

Post-Pandemic Onset Public School Student Test-based Performance in Virginia

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Summary

COVID-19 significantly impacted the educational and home environments for students throughout the Commonwealth of Virginia in ways that may have impacted student learning, as measured by standardized exams. We analyze statewide, student-level administrative and assessment data on the Standards of Learning (SOL) reading and math tests for the 2011-12 through 2020-21 school years among students enrolled in grades 3 through 8. We examine the change in the number of tests taken, the test-taking rate among enrolled students, and student performance on the tests, in the first post-pandemic onset year in which students were tested (2020-21) relative to last full pre-pandemic year (2018-19). Our key findings include the following:

- There was a substantial reduction—a 29% decrease—in the number of 3rd through 8th grade students who took an SOL test in math and reading in the first post-pandemic onset year for which testing data are available (2020-21).
- Declines occurred across all grade levels and regardless of student race or ethnicity or their status as economically disadvantaged, a student with disability, or an English Learner. However, the largest declines were among Black students in both subjects and the smallest declines among English Learners in reading.
- The decline in the number of tests taken was

due primarily to a decline in the test-taking rate among students enrolled in the public schools, but about one-third of the drop was due to a substantial decrease in the number of students enrolled in the public schools post-pandemic.

- Among test-takers, pass rates declined by 32% in math between the last full pre-pandemic year (2018-19) and the first post-pandemic onset year (2020-21), and by 4% in reading. However, interpreting the pre-post pandemic-onset change in reading performance is complicated by the fact that the state introduced a new reading test in 2020-21.
- Pass rates declined in both math and reading for students in all grades 3 through 8 and for all race and ethnicity student groups and student groups defined by their status as economically disadvantaged, a student with disability, or an English Learner.
- Scaled scores decreased on all math tests. The decline in scaled scores was greater among the lower scoring students on the elementary end-of-grade tests (grades 3-5), but greater among the higher scoring students on the middle school end-of-grade tests (grades 6-8).
- While we do not find evidence performance declines were due to changes to the composition of the student population in the aftermath of the pandemic based on observable student characteristics, we cannot fully rule out the possibility that a portion of these

performance shifts were due to systematic compositional shifts based on factors that we do not observe in our data.

Identifying Trends in Student Test-based Performance

It is undeniable that the COVID-19 pandemic significantly impacted the educational environment for students, altering the amount and manner of instruction they received. Not only was the 2019-20 school year shortened by 2-3 months, but students received much of their instruction remotely during the 2020-21 school year. [1] Furthermore, much of that was asynchronous instruction that did not allow the students direct interaction with their teachers. [2] The pandemic also affected students in several ways beyond their schooling environments, through public health challenges and an economic recession. These changes have raised concerns that the pandemic impacted student learning. In this brief, we examine these issues.

We focus on students enrolled in grades 3 through 8 and their learning in mathematics and reading as captured by the Commonwealth's Standards of Learning (SOL) tests. Our analysis provides answers to a series of pressing questions. How did the pandemic influence the number and percent of students enrolled in grades 3 through 8 who took an SOL test? How did the pandemic influence the likelihood a student enrolled in grades 3 through 8 passed an SOL test? How did the pandemic influence the performance of students enrolled in grades 3 through 8 on an SOL test? In partnership with the Virginia Department of Education (VDOE), we answer these questions with an analysis of statewide administrative and assessment data provided by the VDOE. These data allow us to track individual students over time throughout Virginia between school year 2011-12 and 2020-21 (the first full post-pandemic onset school year).

The SOL Tests

We examine the SOL tests aligned to the 2009 and 2017 math standards and the 2010 and 2018 reading standards. The math tests aligned to the older standards were administered between spring 2012 and spring 2018 with the new tests first administered in spring 2019 (before the pandemic onset). The reading tests aligned to the older standards were administered between spring 2013 and spring 2019 with the new tests first administered in spring 2021 (post-pandemic onset). As a result of the March 2020 shutdown, no SOL tests were administered in 2020. (Throughout this brief, we refer to school years by the spring year of the academic year; hence, 2020 refers to school year 2019-20.) In 2021, some students and their families were uncomfortable coming to the school in order to take an SOL test. VDOE, therefore, gave parents a new option of refusing their child to be tested due to pandemic. We will return to this later in this brief.

All students enrolled in grades 3 through 8 are required to participate in the Virginia Assessment Program by taking an SOL test annually in math and reading. There are a few exceptions. Recently arrived English Learners (EL) who have attended school in the United States for less than 12 cumulative months may receive a one-time exemption from the SOL reading tests in grades 3-8. [3] Also, students with disabilities are eligible to take an alternative assessment, the Virginia Alternative Assessment Program. [4]

The SOL reading tests we examine are the SOL end-of-grade tests for grades 3 through 8. In math, in addition to the SOL end-of-grade tests for grades 3 through 8, we also examine the SOL end-of-course tests in Algebra I, Geometry, and Algebra II that these students took when they do not take an end-of-grade test. Roughly 14% of 7th graders and 52% of 8th graders take an end-of-course math exam during the years we examine here.

Number of Students Taking an SOL Test

There was a dramatic reduction in 2021—the first post-pandemic onset year for which testing data are available—in the number of students enrolled in grades 3 through 8 who took an SOL test. This was after years of steady pre-pandemic growth (see **Figure 1**). The reduction between 2019 and 2021 was similar between the two subjects (165,630 fewer math tests and 167,069 fewer reading tests). Both represent a 29% decrease. Fewer students took the tests at all grade levels, however, the declines tended to be higher for the middle school students (grades 6-8) than the elementary school students (grades 3-5) (see the red bars in **Figure 2**). For example, 32-33% fewer students enrolled in grades 6-8 took an SOL reading test compared to 24-29% fewer among students enrolled in grades 3-5. These reductions reverse the general upward trend since 2013 in the number of SOL tests taken (see the blue bars in Figure 2).

