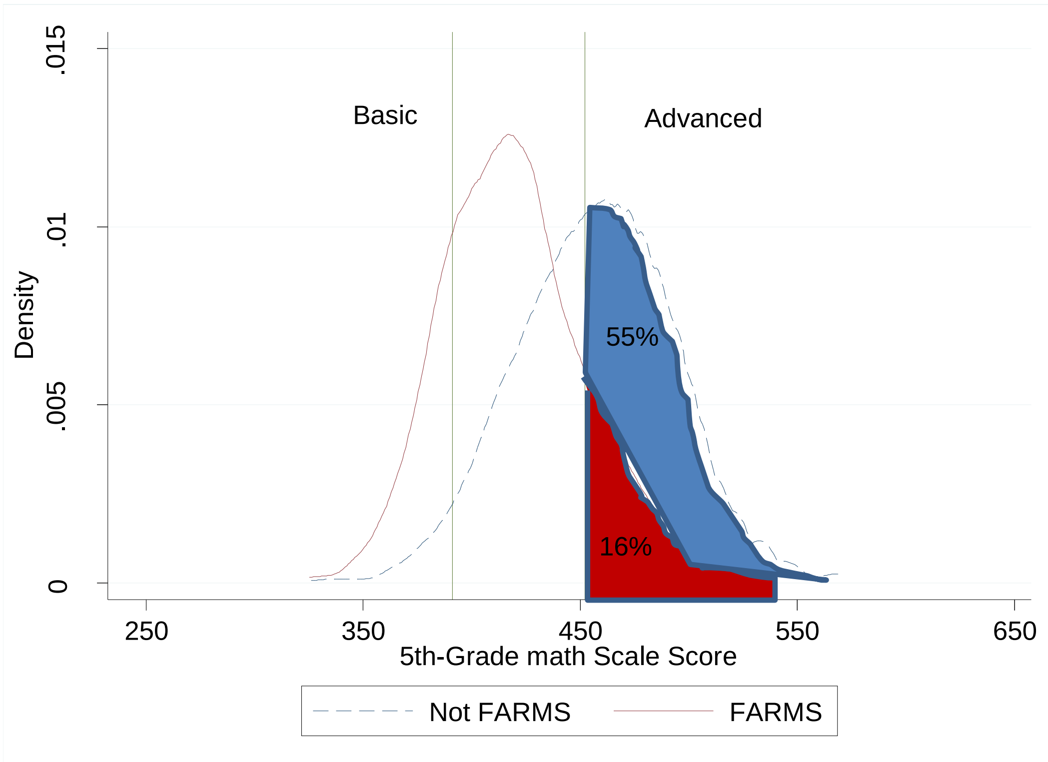


Figure 6. Distribution of performance on grade 5 mathematics MSA assessment relative to the grade- and subject-level proficiency threshold in 2011-12 by FARMS status

Note: The red distribution shows the performance of FARMS students, and the blue dashed-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 roughly similar rates on fifth-grade math MSA performance in 2007-08 to 2011-12.

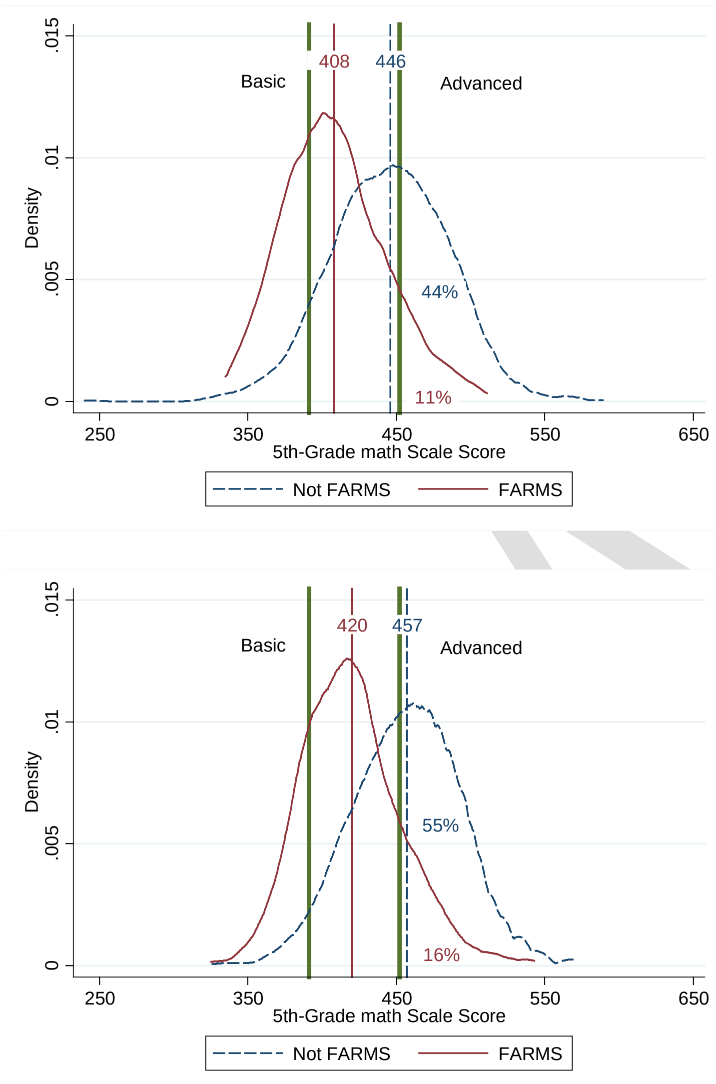


Figure 7. Distribution of performance and average performance on grade 5 mathematics MSA in 2007-08 (top panel) and 2011-12 (bottom panel) by FARMS status

Note: The red distribution shows the performance of FARMS students, and the blue dashed-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 2008= 476; Non-FARMS students in 2008= 3,238; FARMS students in 2012= 706; Non-FARMS students in 2012= 2, 972.

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

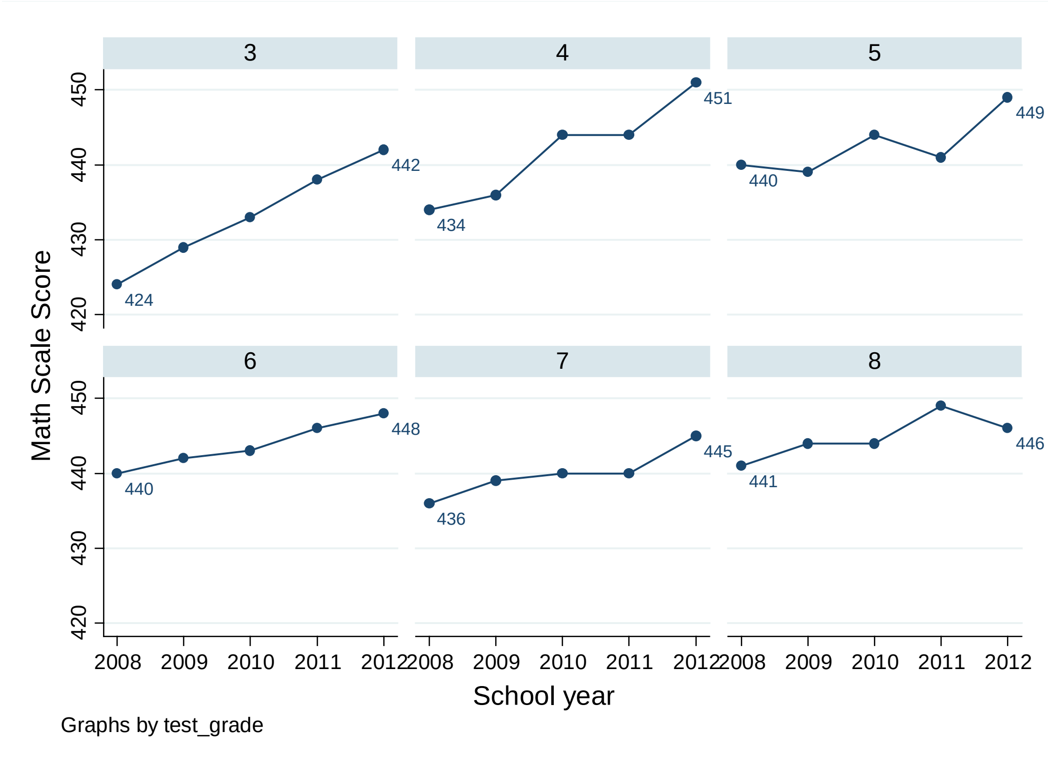


Figure 8. Trends in average math MSA performance (scale scores), by grade level

Note: See Appendix 1 for sample sizes.

Performance on the reading MSA has also improved across grades 3 through 8, but to a lesser degree than improvements on the math MSA.

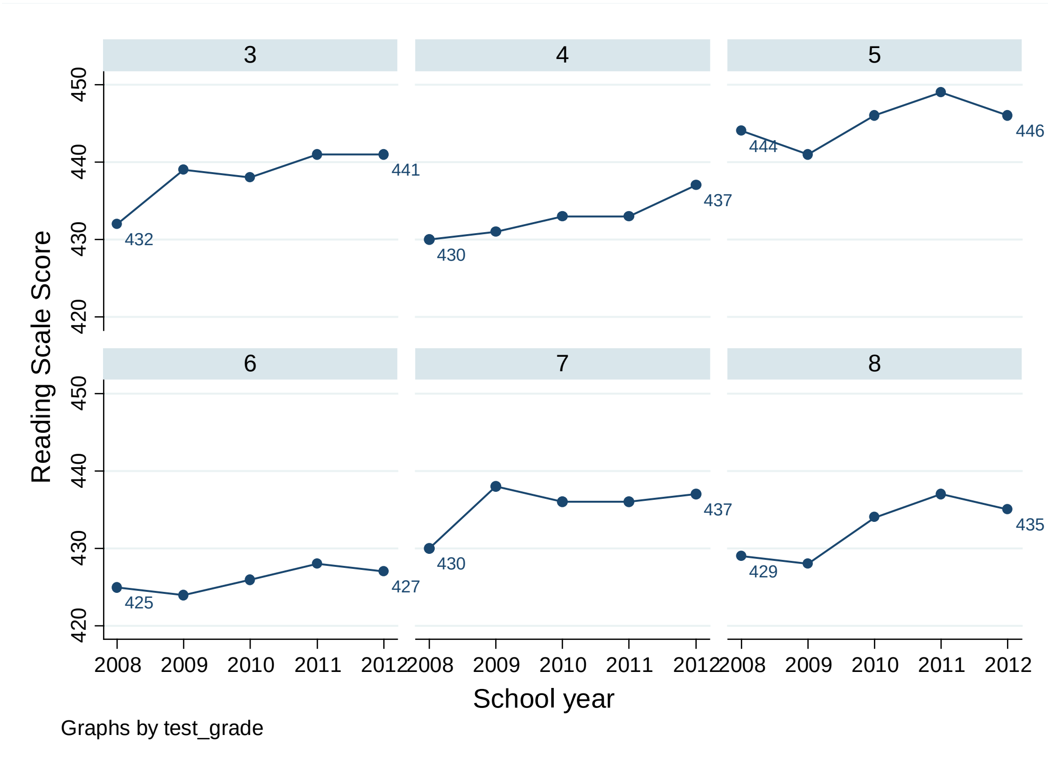


Figure 9. Trends in average reading MSA performance (scale scores), by grade level

Note: See Appendix 1 for sample sizes

The average percentage of students at or above advanced proficiency on the math MSA across grades 3 through 8 has improved in the last several years.

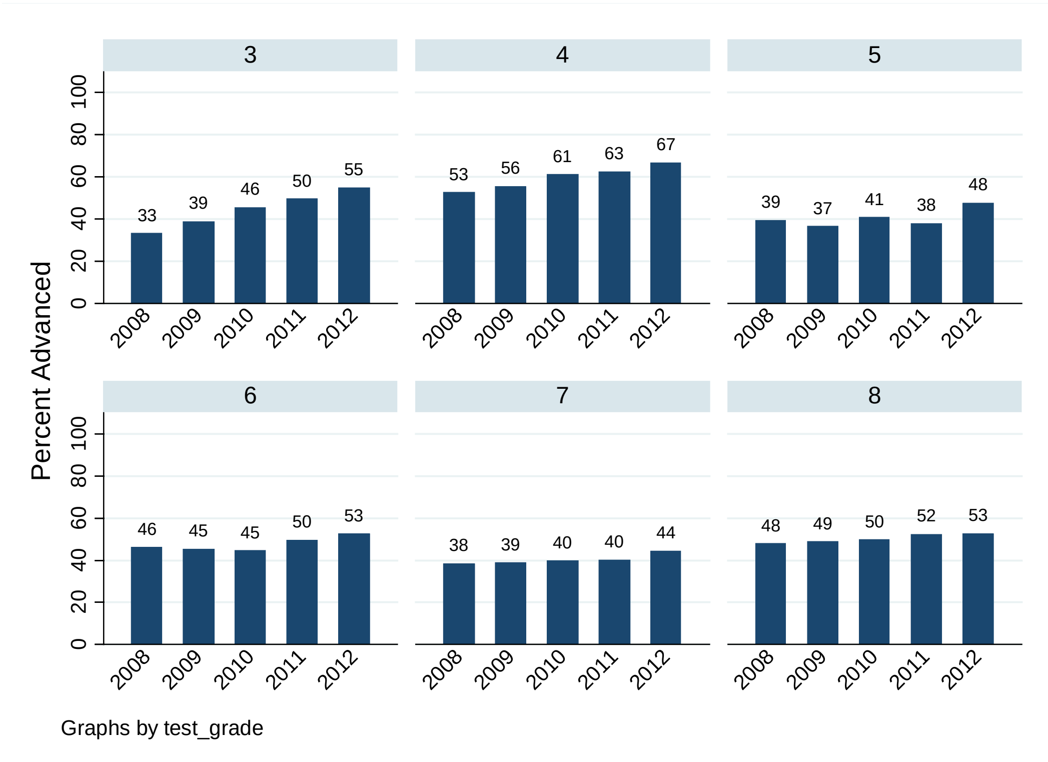


Figure 10. Trends in average math MSA performance (percent advanced proficient), by grade level

Note: See Appendix 1 for sample sizes.

The average percentage of students at or above advanced proficiency on the reading MSA across grades 3 through 8 has improved in the last several years.

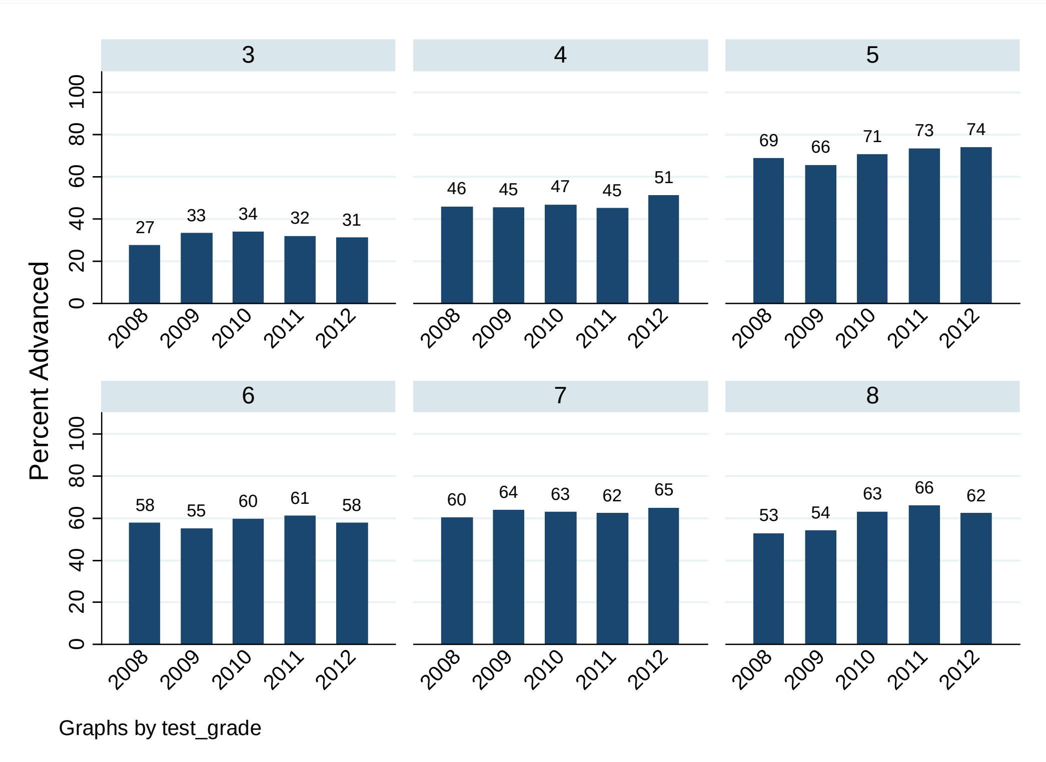


Figure 11. Trends in average reading MSA performance (percent advanced proficient), by grade level

Note: See Appendix 1 for sample sizes.

Average scaled score performance on the math MSA across grades 3 through 8has improved for both FARMS and non-FARMS students in the last several years.

