



Test Score Patterns Across Three COVID-19-impacted School Years

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Test Score Patterns Across Three COVID-19-impacted School Years

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Abstract

The COVID-19 pandemic has been a seismic and on-going disruption to K-12 schooling. Using test scores from 5.4 million U.S. students in grades 3-8, we tracked changes in math and reading achievement across the first two years of the pandemic. Average fall 2021 math test scores in grades 3-8 were .20-.27 standard deviations (SDs) lower relative to same-grade peers in fall 2019, while reading test scores decreased by .09-.18 SDs. Achievement gaps between students in low-poverty and high-poverty elementary schools grew by .10-.20 SDs, primarily during the 2020-21 school year. Observed declines are more substantial than during other recent school disruptions, such as those due to natural disasters.

Background

Since the COVID-19 pandemic began in March 2020, educators, parents, and policymakers have been concerned about potential lost learning associated with on-going disruptions to schooling. Initial predictions drawing from research on summer learning loss, school disruptions due to inclement weather, and absenteeism research projected that students would not acquire 30-50% of their expected learning due to the spring 2020 school closures (Kuhfeld et al., 2020a). Researchers and educators also expected pandemic shocks to widen existing educational inequalities. For example, a survey of education researchers in November 2020 predicted that large increases in achievement gaps between low- and high-income students (from a pre-pandemic gap of 1.0 SD to 1.30 SD in math and 1.25 SD in reading) in elementary school would be observed by spring 2021 (Bailey et al., 2021).

Assessment data collected during the 2020-21 school year provides an initial understanding of student achievement during the early stages of the COVID-19 pandemic. In some cases, related research has relied on state summative assessments, with results indicating larger declines in math than reading between spring 2019 and 2021 (Halloran et al., 2021; West et al., 2021; Thorn & Vincent-Horn, 2021). However, many critics have cautioned against interpreting trends in achievement test results between 2019 and 2021 due to differences in (a) testing population (Ho, 2020), (b) test mode of administration (Barnum, 2021), and (c) the length and content of the tests themselves (Gerwetz, 2021). In other cases, interim achievement tests have been used to examine student growth, including during the 2020-21 school year. For example, Lewis et al. (2021) showed that, although the average student demonstrated positive gains in math and reading during the 2020-21 school year, students were still behind typical (pre-pandemic) averages by spring 2021. Finally, both summative and interim tests show preliminary

evidence of widening achievement gaps by income and race/ethnicity (Halloran et al., 2021; West et al., 2021; Thorn & Vincent-Horn, 2021), though these studies are not able to differentiate the period(s) in which gaps widened the fastest.

These initial findings coalesce on a similar story, but important gaps remain in our understanding of how COVID-19 has affected achievement. First, while evidence suggests that students began the 2020-21 school year less prepared than in prior years (Kuhfeld et al., 2020b), little is known about how prepared students were when they entered school in fall 2021, relative to both the fall of 2020 (directly following the pandemic's onset) and the fall of 2019 (prior to the emergence of COVID-19). Such information can help educators and policymakers contextualize the academic challenges that students currently face and, hopefully, provide data germane to addressing those challenges. Second, while many researchers anticipated income-based achievement gaps widening approximately 25-30% by spring 2021 (Bailey et al., 2021), little is known about how these forecasts played out, including how gaps have changed over the entire scope of the pandemic thus far.¹

This Study

This brief uses new achievement data from fall 2021 (as well as fall data from the two prior years) to examine how student reading and math achievement at the beginning of the school year has changed across the course of the COVID-19 pandemic thus far. Using data from over 5.4 million students in grades 3-8 who took MAP Growth assessments in reading and math, we compared test scores for students in fall 2021 relative to same-grade peers in fall 2020 and

¹ Bailey et al. (2021) asked researchers to forecast individual-based income achievement gaps. While some research studies have examined achievement gaps by school poverty since the start of the pandemic (e.g., Lewis et al., 2021; West et al., 2021), none of the studies we are aware of were scaled in a way that allow for comparisons with the Bailey et al.'s (2021) projections (e.g., estimates were reported as percentile changes rather than standardized test scores). We are unaware of any current research using spring 2021 test scores and individual income data.

fall 2019 in 12,000 schools that administered MAP Growth assessments consistently across all three pandemic-impacted school years (2019-20, 2020-21, 2021-22). We addressed two research questions:

- 1) Have test scores decreased during the first two years of the pandemic (e.g., comparing 3rd grade achievement in fall 2019 and fall 2021)? If so, is that decline attributable to drops occurring (a) in the early phase of the COVID-19 pandemic immediately following school closures or (b) during the 2020-21 school year?
- 2) Did achievement gaps by school poverty widen following the onset of the COVID-19 pandemic? If so, did gaps primarily increase (a) in the early phase of the COVID-19 pandemic immediately following school closures or (b) during the 2020-21 school year?