We see a reduction in the number of SOL tests regardless of student race or ethnicity or their status as economically disadvantaged (ED), a student with disability (SWD), or an English Learner (EL) (see Figure 3). Given that unequal size of each of these student groups, it might not be surprising that decline in the number of tests between 2019 and 2021 were greatest among the largest student groups (i.e., White students, students without disabilities, and non-EL students) (left panels of **Figure 3** on the next page). We, therefore, also present these declines as a percent of number of tests in 2019 (right panels of **Figure 3**). With respect to students'

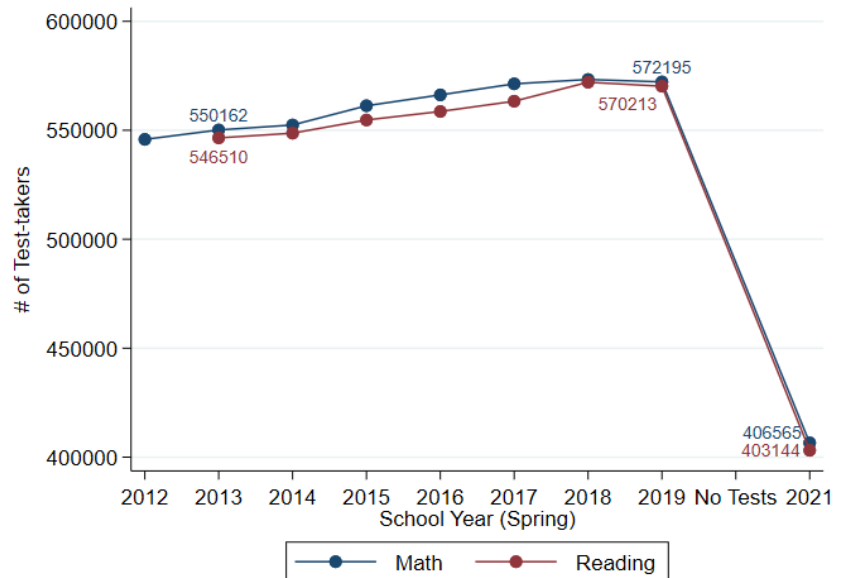


Figure 1. Number of students enrolled in grades 3-8 who took a math or reading SOL exam by school year, 2012 to 2021

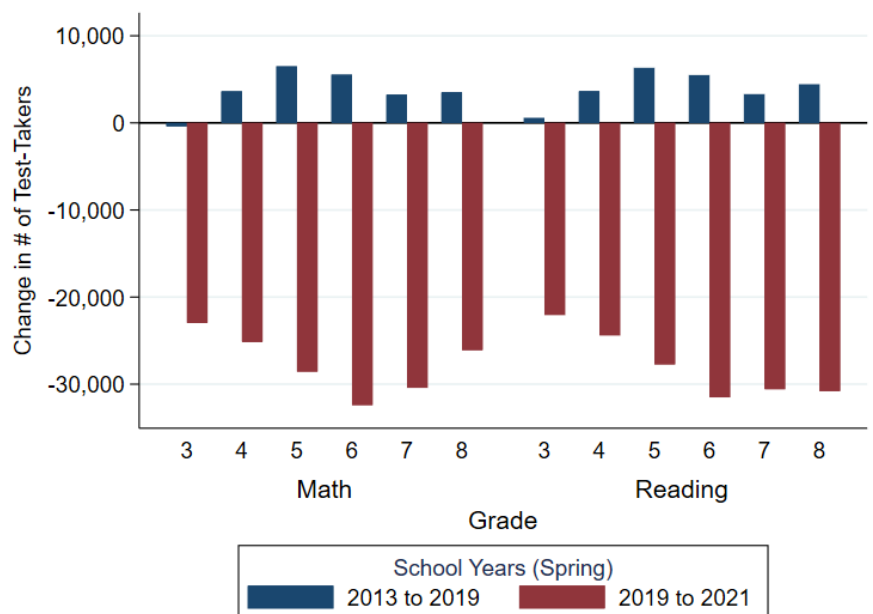


Figure 2. Change in the number of students enrolled in grades 3-8 who took a math or reading SOL exam between 2013 and 2019 and between 2019 and 2021, by grade

race and ethnicity, the largest percentage decrease was among Black students (39% in both subjects).

The smallest percentage decrease was among Asian students (22% in math, 23% in reading). The percentage reduction for the other racial and ethnic groups ranged between 25 and 28%. The