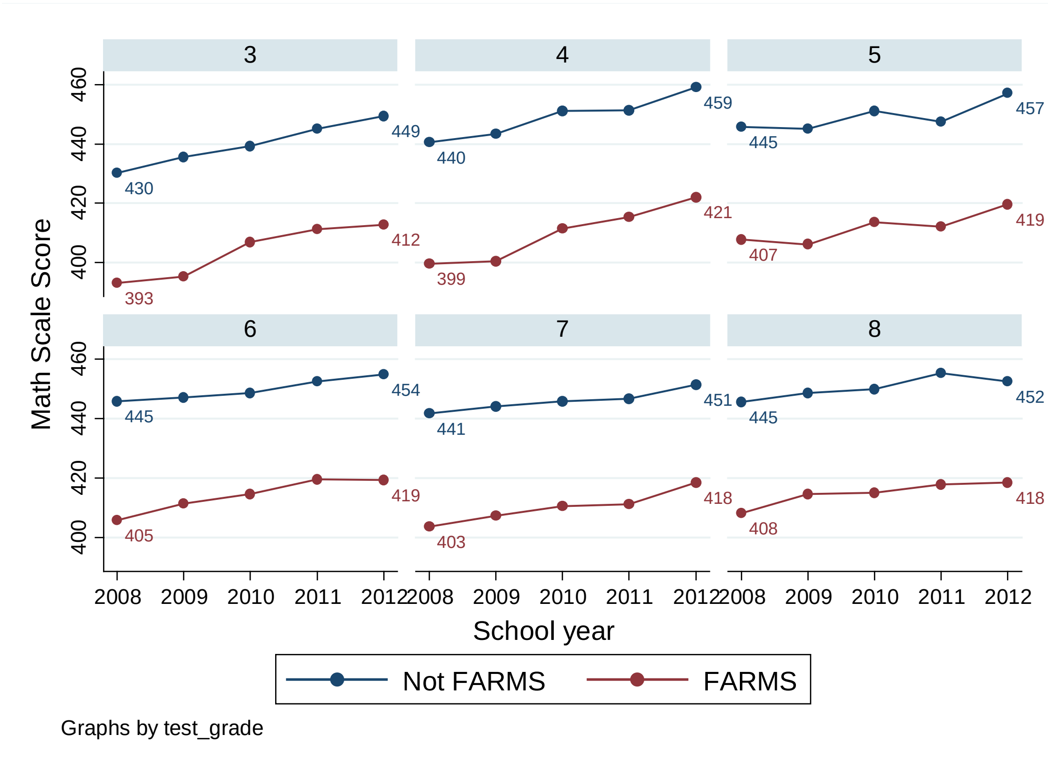


Figure 12. Trend in average mathematics MSA scale score, by FARMS status and grade

Note: Appendix 1 for sample sizes. See Appendix 2 to see graphs by race.

Across grades 3 through 8, the average percentage of students at or above advanced proficiency on the math MSA has improved for both FARMS and non-FARMS students in the last several years.

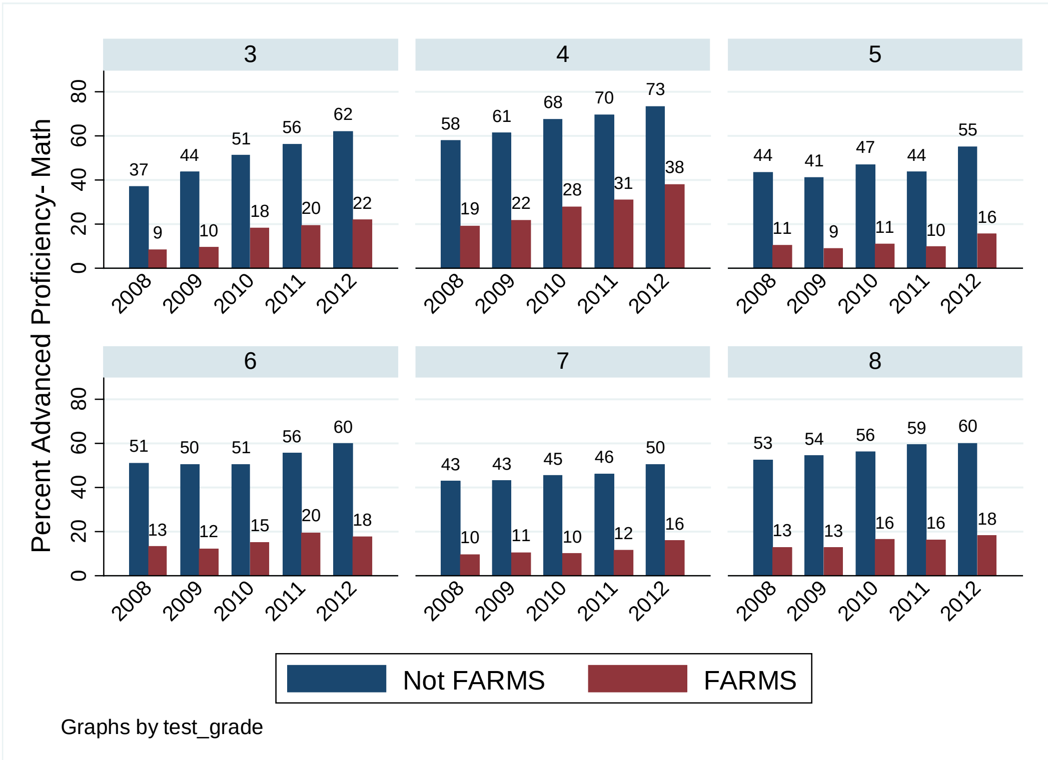


Figure 13. Trend in mathematics MSA advanced proficiency rates, by FARMS status and grade

Note: See Appendix 1 for sample sizes. See Appendix 3 for proficiency gap by race and compared to the state.

While non-FARMS students in grade 5 improved their advanced proficiency rates from 44% to 55%, FARMS students realized less substantial improvement from 11% to 16%.

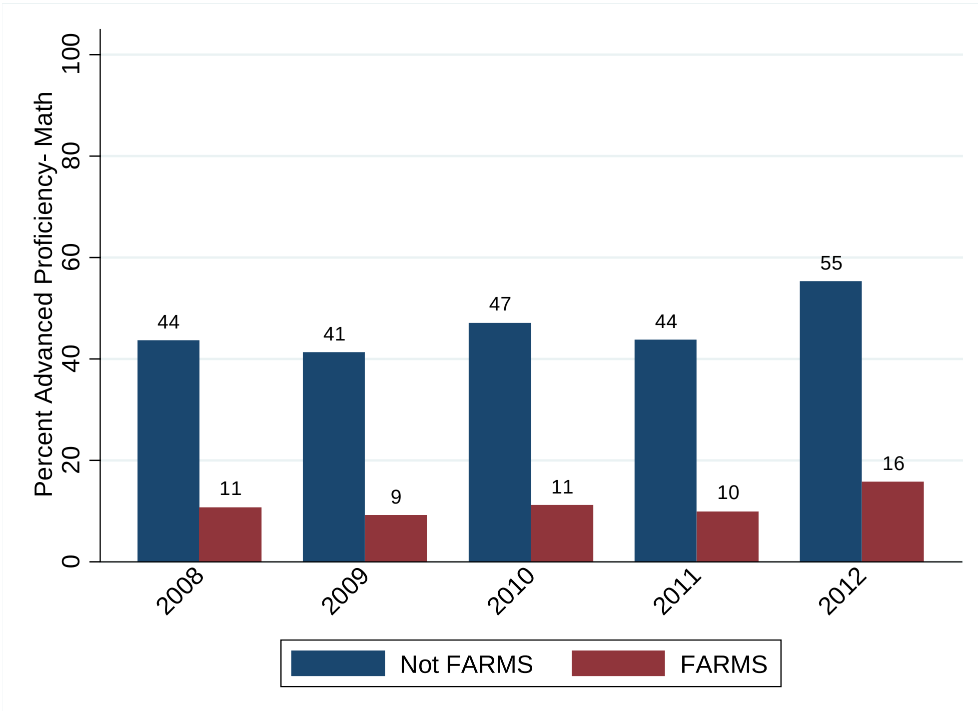


Figure 14. Trend in mathematics MSA advanced proficiency rates in 5th grade, by FARMS status

Note: See Appendix 1 for sample sizes.

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

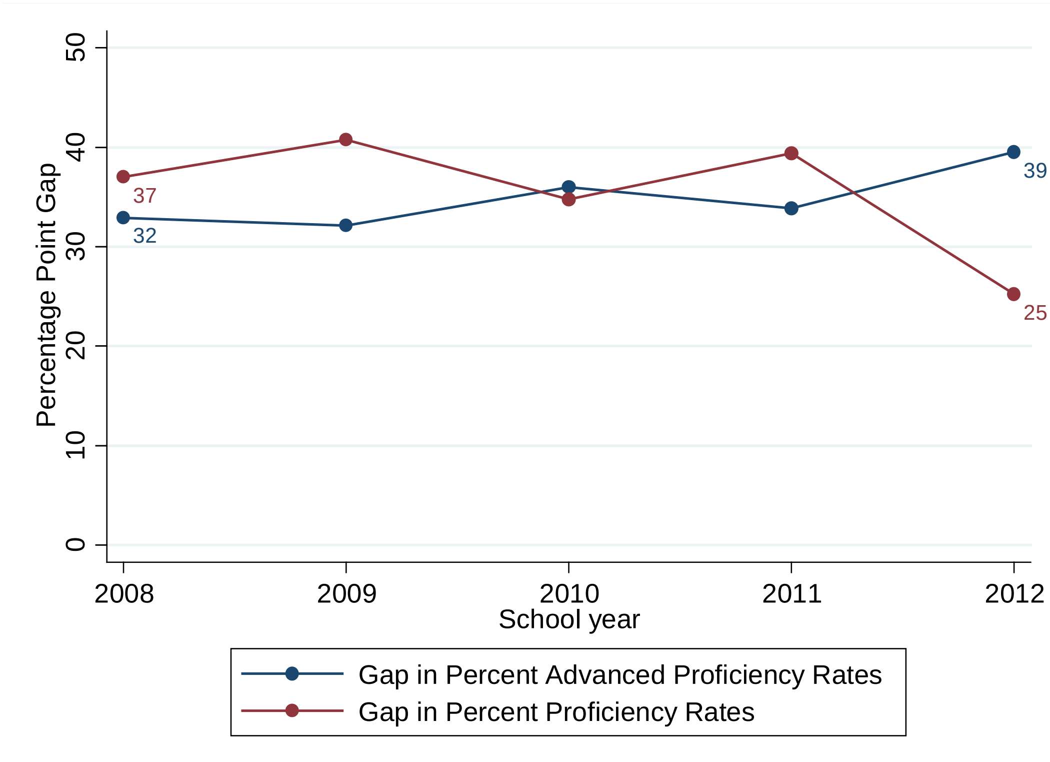


Figure 15. Trend in mathematics MSA scaled gaps between FARMS and non-FARMS students in 5th grade

Note: See Appendix 1 for sample sizes.

Figure 16. Summary of achievement gap trends based on performance on grade 5 mathematics MSA assessment

Test Score Metric	Group	2009-10	2010-11	2011-12	Gap Trends*
Scale Score	Not 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	↑
	Black	420	417	425	↑
Advanced Proficiency	Not 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%	↑
	Black	15%	12%	21%	↑
Scale Score Gaps	Farms-Not FARMS	37	35	37	↔
	ELL-Not ELL	35	42	42	↔
	Asian-White	9	11	12	↔
	Asian-Hispanic	36	42	32	↔
	Asian-Black	42	43	44	↔
	White-Hispanic	27	31	20	↓
	White-Black	33	32	32	↔
	Hispanic-Black	6	1	12	↔
Advanced Proficiency Gaps	Farms-Not FARMS	36%	34%	39%	↑
	ELL-Not ELL	32%	33%	37%	↔
	Asian-White	10%	7%	3%	↔
	Asian-Hispanic	40%	33%	27%	↔
	Asian-Black	45%	39%	38%	↑
	White-Hispanic	30%	26%	24%	↔
	White-Black	35%	32%	35%	↑
	Hispanic-Black	5%	6%	11%	↔

*Based on significance testing the difference between the gap in 2010 and 2012 at a p<0.05 significance level

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.

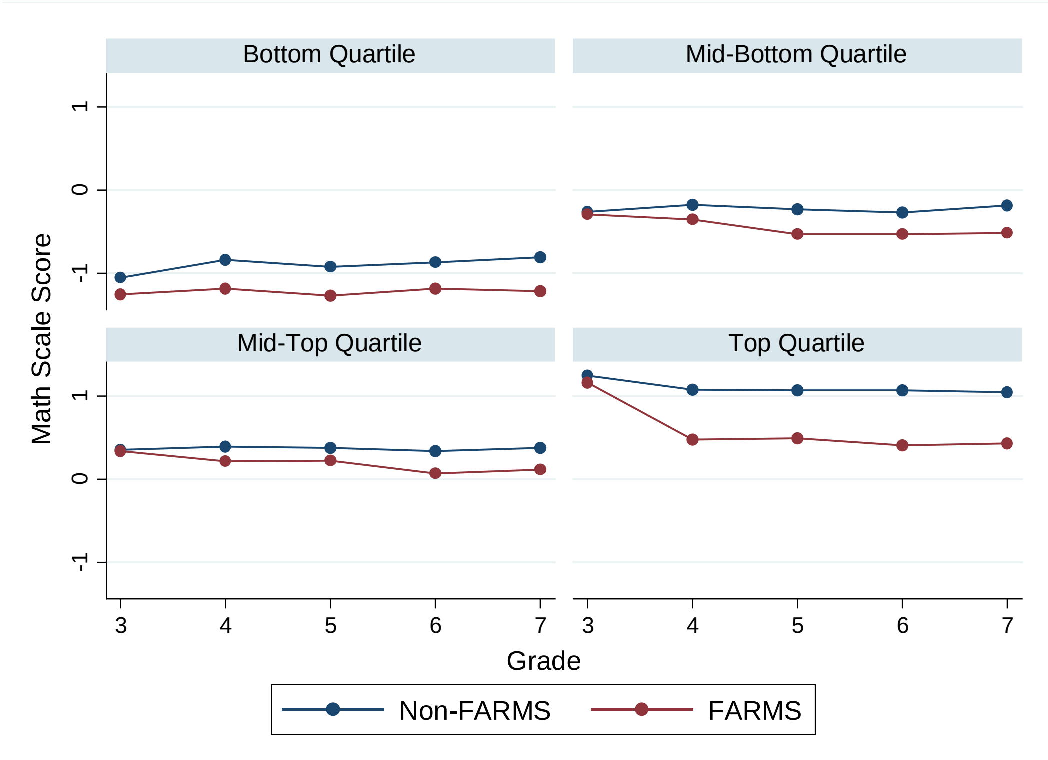


Figure 17. Average scale score trajectory on mathematics MSA for cohort in grade 3 in 2007-08, by FARMS status and third-grade mathematics MSA quartiles

Notes: Only those students enrolled at HCPSS from 3rd 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.

Non-FARMS sample sizes: Q1=325; Q2= 566; Q3= 665; Q4= 689.

FARMS sample sizes: Q1=212; Q2=122; Q3=66; Q4=31.

There is no relationship between percentage of FARMS students in a grade and the size of FARMS-non-FARMS achievement gap.

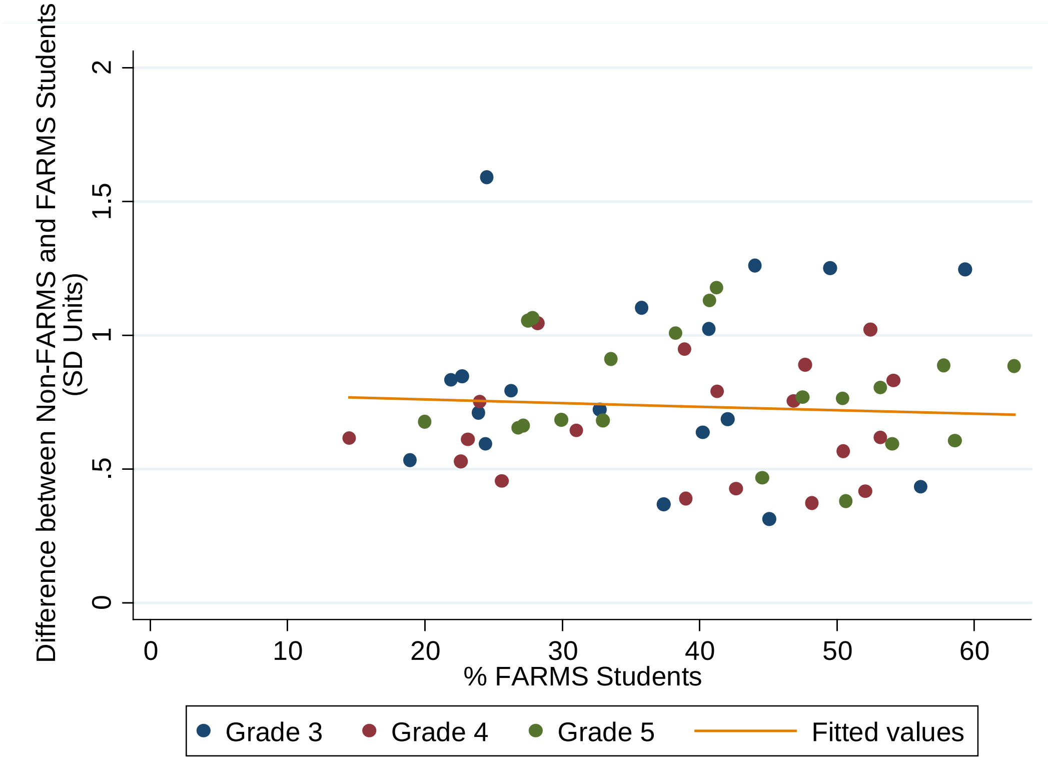


Figure 18. Relationship between the percentage of FARMS students in an elementary school's grade level and gaps between FARMS and non-FARMS student performance, 2012

Note: Results for grades within schools with less than 20 FARMS students were suppressed.