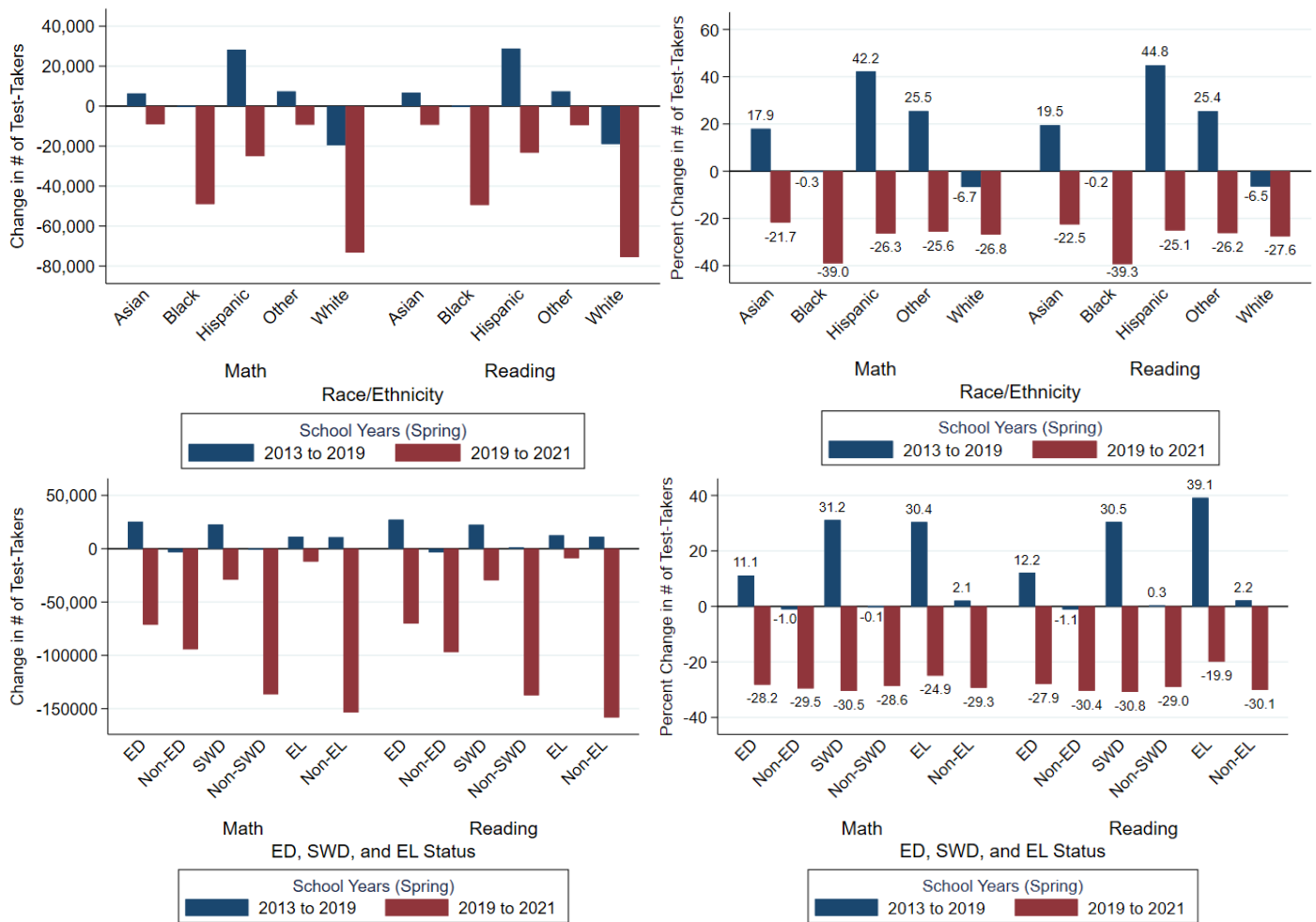


Figure 3. Change and percentage change in the number of students enrolled in grades 3-8 who took a math or reading SOL test between 2013 and 2019 and between 2019 and 2021, by subject, race/ethnicity, and economic disadvantage (ED), students with disabilities (SWD), and English Learner (EL) status

percentage declines were similar between students that were and were not economically disadvantaged and between students that did and did not have a disability. The differences ranged between 1 and 2 percentage points. There were larger differences in the percentage reductions in the number of tests between English Learners and non-ELs. The decline in math tests among EL students was over 4 percentage points smaller than among non-ELs. In reading, the decline among EL students was over 10 percentage points smaller than among non-ELs.

The reduction in the number of math and reading SOL tests taken by students enrolled in grades 3 through 8 is driven by two factors: a decline in the number of students enrolled and an increase in the

number of enrolled students who, for a variety of reasons, do not take the test (i.e., the test-taking rate). In 2021, parents were given the option of refusing, because of the pandemic, to send their child to school to be tested, and a large number of families did just that. Roughly 22% of students enrolled in grades 3-8 did not take an SOL test in 2021 (see **Figure 4** on the next page), and parents of almost three-quarters of those students not taking a test cited the pandemic for their refusal. The 2021 percent of students not taking a test is many times larger than the 1% of students who did not take these tests in 2019. In fact, the percent of students tested has been remarkably consistent since 2012. The test-taking rate was lower among the middle school grades than the elementary

grades (between 68 and 75% compared to between 83 and 85%). This could be due, at least in part, to the fact that elementary school students received more in-person instruction than middle school students. [5]

It is possible to partition the overall decline in the number of SOL tests taken by students enrolled in grades 3 through 8 between the

two causes: declines in enrollment and the test-taking rate. We know that the post-pandemic onset period also came with substantial drops in student enrollment. If we were to assume that the 2021 test-taking rate would have been the same as it was in 2019 without the pandemic, the difference between the number of tests in 2021 (estimated) and the number of tests in 2019 (actual) can be attributed to the decline in enrollments. [6] The difference between the estimated number of 2021 tests and the actual number of 2021 tests can be attributed to the lower test-taking rate. These calculations reveal that the lower test-taking rate caused two-thirds of the decline between 2019 and 2021 while one-third was caused by the enrollment drop.

Whereas the test-taking rate in 2019 did not vary much across student race and ethnicity groups, nor with their status as economically disadvantaged, a student with disability, or an English Learner, there were differences across these groups in 2021. Black students had the lowest test-taking rate in 2021 of any racial group, 70% for both math and reading tests (**Figure 5**, top panel on the next page). Asian and White students had the highest test-taking rates, between 82 and 83% across the two subjects. Additionally, test-taking rates were lower among

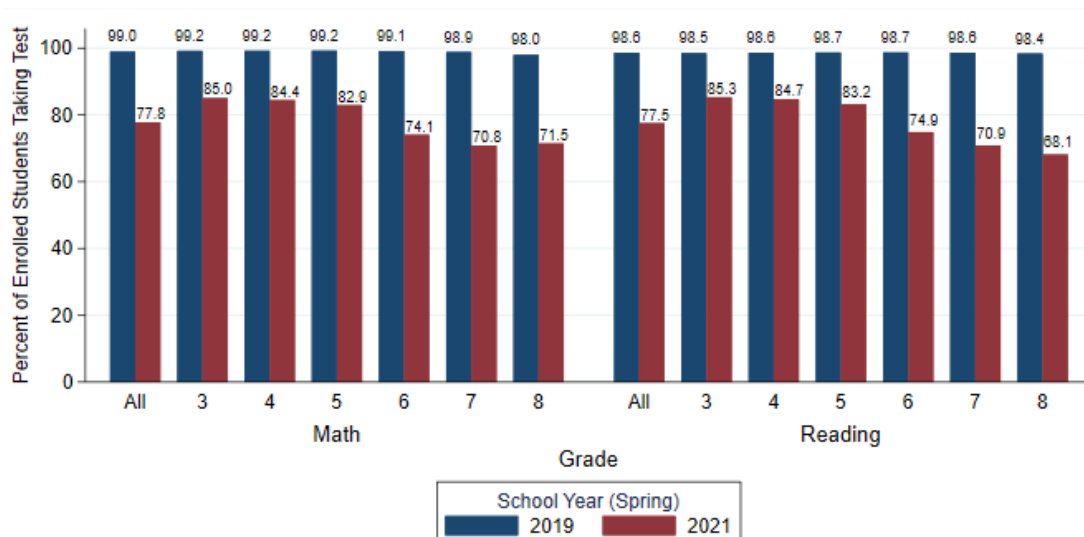


Figure 4. Percent of students enrolled in grades 3-8 that took an SOL test in 2019 and 2021 by grade and subject

students identified as ED, SWD, or EL than among their peers not identified as such (**Figure 5**, bottom panel on the next page). All differences were greater in 2021 than in 2019. For example, the 2019 test-taking rate for SWD students was 2 percentage points lower than for non-SWD students but was more than 6 percentage points lower in 2021. The one exception to this pattern is between EL and non-EL students in reading. In 2019, the test-taking rate for EL students was over 8 percentage points lower than that for non-EL students. In 2021, the difference was less than half that.