The amount of time students remain classified from kindergarten onward has ELL has declined.

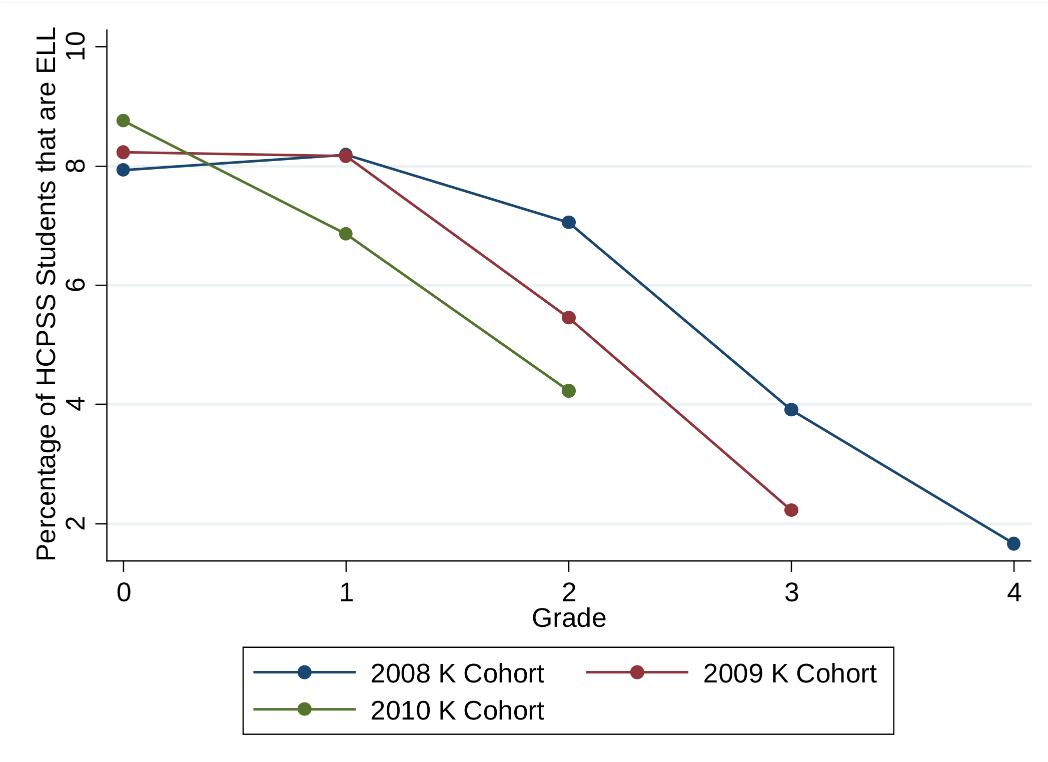


Figure 19. Percentage of students currently classified as ELL, by kindergarten cohort

Note: Each cohort consists of students who were in kindergarten at HCPSS and remained at HCPSS through 2nd grade (2010 cohort), 3rd grade (2009 cohort) and 4th grade (2008 cohort) respectively.
Sample sizes (Total students by kindergarten cohort): 2008= 2710; 2009= 2877; 2010= 3049.

Those students who remained classified as ELL have lower performance relative to their grade-level peers in 2011-12 as compared to 2007-08.

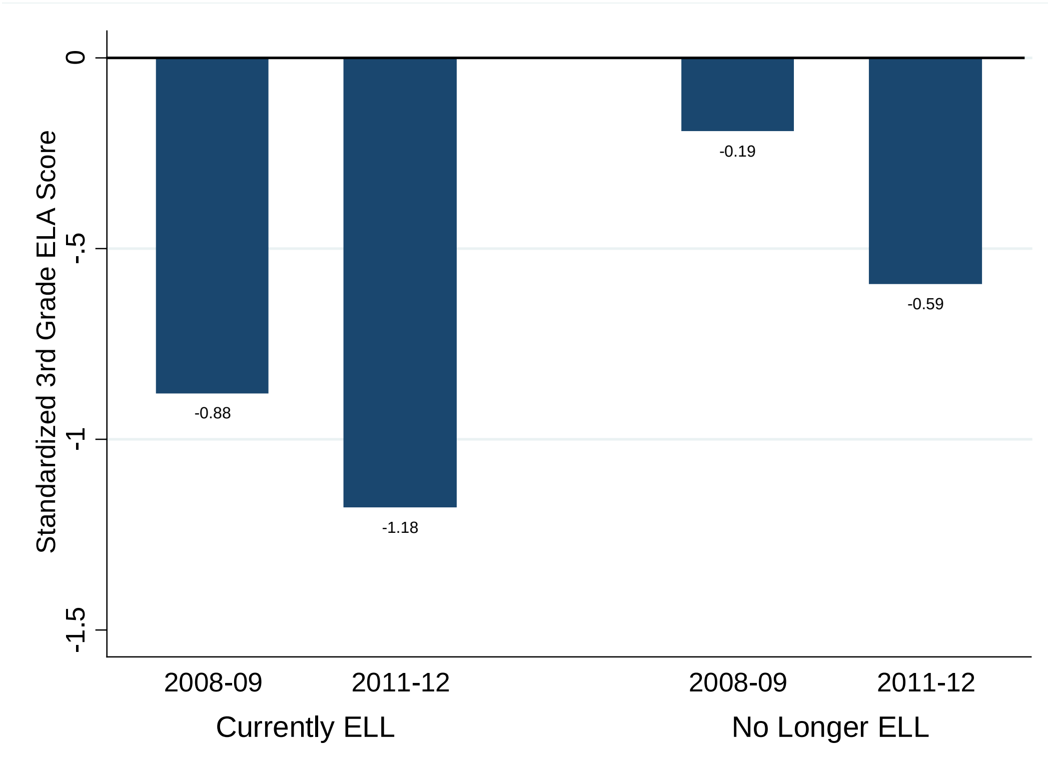


Figure 20. Third-Grade Reading Performance, by ELL status and year

The amount of time students remain classified as ELL from third grade onward has remained the same.

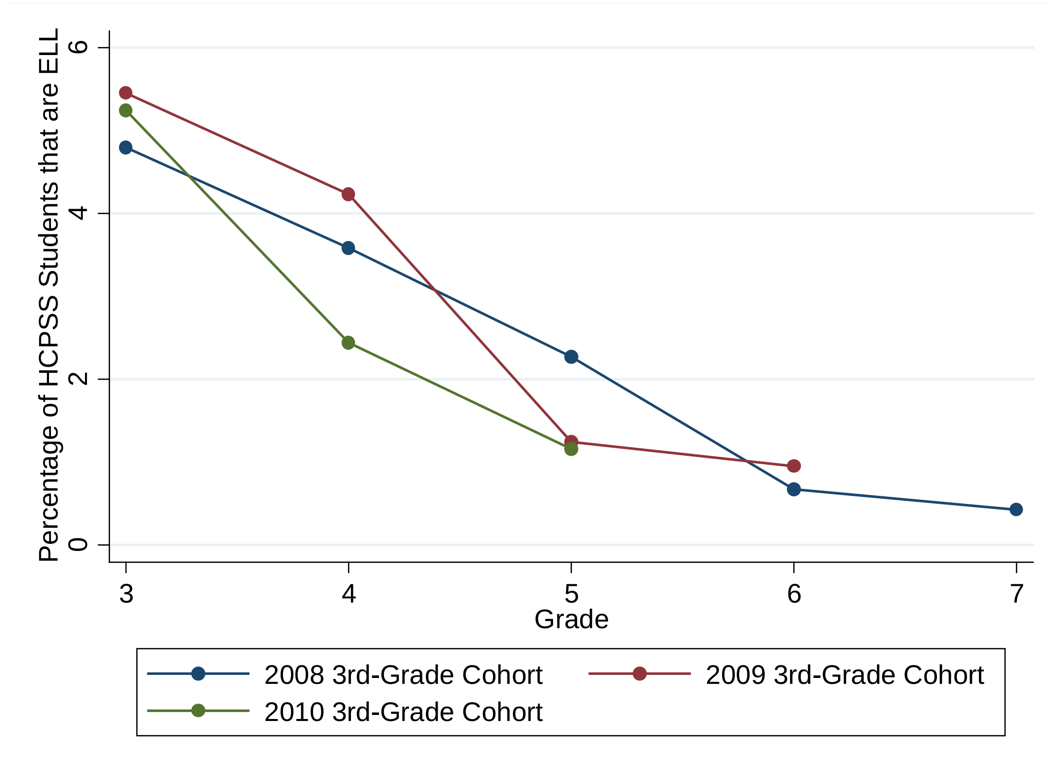


Figure 21. Percentage of students currently classified as ELL, by third-grade cohort

Note: Each cohort consists of students who were in third grade at HCPSS and remained at HCPSS through 5th grade (2010 cohort), 6th grade (2009 cohort) and 7th grade (2008 cohort) respectively.
Sample sizes (Total students by 3rd-grade cohort): 2008= 2815; 2009= 3044; 2010= 3277.

There are decreasing percentages of students who have never taken the algebra/data analysis HSA by the end of ninth grade.

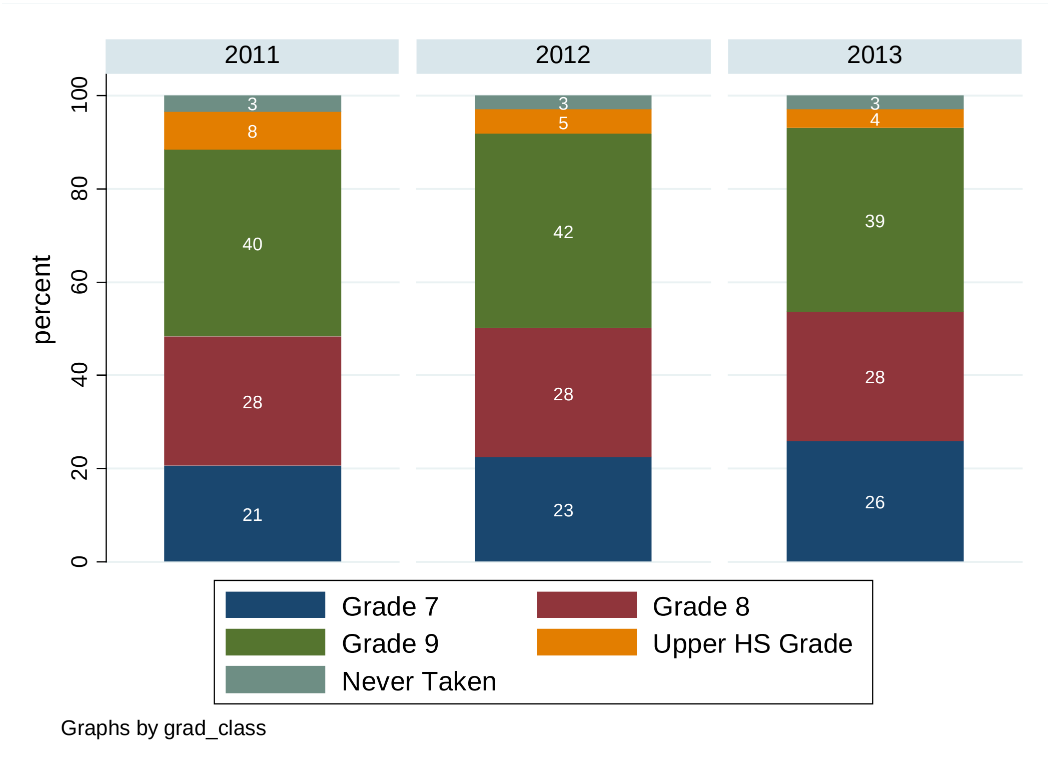


Figure 22. Grade first taken the Algebra/Data Analysis HSA, by graduating class

Note: See Appendix 7 for same graph by race.
Sample sizes: 2011=4317; 2012=4067; 2013=4295.

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

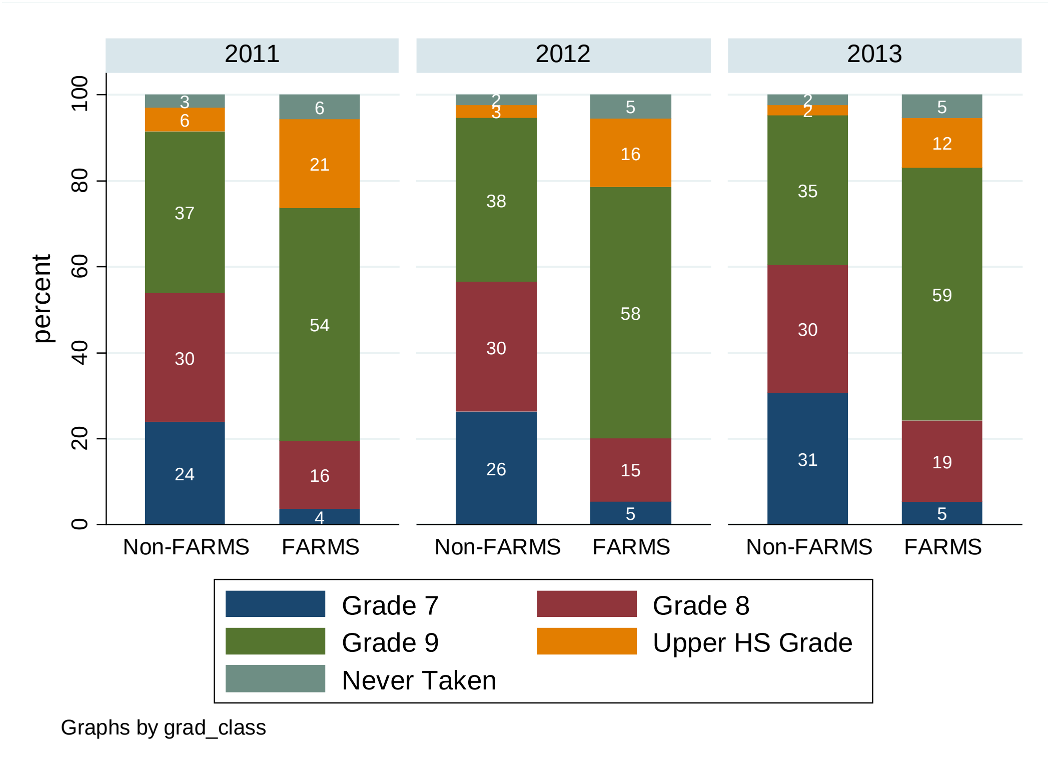


Figure 23. Grade first taken the Algebra/Data Analysis HSA, by graduating class and FARMS status

Sample sizes: 2011 FARMS=706; 2011 Non-FARMS= 3611; 2012 FARMS =718; 2012 Non-FARMS=3349; 2013 FARMS=810; 2013 Non-FARMS=3485.

Gaps in participation and timing of participation remain between FARMS and non-FARMS students remain even after controlling for sixth-grade math performance.

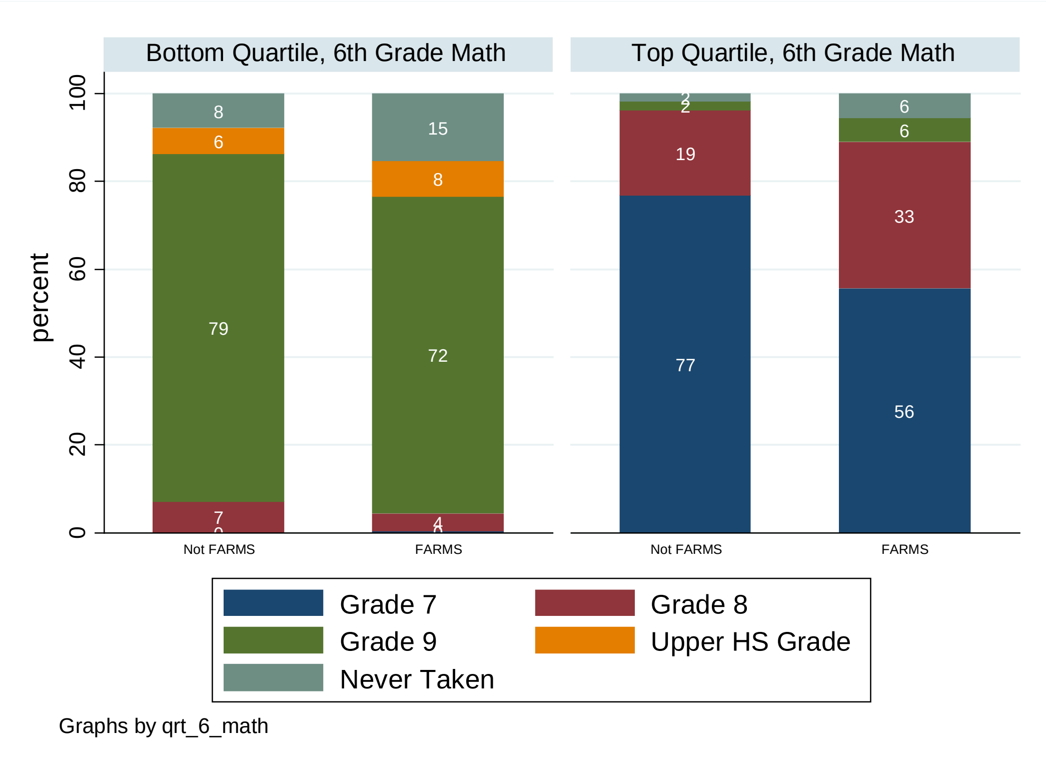


Figure 24. Grade first taken the Algebra/Data Analysis HSA, Class of 2014, by Sixth-Grade Prior Math MSA Performance and FARMS Status

Note: The Class of 2014 has two or more school years (2012-13 and 2013-14) to take any HSA exam. See Appendix 8 for the same graph by race.
Sample sizes=4148.

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

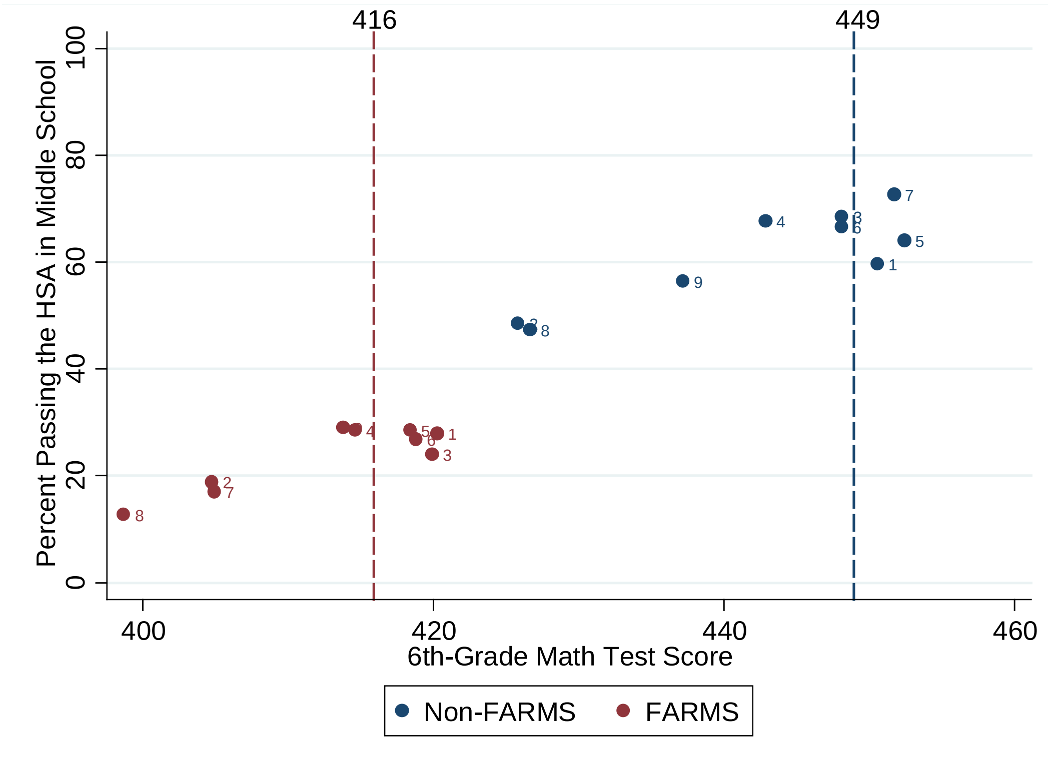


Figure 25. Percentage of middle school students taking the algebra/data analysis HSA in the Class of 2014, by prior sixth-grade math MSA score

Note: In this figure, each red dot represents non-FARMS students in a school and each blue dot represents 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) and average percentage of students taking the HSA in middle school (on the y-axis). Results for schools with less than 20 FARMS or non-FARMS students were suppressed.

Sample sizes: 1= Bonnie Branch Middle School (FARMS N=25; Non-FARMS N=159), 2= Cradlerock School (FARMS N=37; Non-FARMS N=68), 3= Elkridge Landing Middle School (FARMS N=25; Non-FARMS N=143), 4= Harper's Choice Middle School (FARMS N=35; Non-FARMS N=93), 5= Mayfield Woods Middle School (FARMS N=49; Non-FARMS N=128), 6= Murray Hill Middle School (FARMS N=52; Non-FARMS N=90), 7= Oakland Mills Middle School (FARMS N=47; Non-FARMS N=77), 8= Patuxent Valley Middle School (FARMS N=47; Non-FARMS N=131), 9= Wilde Lake Middle School (FARMS N=31; Non-FARMS N=62).

Those who take algebra earlier in their school careers have a greater probability of passing the Algebra/Data Analysis HSA.

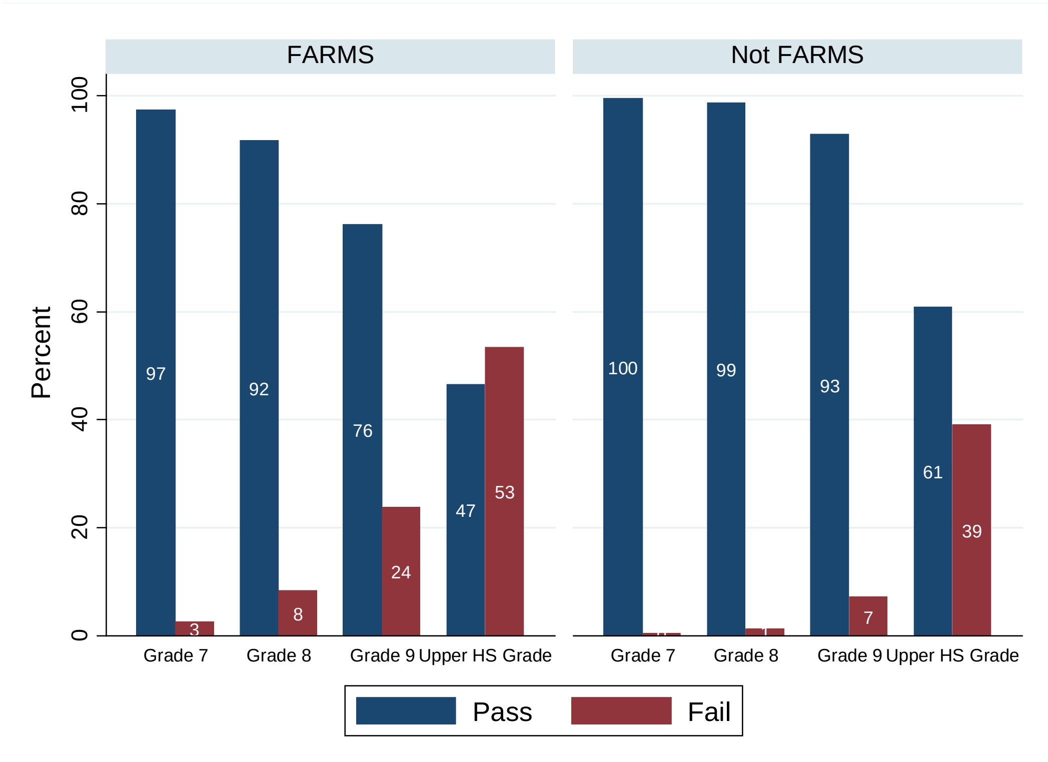


Figure 26. Percentage of students in the Class of 2012 passing their first Algebra/Data Analysis HAS, by FARMS status and grade first taken

FARMS sample sizes: Grade 7=39; Grade 8=108; Grade 9=433; Upper HS Grade=131.

Non-FARMS sample sizes: Grade 7=876; Grade 8=1015; Grade 9=1301; Upper HS Grade=115.

Figure 27. Participation and Passing Rates on High School Assessments, Class of 2012

	Proportion Taking Math HSA	Proportion Taking All Three Exams	Proportion Passing All Three Exams	Total Number of 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
Ever Special Education Student	75%	71%	44%	294
ELL status				
Not ELL	97%	96%	87%	3,908
Ever ELL Student	90%	79%	53%	164
Total	**97%**	**95%**	**86%**	**4,067**

There were small differences in the probability of taking all three HSAs between FARMS and non-FARMS students, controlling for achievement, and larger differences in the probability of passing.

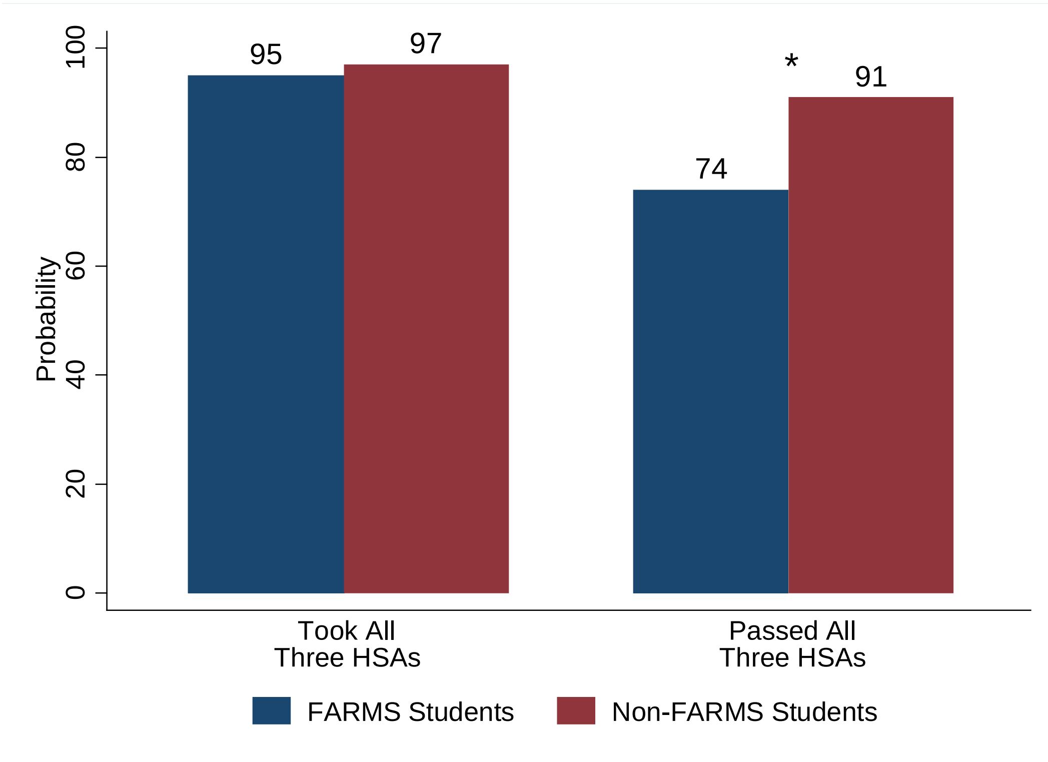


Figure 28. Participation and performance on HSAs controlling for prior eighth-grade math MSA achievement, Class of 2012

Sample size: There were 3330 students in the class of 2012 with prior performance data to complete this analysis. 3225 took all three HSAs, of which 455 were FARMS. 2980 passed all three HSAs, of which 324 were FARMS.

Almost all students took the Algebra/Data Analysis exam across schools, regardless of prior performance.

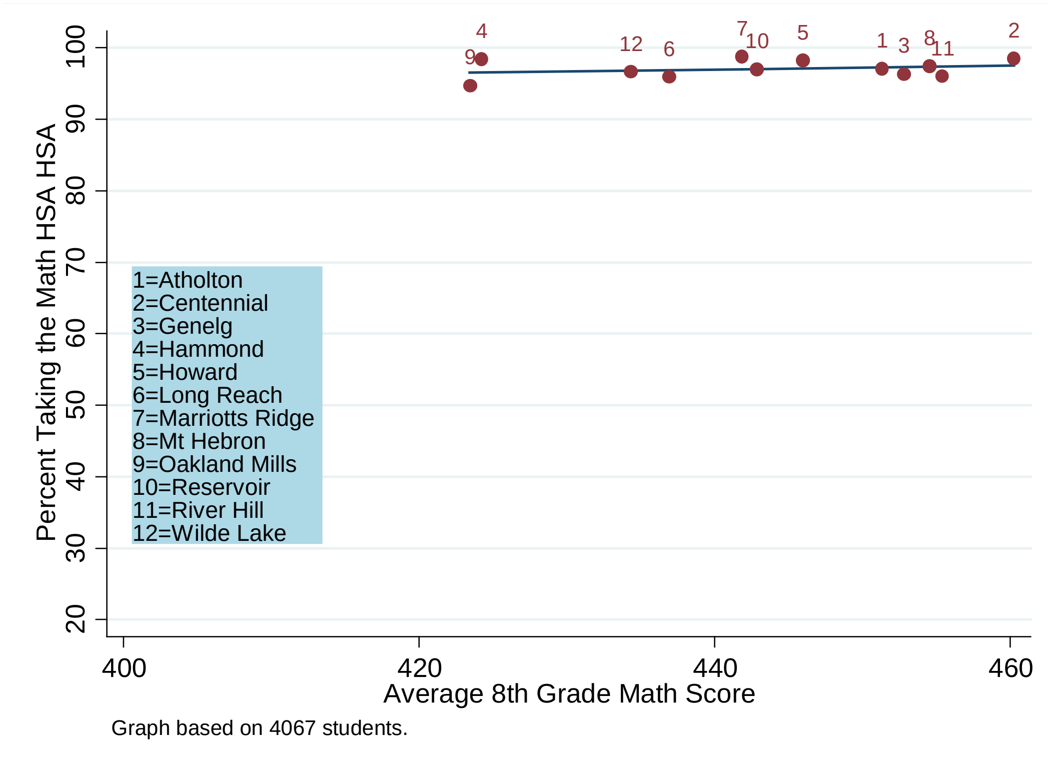


Figure 29. Percentage of high school students taking all three HSAs, by prior eighth-grade math score, Class of 2012

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 Size: 4067.

Prior performance is related to the percentage of students passing all three HSAs by school.

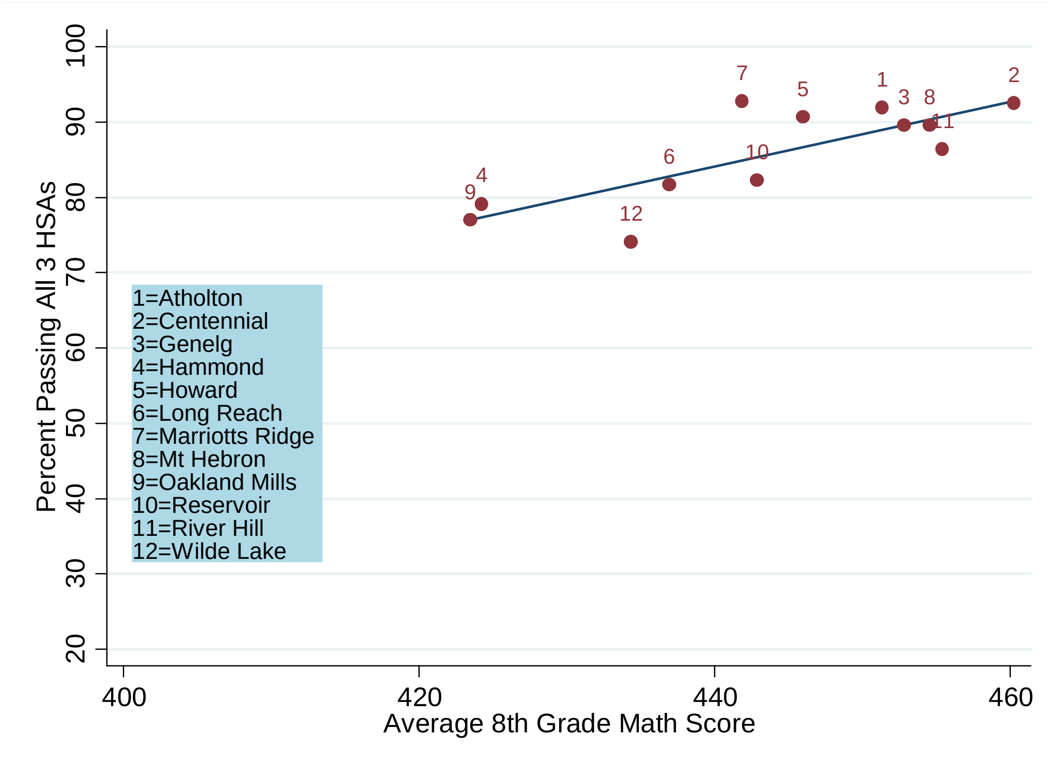


Figure 30. Percentage of high school students passing all 3 HSAs, by prior eighth-grade score, class of 2012

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 all three HSA exams (on the y-axis). Sample Size: 4067.