Impact of the 2021 Reduction in the Number of Tests on Pass Rates and Test Scores

Before turning to our analysis of SOL pass rates and scaled scores, we must acknowledge that the comparison we make below between student performance in 2021 and 2019 may be due to these compositional changes in the 2021 test-taking population. We tested this by weighting the 2021 population of tested students enrolled in grades 3 through 8 to look observationally similar to the 2019 test population. These raked weights made the two populations similar with respect to their gender and racial-ethnic composition, the proportion of the students identified as ED, SWD, and EL, the

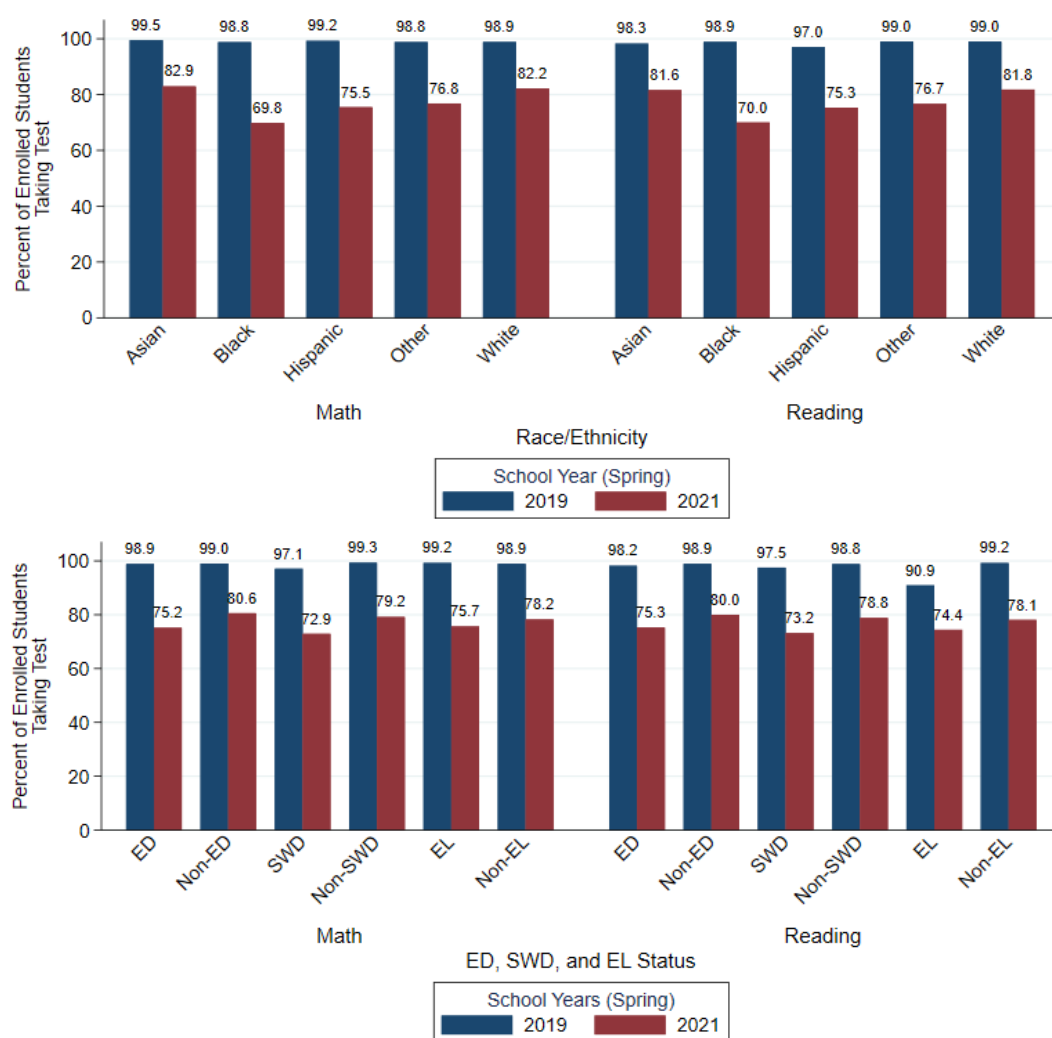


Figure 5. Percent of students enrolled in grades 3-8 that took an SOL test in 2019 and 2021 by subject, race/ethnicity, and economic disadvantaged (ED), students with disabilities (SWD), and English Learner (EL) status

proportion of students over-aged for their grade (a proxy for being previously retained in grade), the proportion of students who were not enrolled in any Virginia public school the prior year, and the distribution of students among Virginia's 132 school divisions. We created these weights separately for each grade and subject. Our results changed negligibly when we applied these weights. We, therefore, present the unweighted results here.

We are unable to incorporate students' prior SOL test performance into our weights. Given the lack of SOL tests from 2020, we only observe prior performance we only observe prior performance for 5th through 8th graders who were enrolled in a

Virginia public school two years prior. Differential attrition on prior achievement, however, remains a real concern. On this restricted sample, we examined the rate of attrition by quintiles of prior SOL test performance. We find that attrition increases with test scores from 4.2% among the lowest scores students to 5.1% among the highest scoring students. This suggests that the attrition contributes to the unweighted 2019-2021 comparisons we present below in such a way that the results overestimate the size of the change in test performance; yet, given the size of the difference in attrition rates across baseline performance groups, it is unlikely to be a major contributor.