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

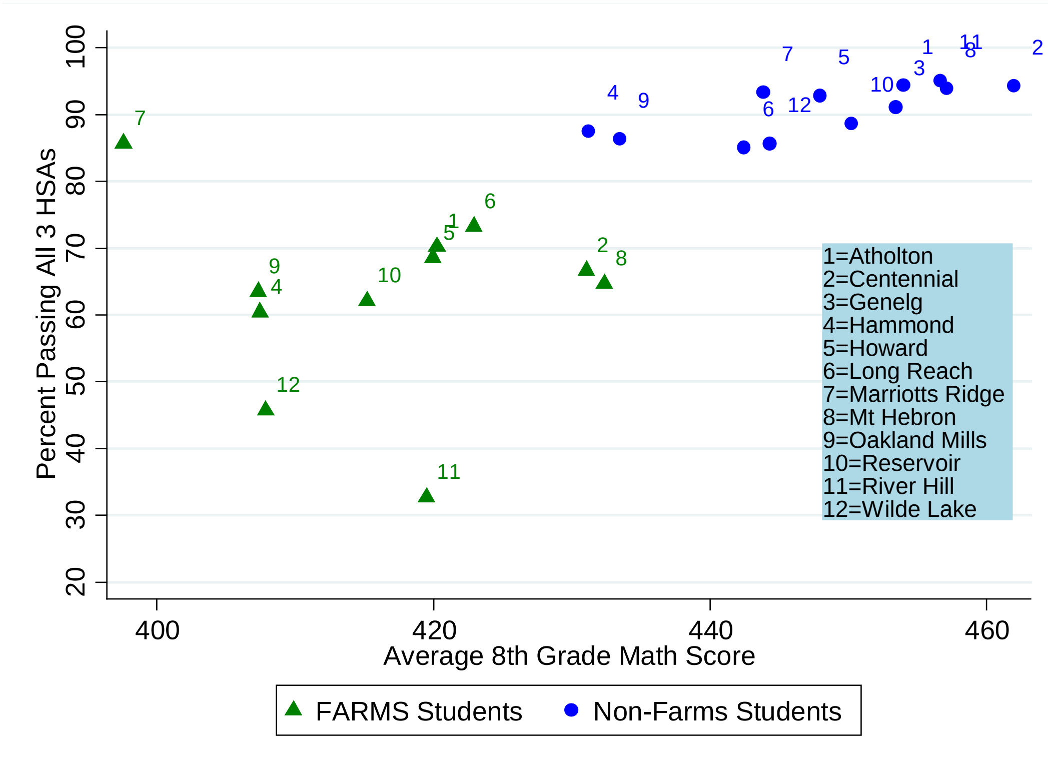


Figure 31. Percentage of high school students passing all three HSAs, by prior eighth-grade math score, Class of 2012

Note: Each blue dot now represents the non-FARMS student averages for a high school and the green triangles represent the FARMS student averages for each high school.

Figure 32. Participation Rates on Advanced Placement Exams, Class of 2012

	Proportion Taking at Least 1 AP	Proportion Passing at Least 1 AP	Total Number of 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
Multiple/ Other	46%	40%	211
Special Education Status			
Not Special Education	46%	40%	3778
Ever Special Education Student	10%	7%	294
ELL Status			
Not ELL	45%	38%	3908
Ever ELL Student	22%	17%	164
Total	**44%**	**37%**	**4067**

There are gaps in participation in AP classes between FARMS and non-FARMS students rather than performance on the exams.

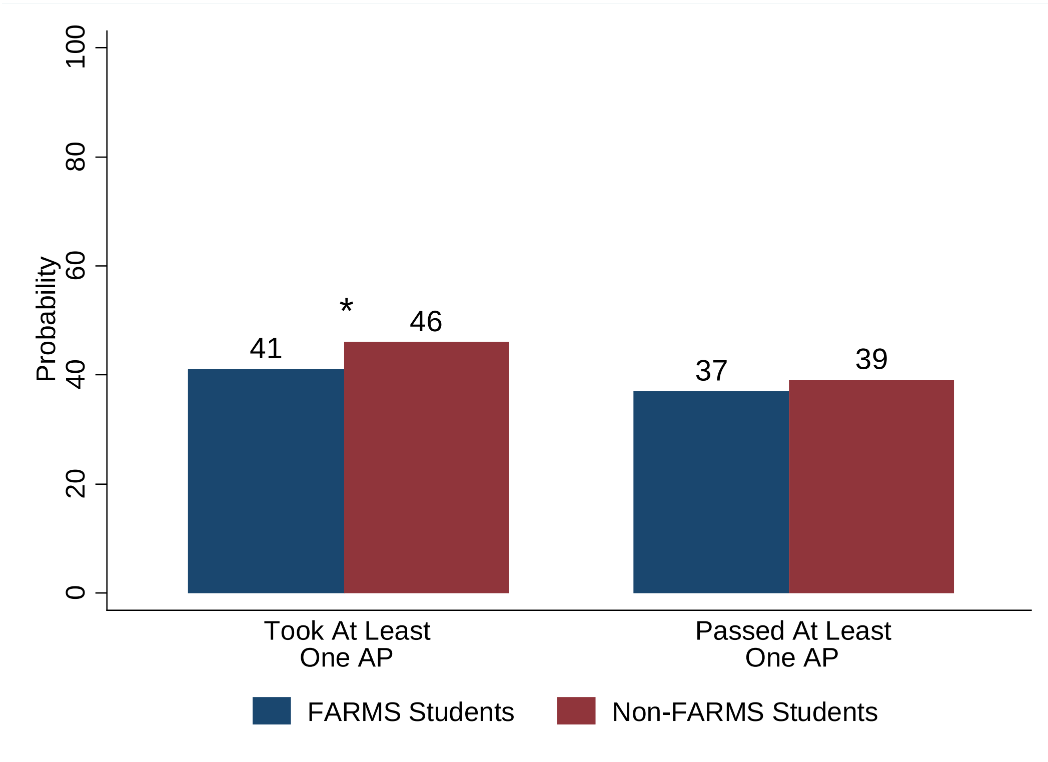


Figure 33. Participation and pass rates controlling for achievement

Note: See Appendix 9 for same graph by race. *p < .05 comparing the difference between student characteristics in probability of taking and passing an AP exam.
Sample: There were 3333 students in the class of 2009 with prior performance data to complete this analysis. 1594 took at least one AP, of which 100 were FARMS.1373 passed at least one AP, of which 76 were FARMS.

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

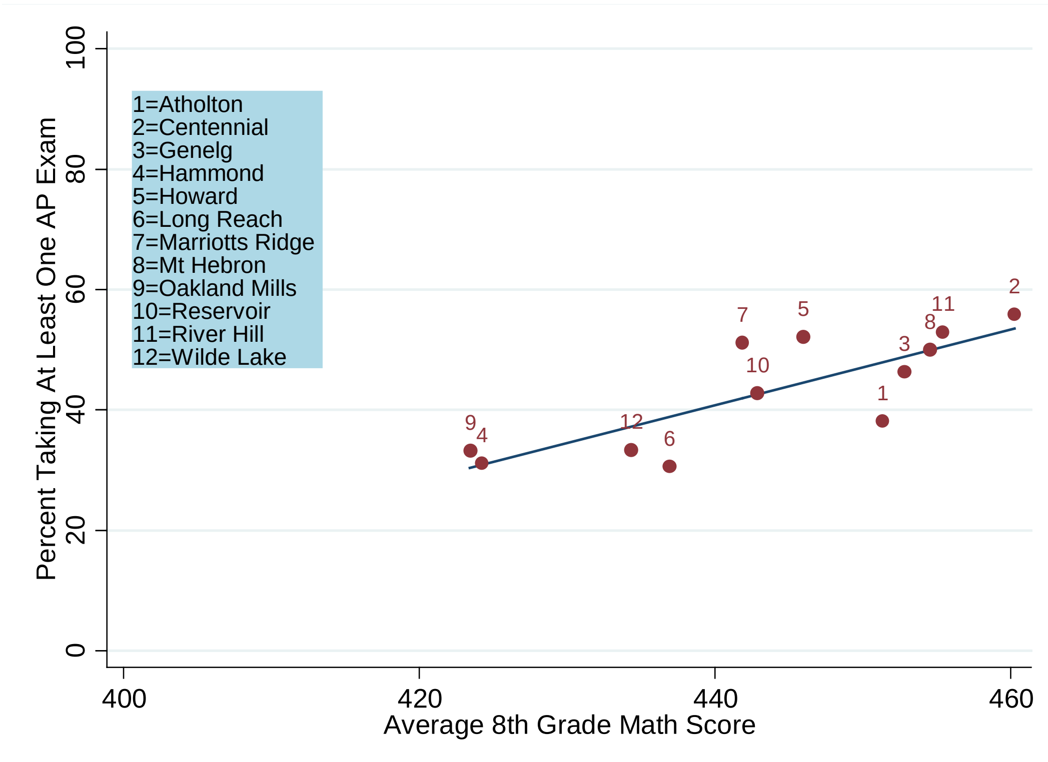


Figure 34. Percentage of high school students taking at least one AP exam in the Class of 2012, by school and prior eighth-grade score

Note: FARMS students are those receiving free and reduced-price meals services.
Sample size= 4067 students.

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

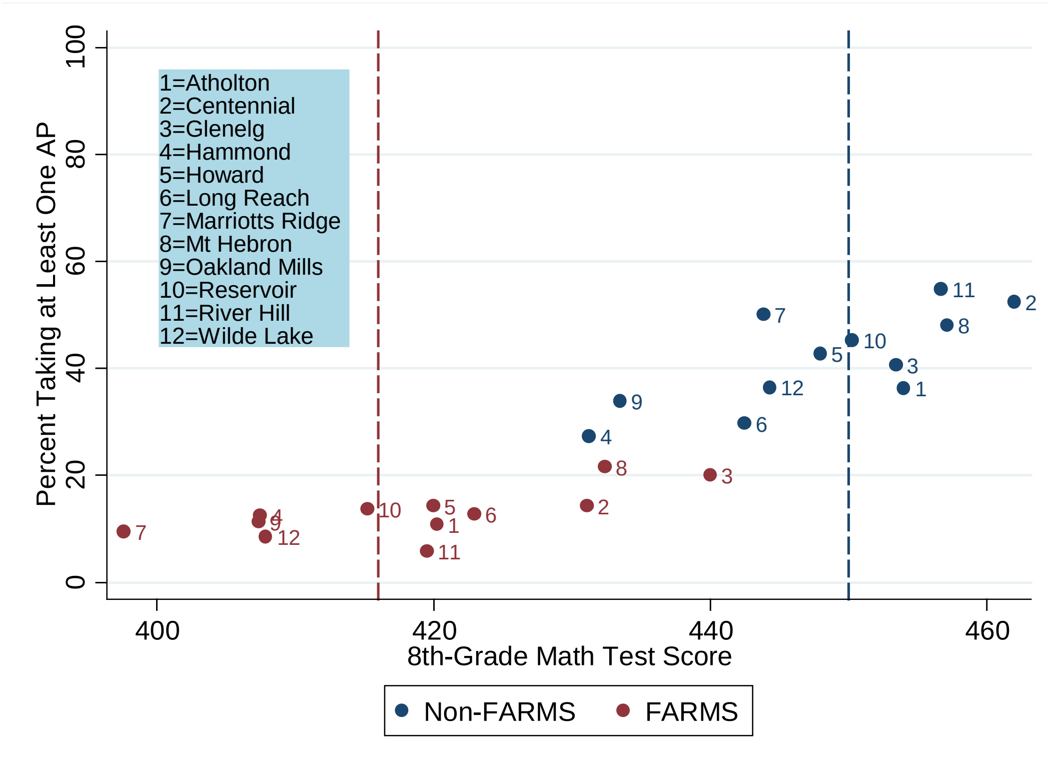


Figure 35. Percentage of high school students taking at least one AP exam in Class of 2012, by school and prior and eighth-grade score

Note: FARMS students are those receiving free and reduced-price meals services. Schools with less than 20 FARMS students not shown in the figure.

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

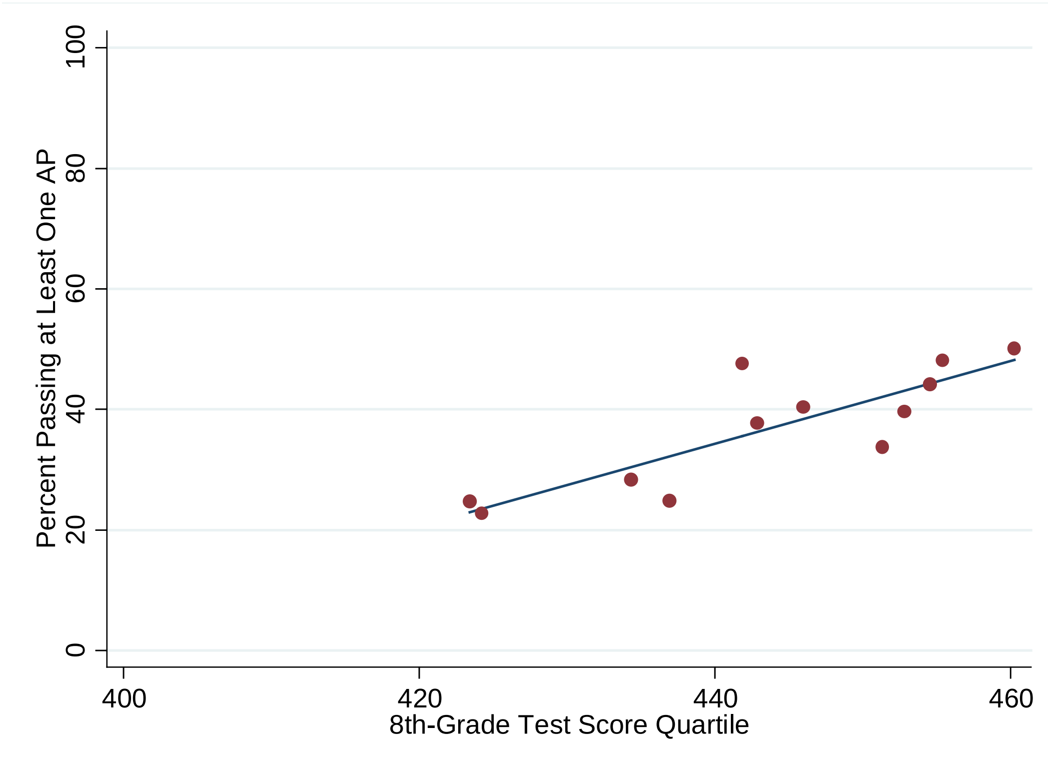


Figure 36. Percentage of high school students taking and passing at least one AP exam in Class of 2012, by school and prior and eighth-grade score

Sample sizes: 4067 students.

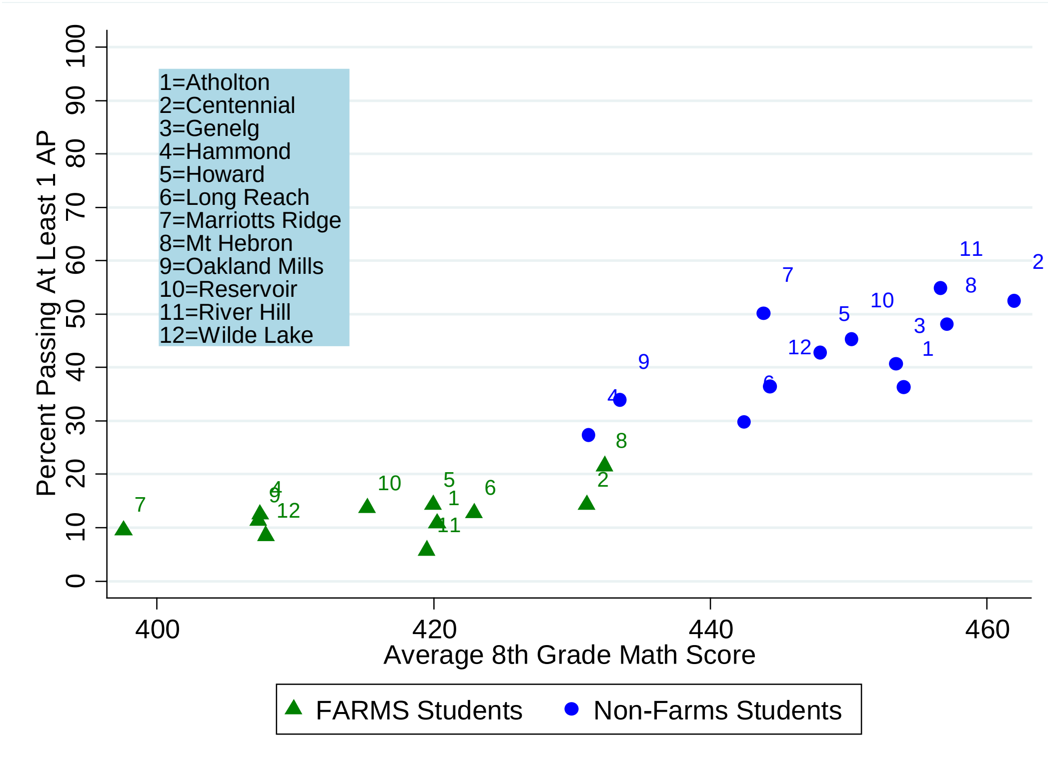


Figure 37. Percentage of high school students taking and passing at least one AP exam in the Class of 2012, by school and FARMS status and prior eighth-grade score

Note: Graph based on 4067 students.

Gifted participation has increased across the early grades.

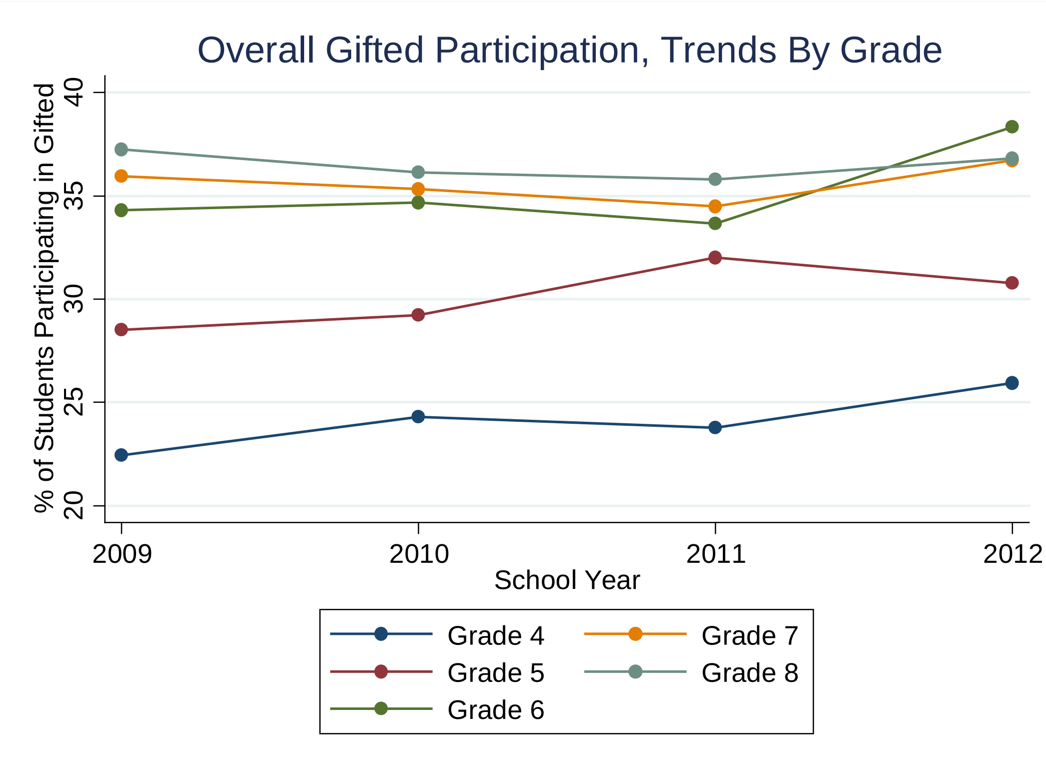


Figure 38. Overall gifted participation trends, by grade

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

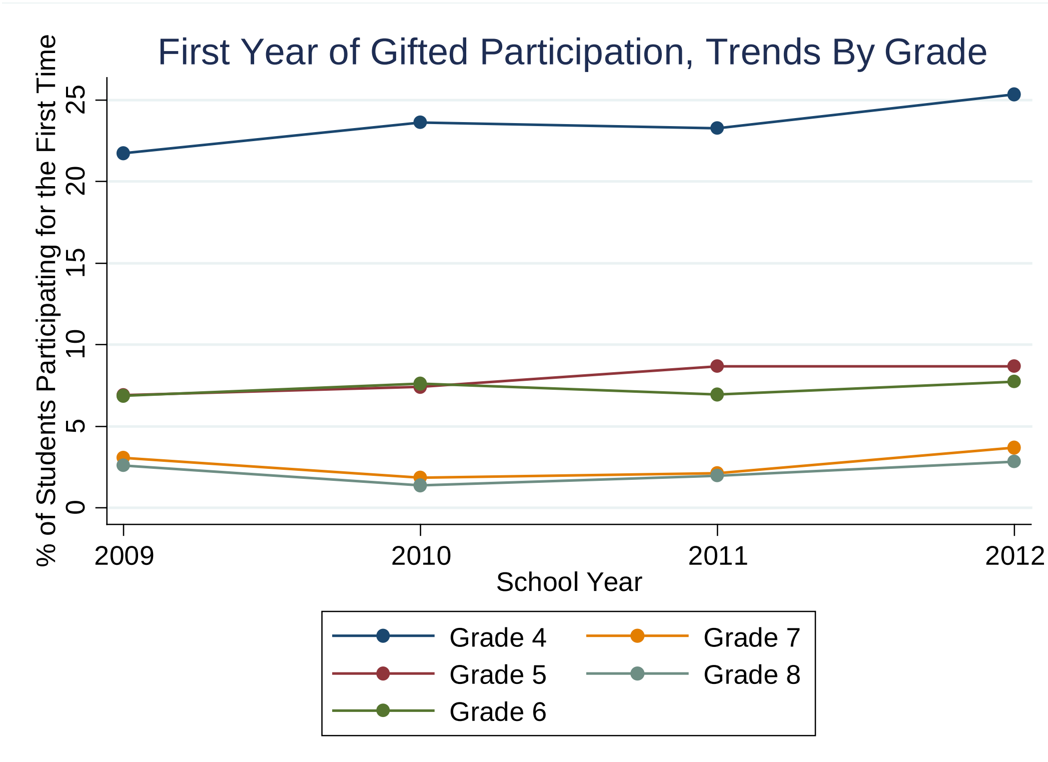


Figure 39. First year of gifted participation trends, by grade

The gifted student population is not entirely representative of schools' student populations.

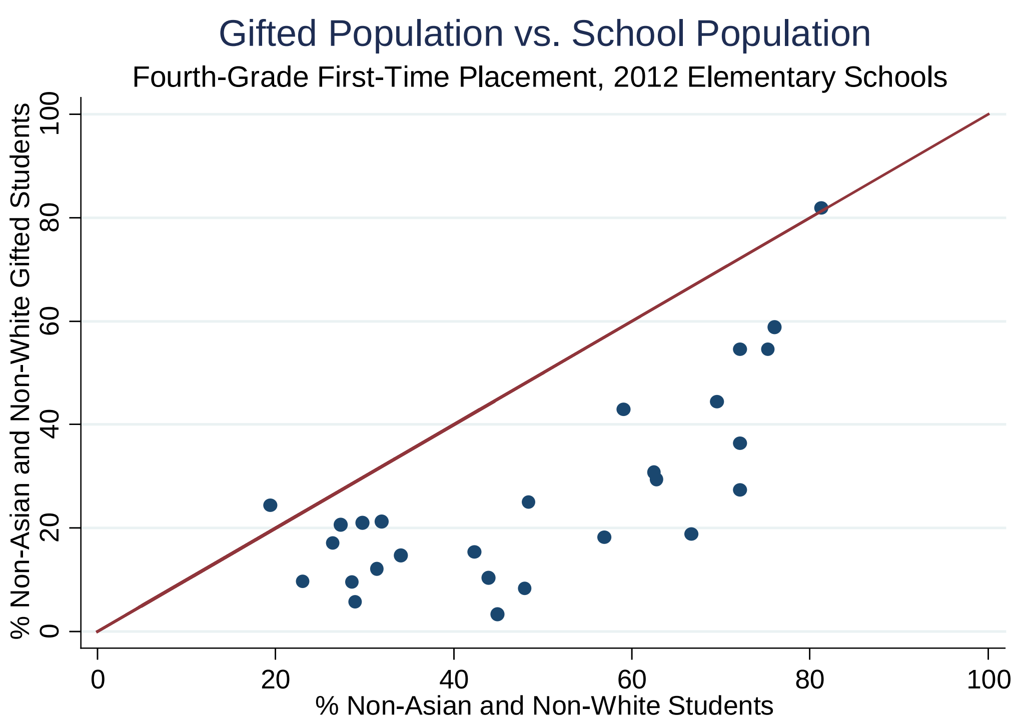


Figure 40. Gifted population versus school population, fourth-grade first-time placement in 2012 elementary schools

The gifted student population is not entirely representative of schools' student populations.

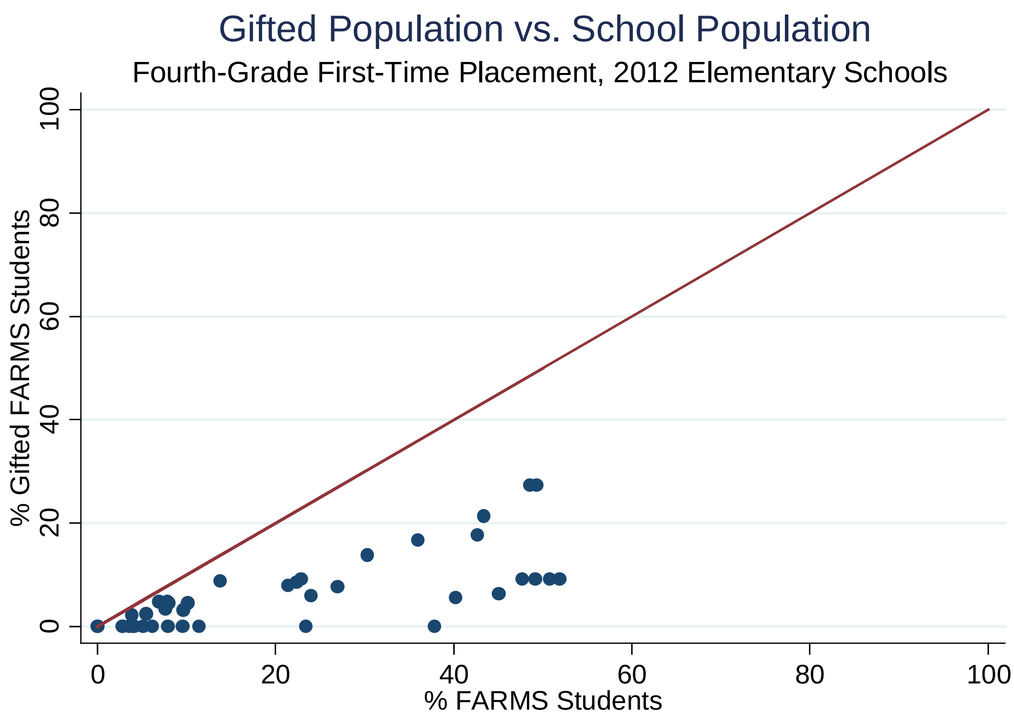


Figure 41. Gifted population versus school population, fourth-grade first-time placement in 2012 elementary schools

The review process for first-time placement is more common in middle school.

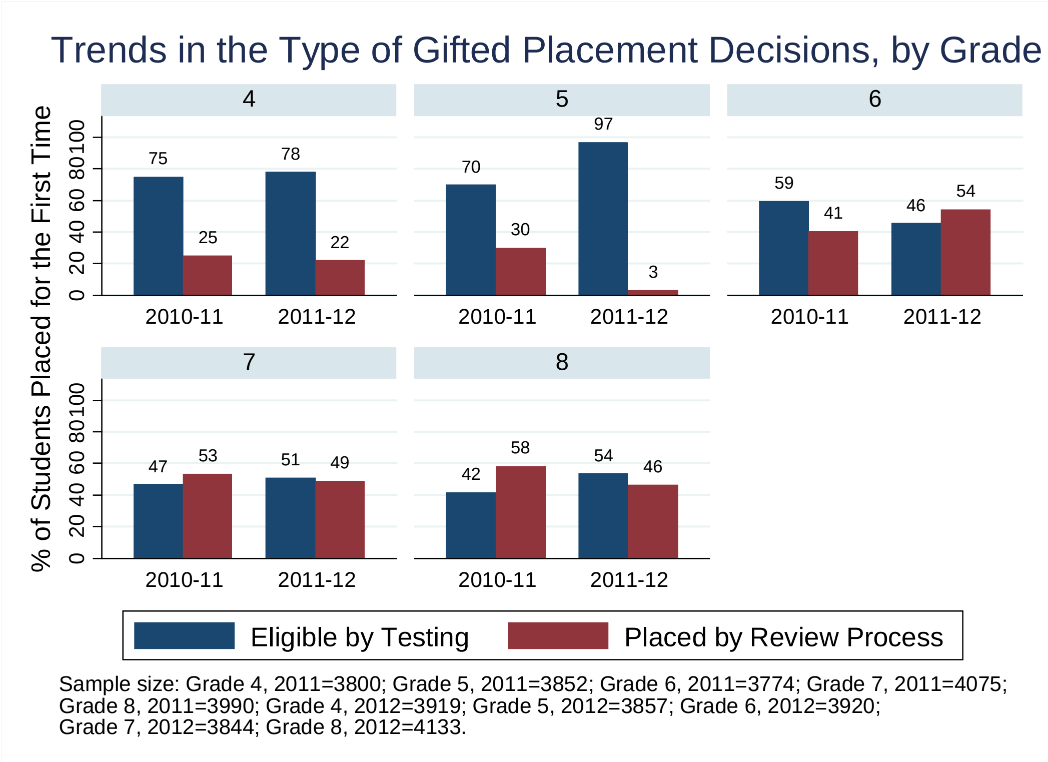


Figure 42. Trends in the type of gifted placement decisions, by grade

A far smaller proportion of FARMS students are placed into gifted. Of those FARMS students in GT, almost all are placed through testing.

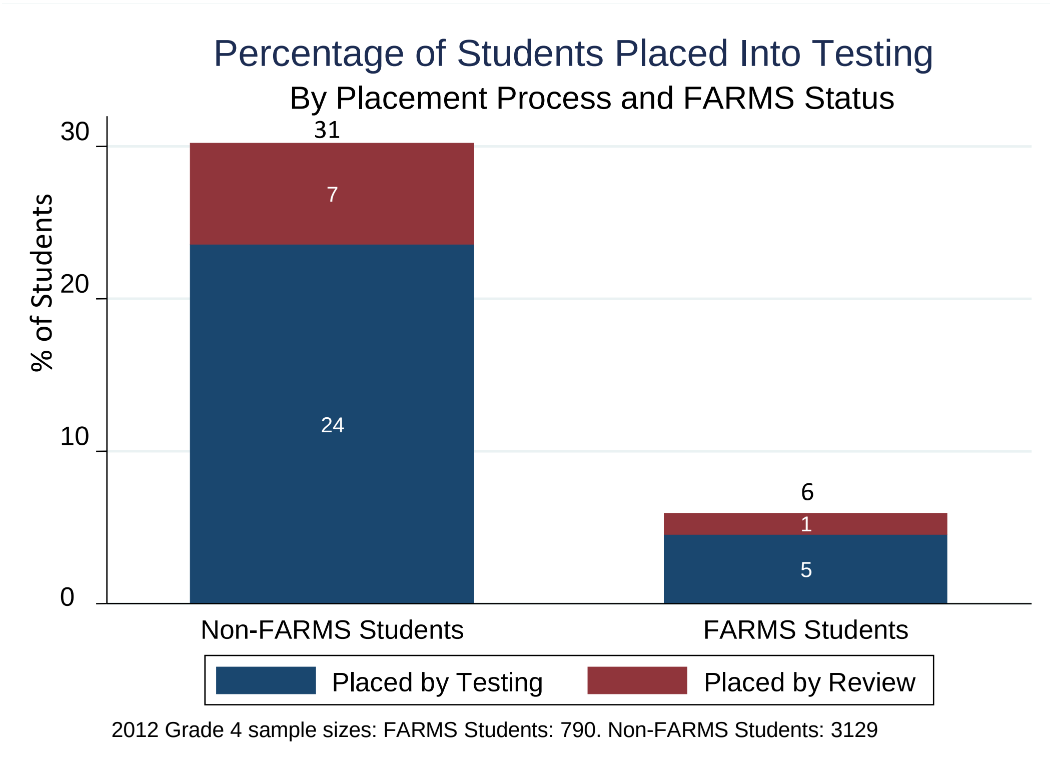


Figure 43. Percentage of students placed into testing, by placement process and FARMS Student

Sample sizes: 2012 grade 4 FARMS students: 790; 2012 grade 4 non-FARMS students: 3129.

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

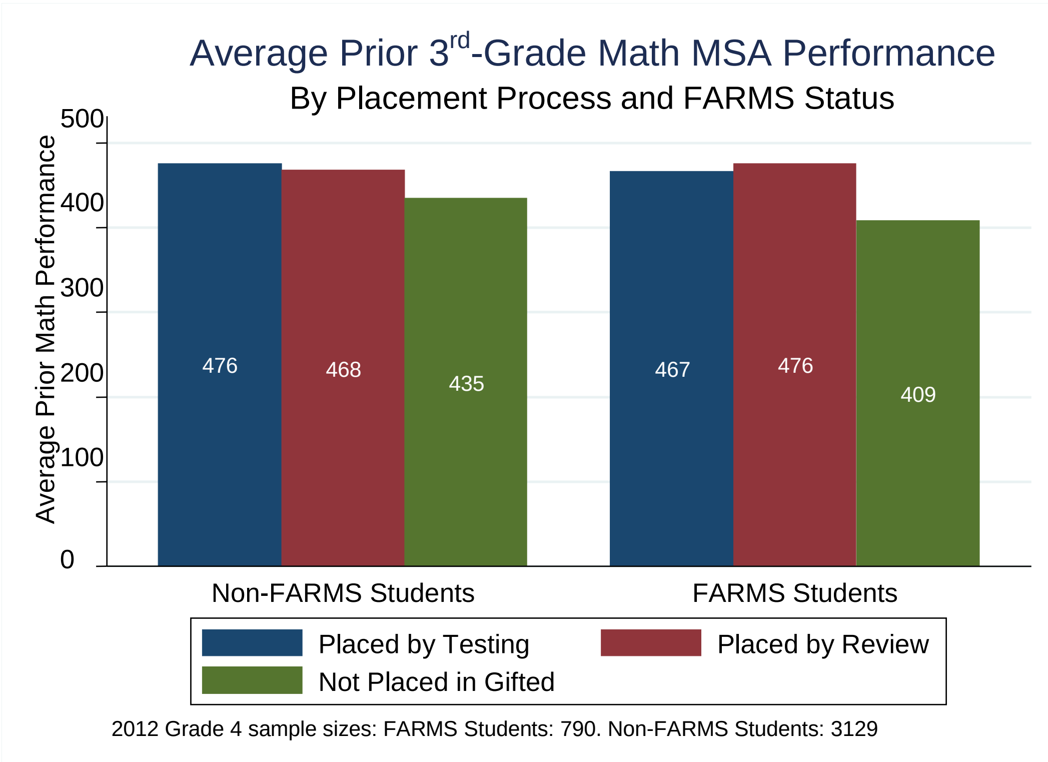


Figure 44. Average prior third-grade math MSA performance, by placement process and FARMS status

Sample sizes: 2012 grade 4 FARMS students: 790; 2012 grade 4 non-FARMS students: 3129.