SOL Pass Rates

Among the students enrolled in grades 3 through 8 who took SOL tests, the percent who passed the math tests declined in 2021 relative to 2019 (see **Figure 6** on the next page). The post-pandemic onset math pass rate was 25 percentage points lower than it had been in last pre-pandemic year (53 versus 78%). This translates to 32% fewer students passing a math test in 2021 than in 2019. This decline was much larger than any other year-to-year change we observe in the pre-pandemic period. The math pass rates declined in all grades. The declines ranged from 22 percentage points among 8th grade students to 27 percentage points among 6th grade students. Recall that the same math exams were administered in 2019 and 2021.

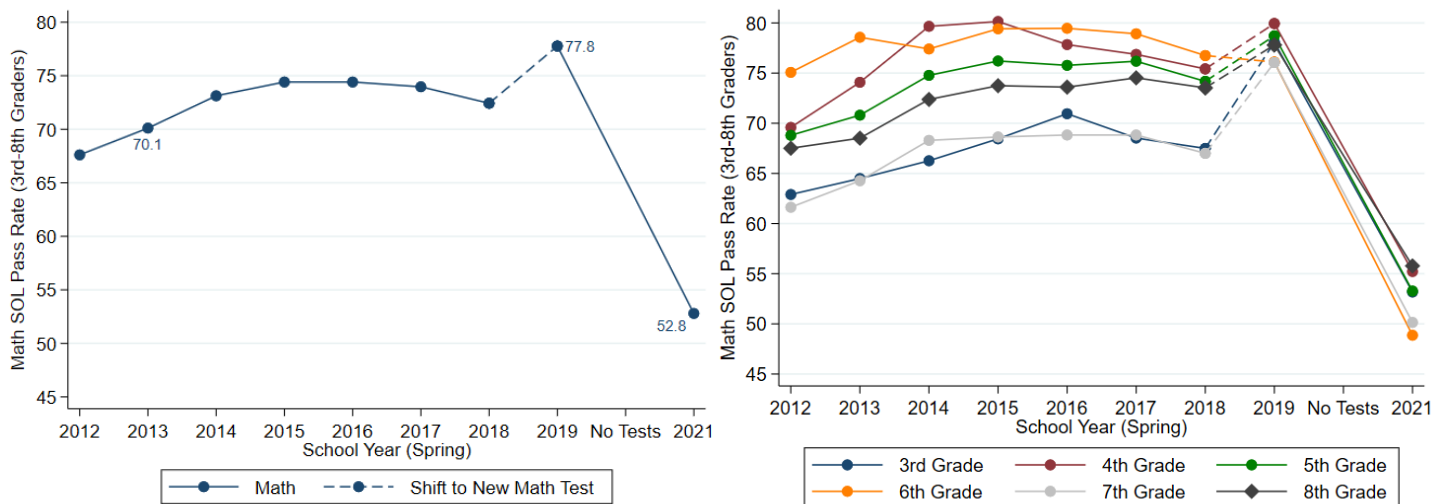


Figure 6. Math SOL pass rates by year overall and by grade
Note: The dotted lines indicate shifts to new math SOL tests in 2019.

The reading pass rate declined 4 percentage points between 2019 to 2021 (see **Figure 7**). The declines ranged from 1 percentage point in 8th grade to 8 percentage points in 5th grade. Interpreting the size of these declines, however, is complicated by the fact that the pandemic onset coincided with the introduction of new reading tests. It is likely that we would have seen a much larger decline in the reading pass rate if the old reading tests had been administered in 2021, given that the cut-scores on the new reading tests were set so that more students would pass the exams as was the case with the new math tests. This likely helps to explain why the 2019 math pass rate was more than 5

percentage points higher than in 2018 (the last year in which the state administered the old math exam). The 2021 change in the reading tests also means that we cannot make comparisons between math and reading in terms of the relative size of the performance declines.

Math pass rates declined between 2019 and 2021 for all student groups we examined (see **Figure 8** on the next page). Asian students experienced the smallest decline (14 percentage points) of any racial group while Black and Hispanic students experienced the greatest declines (each 33 percentage points). Given that these declines were

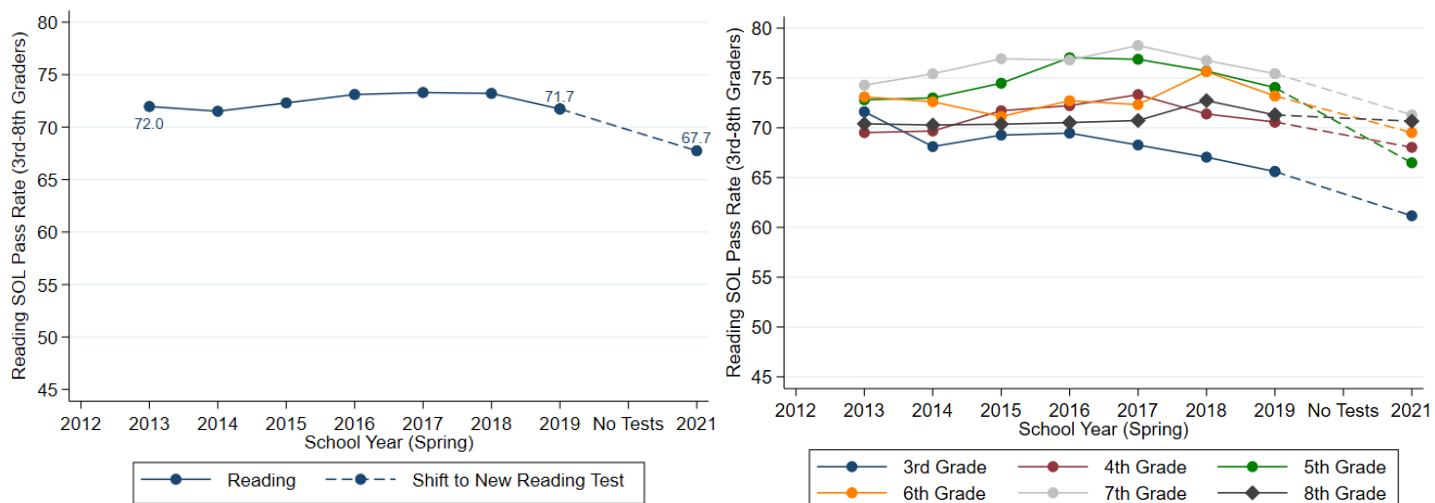


Figure 7. Reading SOL pass rates by subject, year, and grade
Note: The dotted lines indicate shifts to new reading SOL tests in 2021.