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

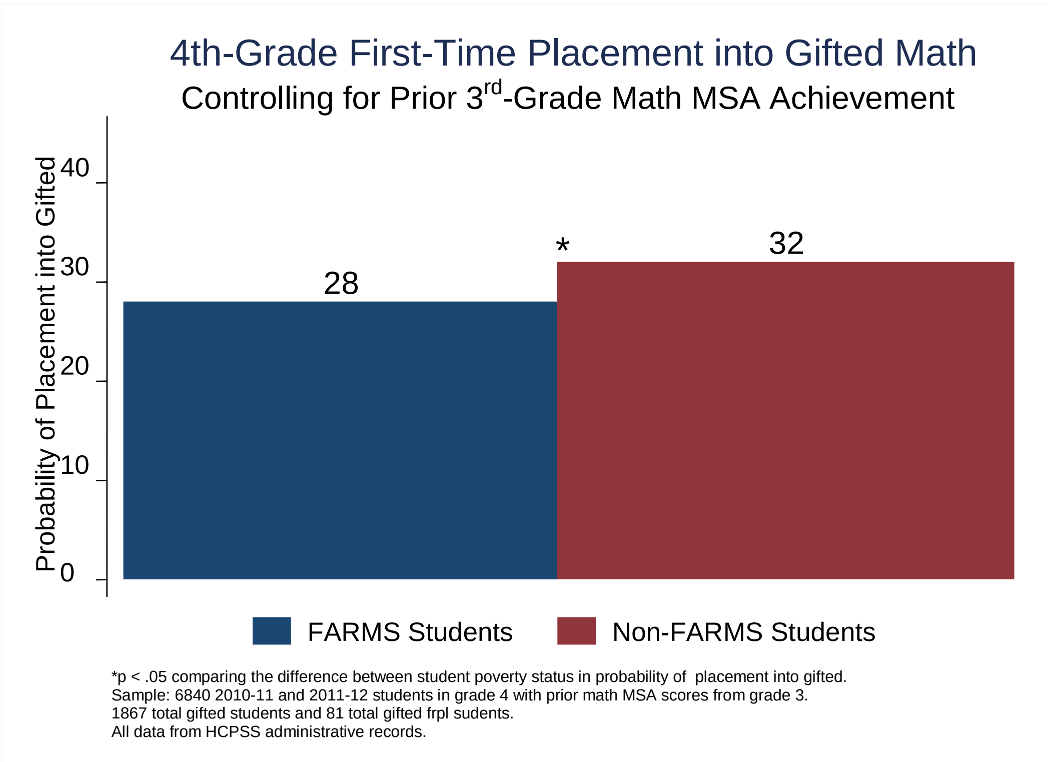


Figure 45. Fourth-grade first-time placement into gifted math, controlling for prior third-grade math MSA achievement

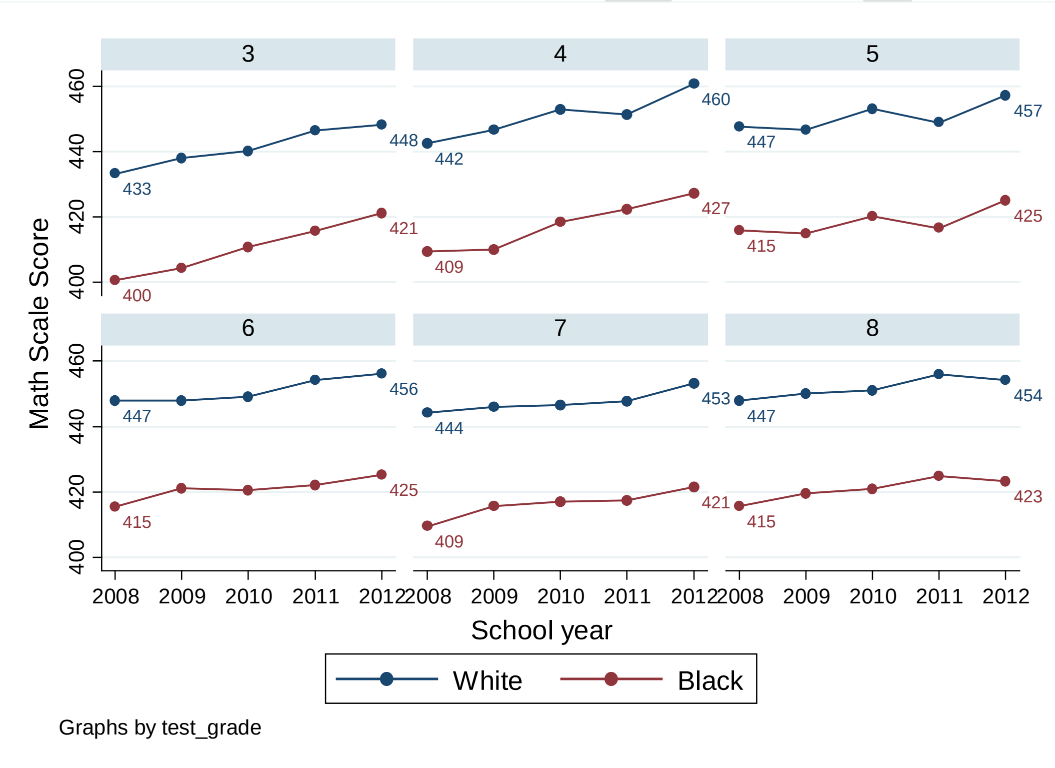
Note: FARMS students are those receiving free and reduced-price meals services.
* $p < 0.05$ comparing the difference between student poverty status in probability of placement into gifted.
Sample sizes : 6840 2010-11 and 2011-12 students in grade 4 with prior math MSA scores from grade 3. 1867 total gifted students and 81 total gifted FARMS students.

Appendices

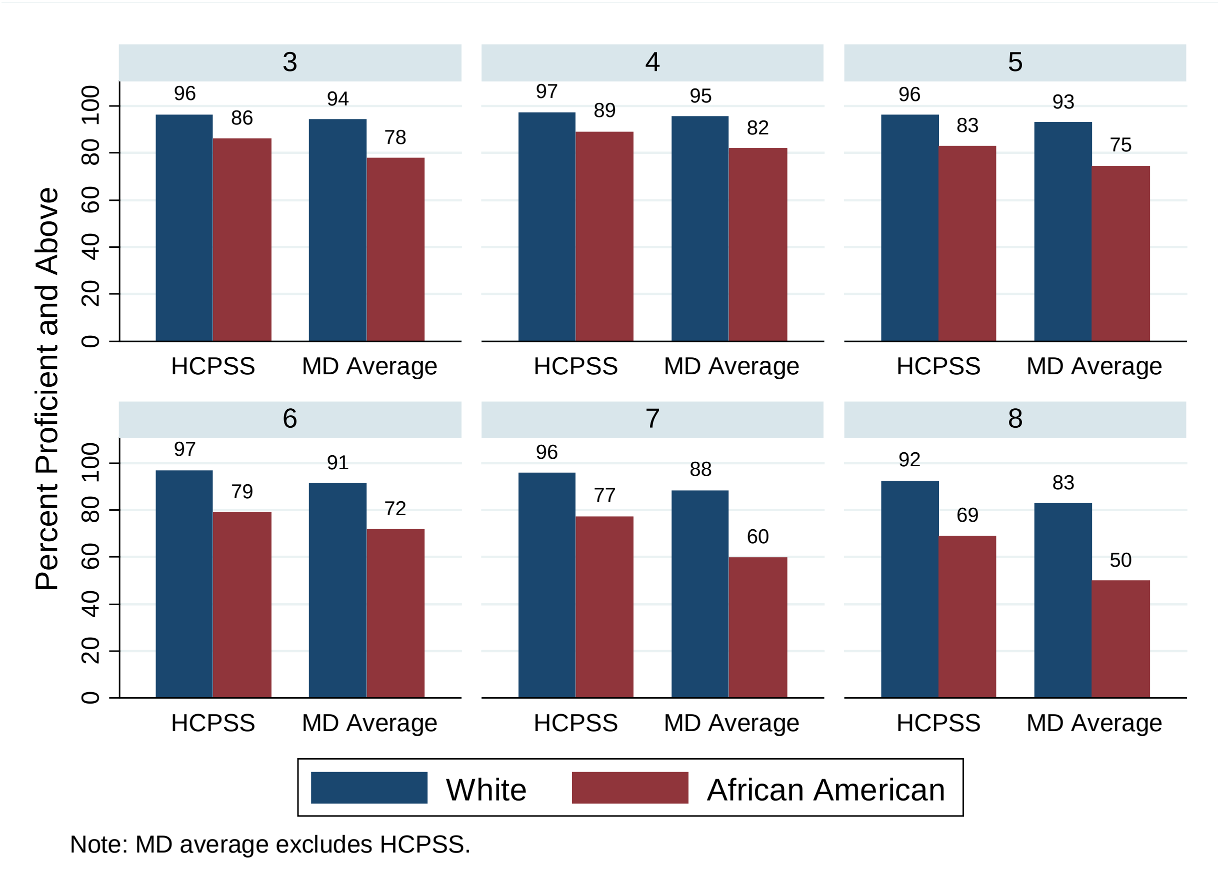
Appendix 1. Sample sizes for test score trends

Grade	2007-08	2008-09	2009-10	2010-11	2011-12
3	3356	3483	3483	3651	3769
4	3622	3444	3554	3599	3728
5	3714	3765	3556	3727	3678
6	3771	3682	3804	3557	3726
7	4092	3810	3745	3867	3645
8	3885	4095	3915	3862	3942

Appendix 2. Average Mathematics MSA Scale Score, by Race and Grade



Appendix 3. Comparing HCPSS Averages to State of Maryland Averages of Percent Proficient and Above, 2012 Math MSA



Appendix 4. Summary of achievement gap trends based on performance on the mathematics MSA, Grades 3-4 and 6-8

FARMS vs. Non-FARMS Gaps						
Grade	2008 Scale Score Gap	2012 Scale Score Gap	Trend in Scale Score Gap	2008 Percentage Point Advanced Gap	2012 Percentage Point Advanced Gap	Trend in Advanced Proficiency Rate Gap
3	37	35	↓	29	40	↑
4	41	37	↓	39	35	↓
6	40	36	↓	38	42	↑
7	38	32	↓	33	35	↑
8	38	34	↓	40	42	↑
Black vs. White Gaps						
Grade	2010 Scale Score Gap	2012 Scale Score Gap	Trend in Scale Score Gap	2010 Percentage Point Advanced Gap	2012 Percentage Point Advanced Gap	Trend in Advanced Proficiency Rate Gap
3	29	27	↓	31	30	↑
4	34	33	↓	34	32	↓
6	27	31	↑	31	37	↑
7	29	31	↑	29	35	↑
8	29	30	↑	36	38	↑
Black vs. Asian Gaps						
Grade	2010 Scale Score Gap	2012 Scale Score Gap	Trend in Scale Score Gap	2010 Percentage Point Advanced Gap	2012 Percentage Point Advanced Gap	Trend in Advanced Proficiency Rate Gap
3	40	39	↓	42	41	↓
4	41	41	↔	42	36	↓
6	40	41	↑	44	49	↑
7	41	42	↑	45	49	↑
8	40	41	↑	46	47	↑
Hispanic vs. White						
Grade	2010 Scale Score Gap	2012 Scale Score Gap	Trend in Scale Score Gap	2010 Percentage Point Advanced Gap	2012 Percentage Point Advanced Gap	Trend in Advanced Proficiency Rate Gap
3	25	22	↓	24	27	↑
4	37	37	↔	35	35	↔
6	23	33	↑	25	39	↑
7	26	26	↔	31	29	↓
8	27	25	↓	39	31	↓
Hispanic vs. Asian						
Grade	2010 Scale Score Gap	2012 Scale Score Gap	Trend in Scale Score Gap	2010 Percentage Point Advanced Gap	2012 Percentage Point Advanced Gap	Trend in Advanced Proficiency Rate Gap

3	36	34	↓	36	38	↑
4	46	45	↓	43	39	↓
6	36	43	↑	38	50	↑
7	38	37	↓	46	43	↓
8	38	36	↓	46	43	↓
ELL vs. Non-ELL						
Grade	2008 Scale Score Gap	2012 Scale Score Gap	Trend in Scale Score Gap	2008 Percentage Point Advanced Gap	2012 Percentage Point Advanced Gap	Trend in Advanced Proficiency Rate Gap
3	28	45	↑	23	45	↑
4	29	55	↑	29	48	↑
6	24	35	↑	23	39	↑
7	27	40	↑	21	28	↑
8	25	30	↑	26	30	↑

Appendix 5. Summary of achievement gap trends based on performance on the reading MSA, Grades 3-8

FARMS vs. Non-FARMS Gaps

Grade	2008 Scale Score Gap	2012 Scale Score Gap	Trend in Scale Score Gap	2008 Percentage Point Advanced Gap	2012 Percentage Point Advanced Gap	Trend in Advanced Proficiency Rate Gap
3	33	32	↓	25	27	↑
4	35	31	↓	34	36	↑
6	34	30	↓	39	37	↓
7	32	28	↓	39	33	↓
8	32	29	↓	38	37	↓

Black vs. White Gaps

Grade	2010 Scale Score Gap	2012 Scale Score Gap	Trend in Scale Score Gap	2010 Percentage Point Advanced Gap	2012 Percentage Point Advanced Gap	Trend in Advanced Proficiency Rate Gap
3	28	26	↓	26	22	↓
4	31	27	↓	31	29	↓
6	21	23	↑	30	28	↓
7	23	24	↑	27	29	↑
8	19	21	↑	27	28	↑

Black vs. Asian

Grade	2010 Scale Score Gap	2012 Scale Score Gap	Trend in Scale Score Gap	2010 Percentage Point Advanced Gap	2012 Percentage Point Advanced Gap	Trend in Advanced Proficiency Rate Gap
3	28	30	↑	26	25	↓
4	35	28	↓	36	29	↓
6	26	28	↑	31	31	↔
7	32	30	↓	33	31	↓
8	25	26	↑	31	38	↑

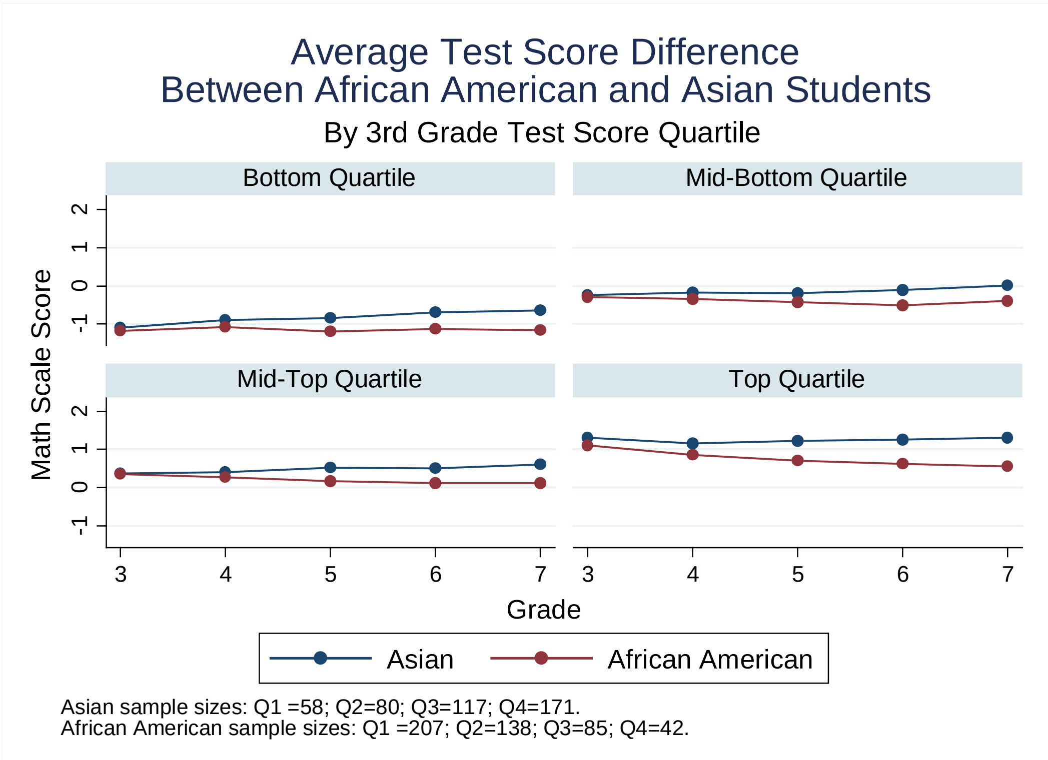
Hispanic vs. White

Grade	2010 Scale Score Gap	2012 Scale Score Gap	Trend in Scale Score Gap	2010 Percentage Point Advanced Gap	2012 Percentage Point Advanced Gap	Trend in Advanced Proficiency Rate Gap
3	26	27	↑	24	22	↑