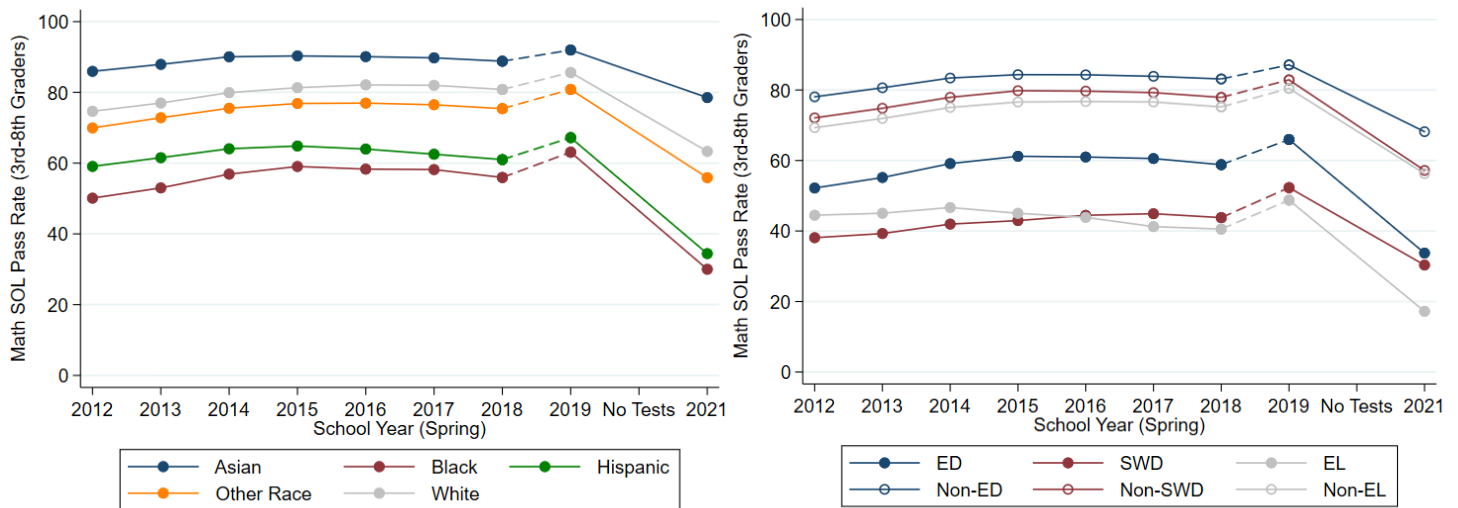


Figure 8. Math SOL pass rates by subject, year, and student ED, SWD, and EL status
Note: The dotted lines indicate shifts to new math SOL tests in 2019.

larger than the 22-percentage point decline for White students, the Black-White and Hispanic-White differences in pass rates each increased by 11 percentage points. The 2021 Black-White difference was 48% larger than in 2019 while the Hispanic-White difference was 57% larger in 2021 than 2019. Among the other student groups, ED and EL students experienced the greatest declines (each 32 percentage points), larger than the decline in the math pass rate for non-ED and non-EL students (19 and 24 percentage points, respectively). Contrarily, the decline for SWD students was smaller than the decline for non-SWD students (22 and 26

percentage points, respectively).

Reading pass rates also declined for all the student groups we examined (see **Figure 9**). The declines for Hispanic and Black students were slightly larger than for White students (8 and 6, respectively, versus 4 percentage points). Asian students experienced the smallest decline (1 percentage point). The pattern of the declines among the other student groups mirrors those in the math pass rates. EL and ED students experienced the largest declines (7 and 6 percentage points, respectively). Reading pass rates for SWD students declined 2

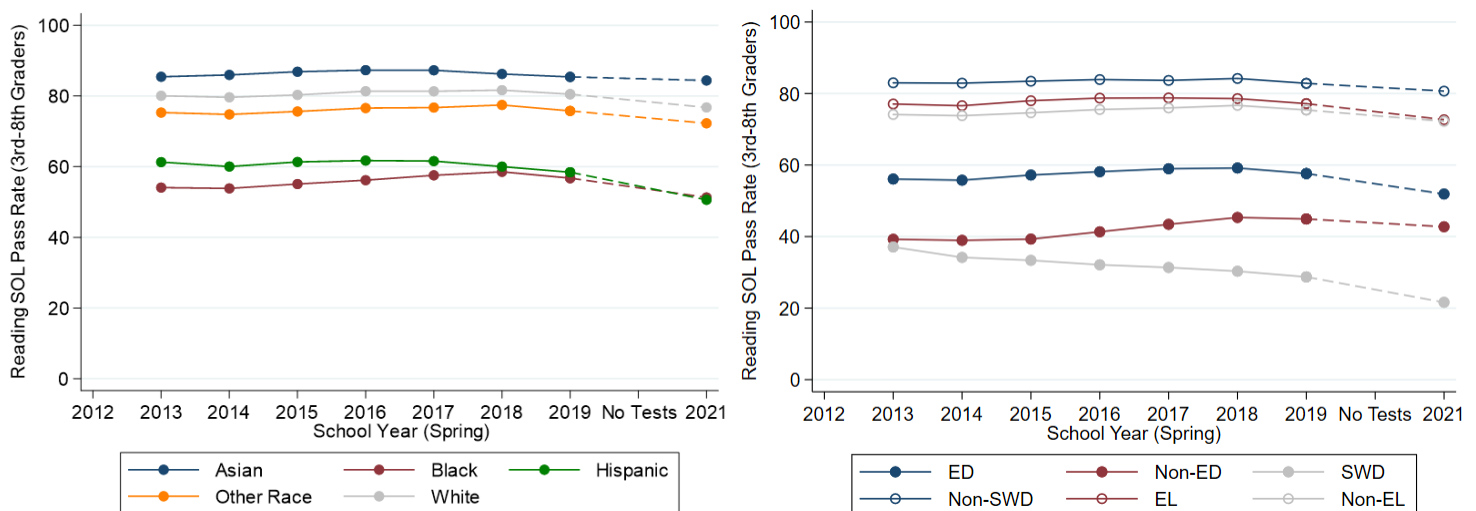


Figure 9. SOL pass rates by subject, year, and student ED, SWD, and EL status
Note: The dotted lines indicate shifts to new math SOL tests in 2019.

percentage points.

SOL Scaled Scores

The pass rates, while informative and policy-relevant, only capture the share of students above a specific threshold. Examining the change in test scores, both the average scores and the scores at specific points in the score distribution, can provide additional insights into how student performance in math and reading changed after the pandemic's onset. For these analyses, we present statistics for each SOL test separately, including only students enrolled in grades 3 through 8.

Average math SOL scaled scores decreased on each math test (see **Figure 10**). The declines were similar across the end-of-grade exams (between 38 and 41 points) and across the end-of-course exams (between 31 and 34 points). To understand how the distribution of scores changed, we calculate the differences at the 15th, 25th, 50th, 75th, and 85th percentiles of 2019 test performance (see **Figure 11**). The results indicate that it is not the case across the math tests that either the declines were always greatest among the students who were lowest or the highest scoring prior to the pandemic. For example, the decline in scaled scores was greater among the lower scoring students on the elementary and end-of-grade tests

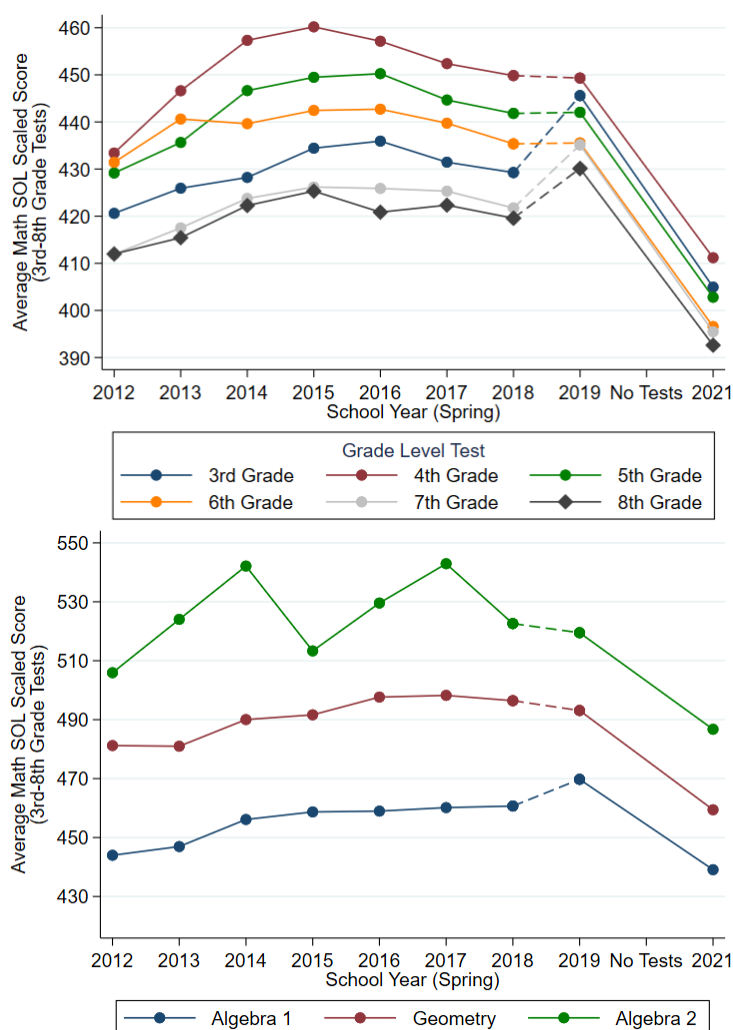


Figure 10. Average math SOL scaled scores of students enrolled in grades 3-8 by year and SOL test
Note: The dotted lines indicate shifts to new math SOL tests in 2019.

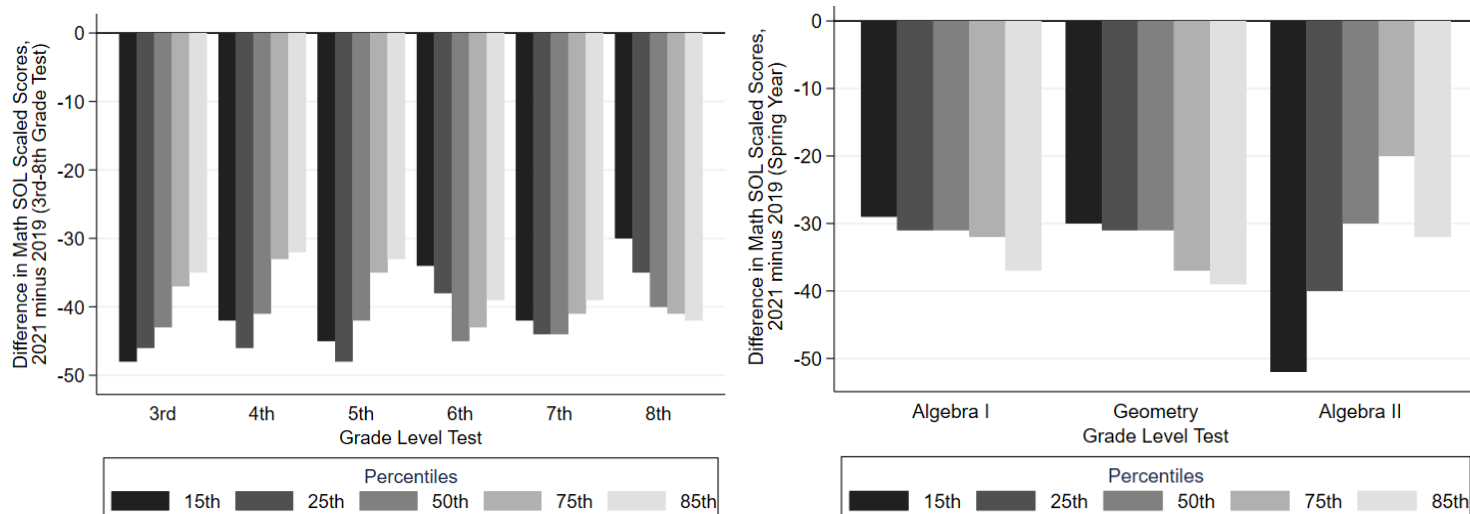


Figure 11. Change in math SOL scaled scores between 2019 and 2021 at various points in the score distribution by math SOL test

(i.e., 3rd through 5th grades), but greater among the higher scoring students on the middle school end-of-grade tests (i.e., 6th through 8th grades). That said, these analyses could be subject to sensitivity given we know that there was some differential attrition from the test-taking population by baseline achievement levels.