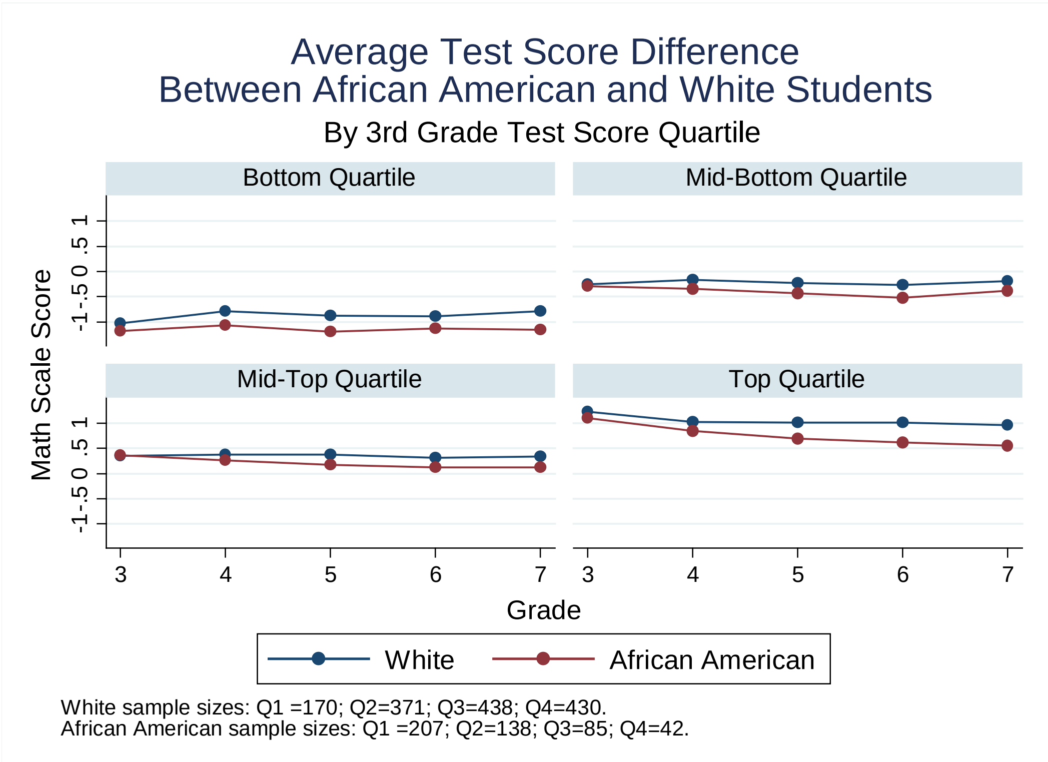
4	34	34	↔	37	39	↑
6	21	26	↑	33	34	↑
7	27	21	↓	29	22	↓
8	23	23	↔	32	33	↑
Hispanic vs. Asian						
Grade	2010 Scale Score Gap	2012 Scale Score Gap	Trend in Scale Score Gap	2010 Percentage Point Advanced Gap	2012 Percentage Point Advanced Gap	Trend in Advanced Proficiency Rate Gap
3	26	31	↑	24	26	↑
4	38	35	↓	42	38	↓
6	26	31	↑	34	37	↑
7	36	27	↓	35	24	↓
8	29	28	↓	35	35	↔
ELL vs. Non-ELL						
Grade	2008 Scale Score Gap	2012 Scale Score Gap	Trend in Scale Score Gap	2008 Percentage Point Advanced Gap	2012 Percentage Point Advanced Gap	Trend in Advanced Proficiency Rate Gap
3	31	46	↑	23	32	↑
4	31	56	↑	31	51	↑
6	37	57	↑	43	68	↑
7	40	48	↑	50	53	↑
8	45	52	↑	55	58	↑

Appendix 6. Average scale score trajectory on mathematics MSA for cohort in grade 3 in 2007-08

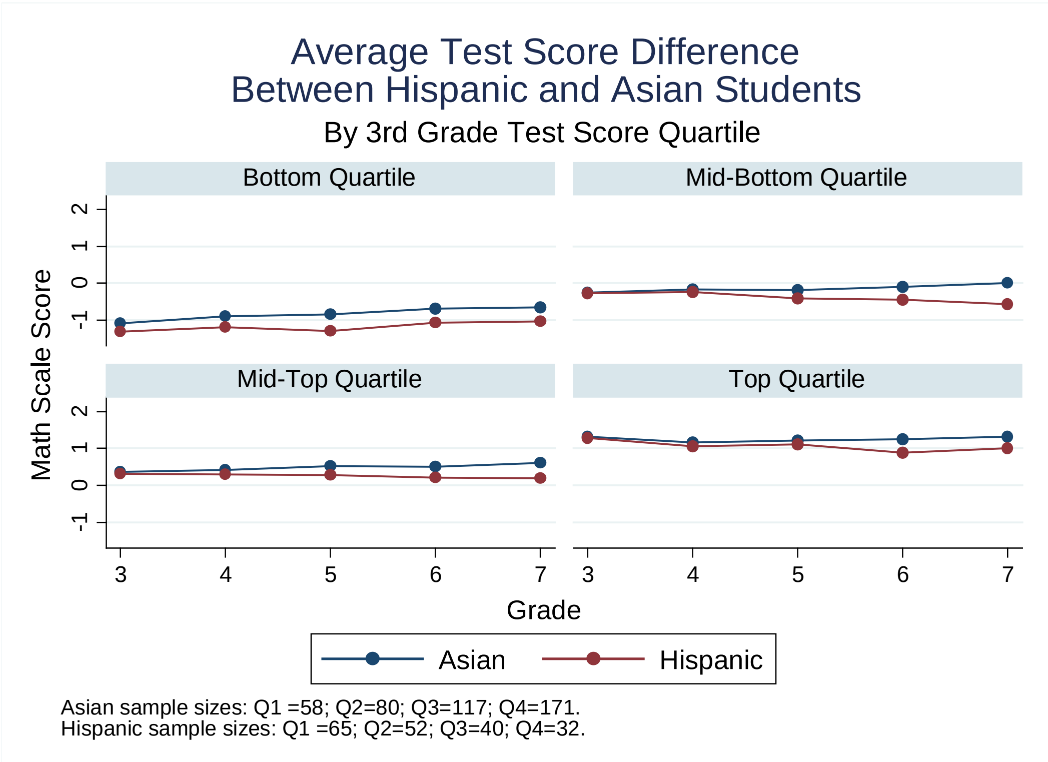
A. Average scale score trajectory on mathematics MSA for cohort in grade 3 in 2007-08, African American and Asian students' initial performance quartiles



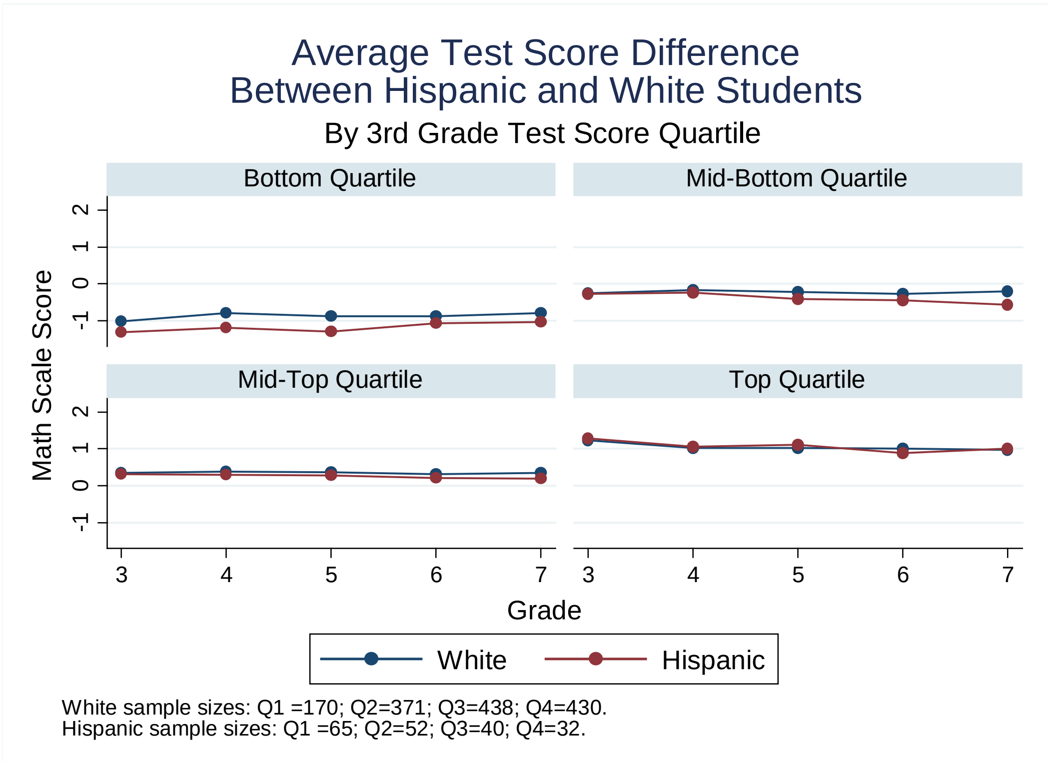
B. Average scale score trajectory on mathematics MSA for cohort in grade 3 in 2007-08, African American and White students' initial performance quartiles



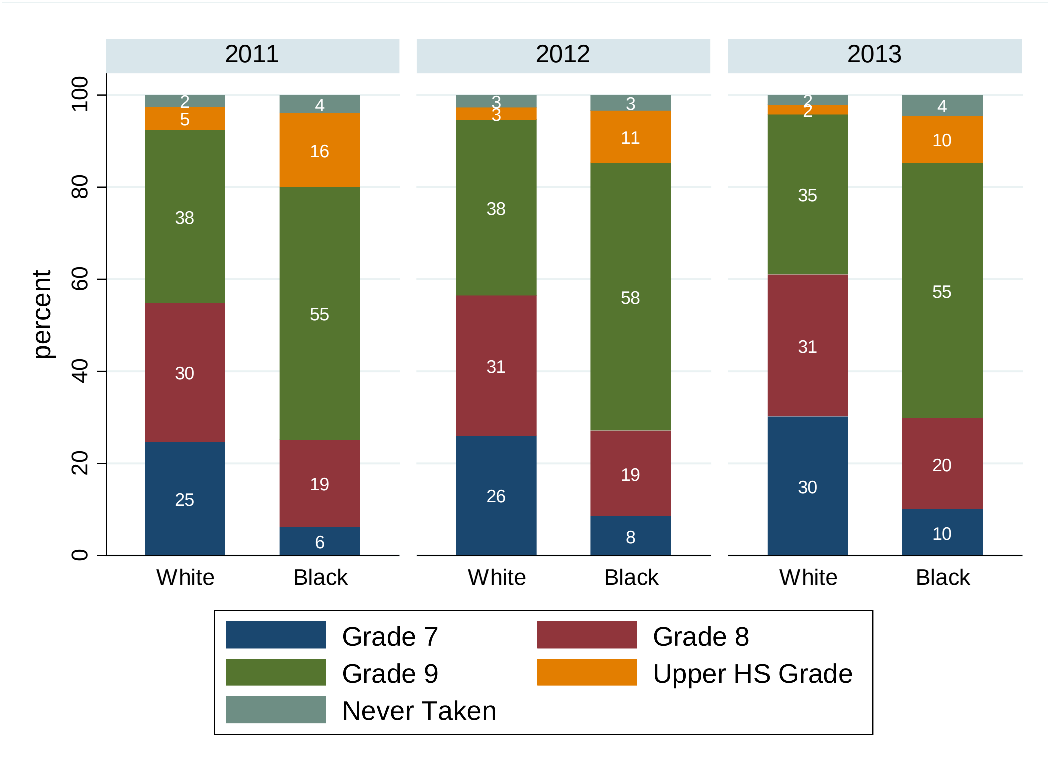
C. Average scale score trajectory on mathematics MSA for cohort in grade 3 in 2007-08, Hispanic and Asian students' initial performance quartiles



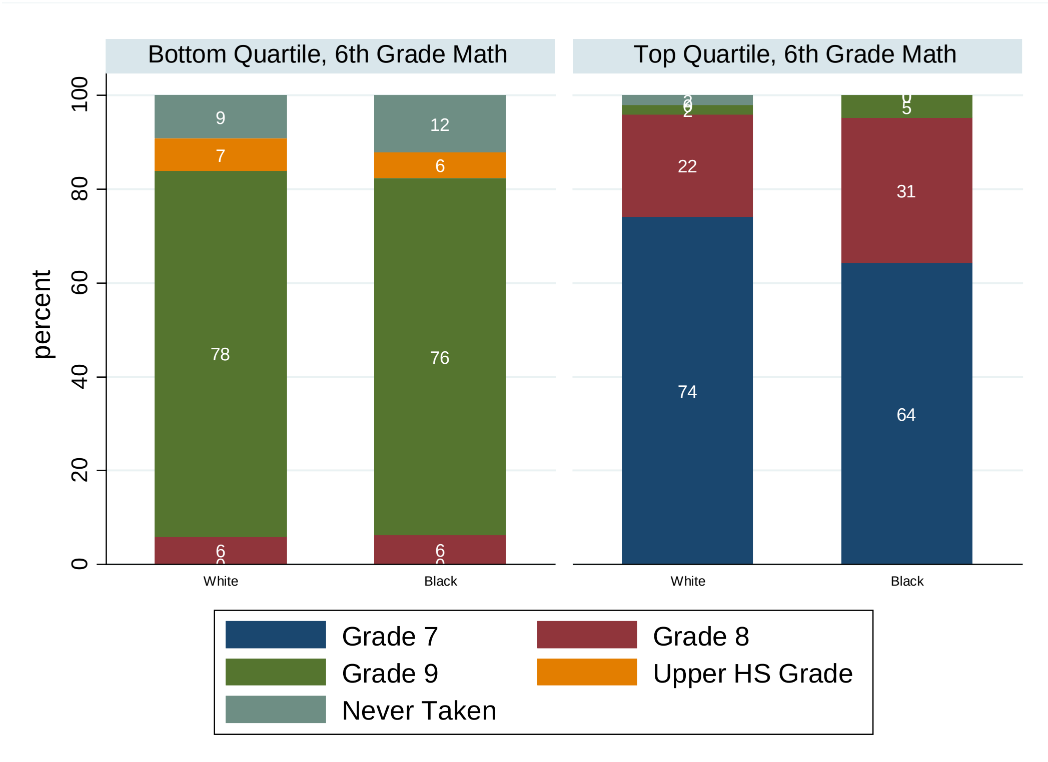
D. Average scale score trajectory on mathematics MSA for cohort in grade 3 in 2007-08, Hispanic and White students' initial performance quartiles



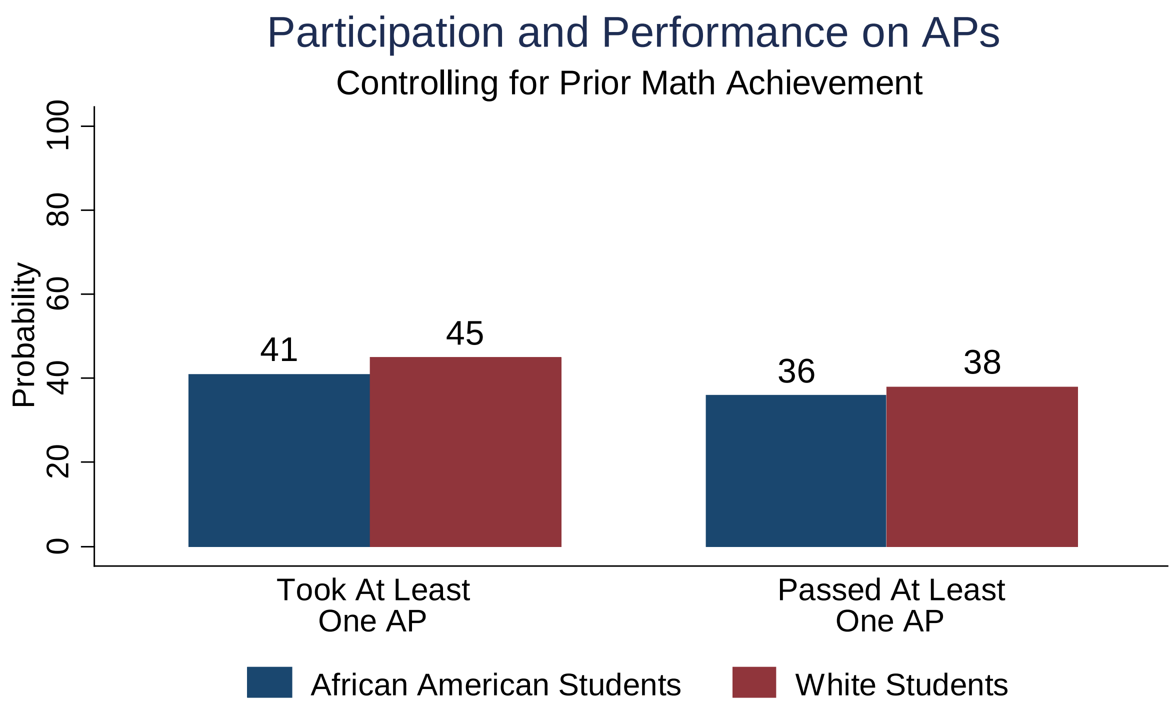
Appendix 7. Timing of HSA Test Taking, by Race and Year



Appendix 8. Timing of HSA Test Taking, by Race and Prior Performance



Appendix 9.



*p < .05 comparing the difference between student characteristics in probability of taking and passing an AP exam.
Sample: There were 2467 students in the class of 2009 with prior performance data to complete this analysis.
1104 took at least one AP, of which 144 were afam.
946 passed at least one AP, of which 107 were afam.
All data from HCPSS administrative records.