Average reading scores decreased in 2021 relative to 2019 on each test (between 6 and 19 points) except for the 8th grade test on which the average score increased by 2 points (see **Figure 12**). The declines were greatest for the higher scoring students on the elementary end-of-grade tests (**Figure 13**). There was very little difference in the declines among lower and higher scoring students on the 6th and 7th grade tests. On the 8th grade test, scores for the higher scoring students increased relative to 2019 whereas scores for the lower scoring students decreased. Again, the interpretation of these changes is complicated by the test change that coincided with the pandemic.

Closing

The first full school year after the onset of the COVID-19 pandemic saw dramatic drops in the number of state standardized exams completed in Virginia among 3rd to 8th grade public school students, in the test-taking rate among enrolled students, and in student performance on the exams. While this brief takes an important first step in describing these patterns over time, there remain important limitations. For example, we are unable to determine the exact extent to which student attrition from the public school system or from the test-taking sample may have varied systematically on

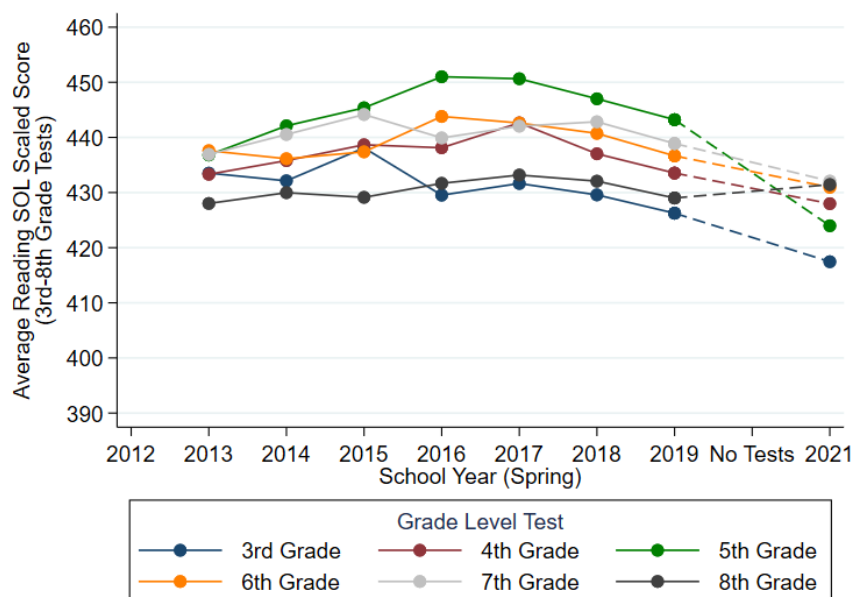


Figure 12. Average reading SOL scaled scores of students enrolled in grades 3-8 by year and SOL test
Note: The dotted lines indicate shifts to new reading SOL tests in 2021.

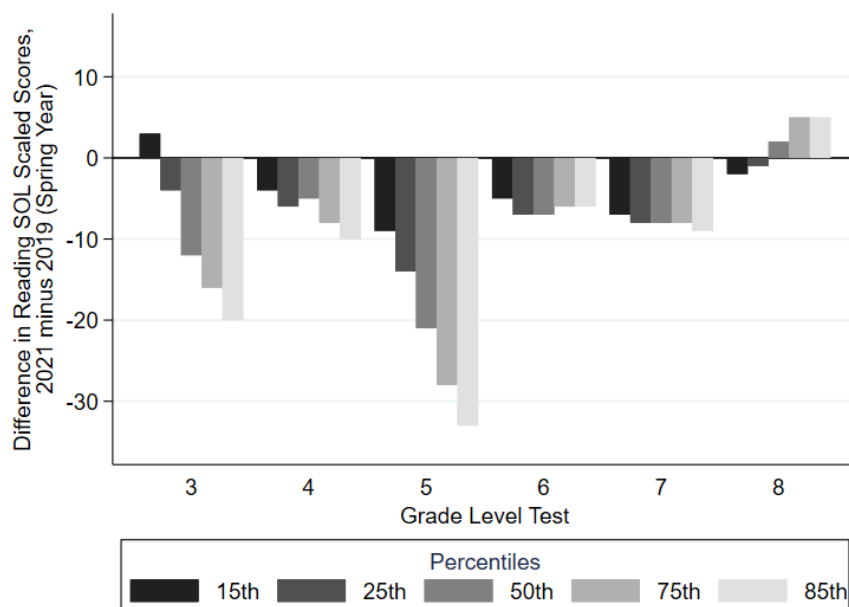


Figure 13. Change in reading SOL scaled scores between 2019 and 2021 at various points in the score distribution by reading SOL test

dimensions that are not well-captured by the administrative data but that could explain the changes in proficiency rates and test scores. Our approaches to explore this—weighting the 2021 test-taking population to look the similar to the

2019 test-taking population and comparing attrition rates across performance levels on prior SOL tests—suggest it is a factor in the change in student test-based performance, but that it is unlikely to explain all of the change. Further exploration of this possibility will be critical to interpreting the extent to which the decline in student test-based performance represents a decline in real learning.

Additionally, readers may be tempted to conclude from our results that performance in math declined more so than in reading. We are not able, however, to make such claims across subjects given the post-pandemic change in reading performance is difficult to interpret since we do not have results on a comparable test administered both before and after the pandemic's onset in reading. Finally, although we observe declines in performance, we are not able to attribute those declines to any particular cause, whether it be division's responses to the pandemic, student exposure to illness or to economic consequences of the pandemic. Addressing those questions will be the subject of our future research designed to help inform pandemic recovery efforts.

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