Results

Math achievement dropped across the first two years of the pandemic, while reading achievement dropped primarily between fall 2020 and fall 2021

Figure 1 presents changes in average test scores in SD units² in fall 2020 and fall 2021 relative to fall 2019. Depending on grade, math test scores were .11-.18 SDs (the value denoted by the green bars) lower in fall 2020 relative to fall 2019³, and then decreased an *additional* .09-.13 SDs by fall of 2021 (the difference between the green and purple bars). These results imply that the first and second year of the COVID-19 pandemic each resulted in similar math declines, and that students continue to begin the school year less prepared in each year since the pandemic

² Test scores are standardized relative to the mean and standard deviation (SD) observed in our sample in fall 2019 (separately by grade and subject). See the supplemental materials for a description of the assessment, sample, and methods.

³ See Johnson, Kuhfeld, and Tarasawa (2021) for a discussion of the accuracy of Kuhfeld et al. (2020a)'s "COVID Slide" projections, which predicted students would likely return in fall 2020 with 63-68% of a typical year's learning (depending on grade) in reading and 37-50% in math. While fairly typical reading gains were observed by fall 2020 (exceeding the projections), students started fall 2020 having made 34%-80% of prior-year math learning gains on average.

began. Meanwhile, reading shows a notably different pattern across the two years. Specifically, students showed mostly similar performance in fall 2020 compared to their same-grade peers before the pandemic (changes ranging from $-.02$ to $.05$ SDs by grade). However, sizable drops occurred between fall 2020 and fall 2021 ($.13$ to $.23$ SDs).

Achievement gaps between low- and high-poverty schools widened in elementary grades and gaps increased primarily during the 2020-21 school year

Figure 2 displays changes in achievement gaps for low-poverty versus high-poverty schools between fall 2019 and fall 2021 (see online supplemental materials for calculations). Prior to the pandemic (e.g., fall 2019), there was already approximately a 1 SD difference in achievement between students in low- and high-poverty schools in both subjects (denoted by the circle at the base of the arrow)⁴. In the elementary school grades, these gaps are now approximately 20% wider in math and 15% wider in reading relative to before the pandemic (corresponding to a $.20$ SD change in math and $.13$ SD change in reading). However, changes in gaps by school poverty were much more modest in the middle school grades.

We also investigated the timing of when the school poverty achievement gap widened. Figure 3 displays the changes in average performance by school poverty level during the early stages of the pandemic (fall 2019 versus fall 2020) and the 2020-21 school year (fall 2020 versus fall 2021). While students in both low- and high-poverty schools showed declines in math following the onset of the pandemic, there are striking differences in the patterns observed during the 2020-21 school year by school poverty. Test scores continued to slide considerably for students in high-poverty elementary schools between fall 2020 and fall 2021 while they declined much more modestly in low-poverty elementary schools. In reading, both groups held

⁴ Bailey et al. (2021) similarly reported a pre-pandemic achievement gap of 1SD between elementary-aged students in the bottom and top income quintile.

steady between fall 2019 and fall 2020 and then showed sizable declines between fall 2020 and fall 2021, with moderately larger declines for students in high-poverty schools such that gaps widened.

Discussion

The COVID-19 pandemic represents an unprecedented interruption to students' lives and schooling experiences, so it is perhaps not surprising that large academic declines were observed during this period. We found that average same-grade math test scores dropped by .20-.27 standard deviations (SDs) between fall 2019 and fall 2021. These drops are significantly larger than estimated impacts from other large school disruptions, such as after Hurricane Katrina (Sacerdote [2012] when reported math scores dropped .17 SDs in one year for New Orleans evacuees). Further, while reading declined little between fall 2019 and 2020, suggesting that the effects of the early phase of the pandemic were mainly on math, large declines emerged between fall of 2020 and 2021, suggesting that reading has also been negatively impacted. While we should not speculate about the potential causes of the decline in reading between fall of 2020 and 2021, understanding it will likely be vital to helping students catch up as they continue to move through school.

Second, we show that, as hypothesized by educational researchers (e.g., Bailey et al., 2021), income-based gaps have indeed expanded substantively during the COVID-19 pandemic. In the elementary grades (where widened gaps were most evident), gaps increased by roughly 20% in math and 15% in reading. These estimates are similar to, but slightly lower than, researcher's projections (though one should note we are limited to using school poverty rather than student-level socioeconomic status [SES] in these analyses). However, our results corroborate the prediction that math would be more impacted than reading (both in terms of

overall achievement declines and widening of achievement gaps). Although speculative, this is possibly because parents have more capacity to support learning in reading and are more likely to routinely engage their children with reading as opposed to math learning (Sawchuk & Sparks, 2020).

The widening of income-based gaps is in part attributable to differential patterns in how test score declines have accumulated across the scope of the pandemic. Specifically, during the 2020-21 school year, high-poverty schools continued to experience declines in math and had larger losses in reading, whereas low-poverty schools avoided further losses in math and saw less severe losses in reading. The result is that the pandemic has taken a larger toll on students in high-poverty schools. Thus, educators working in high-poverty schools likely have an even more difficult task to address the effects of COVID-19. Since students in poorer communities have also likely been impacted more by economic, health, and socio-emotional effects from the pandemic (West et al., 2021; Thorn & Vincent-Lancrin, 2021), policymakers may wish to consider what additional resources are needed to support teachers serving the nation's lowest income—and potentially most vulnerable—students.

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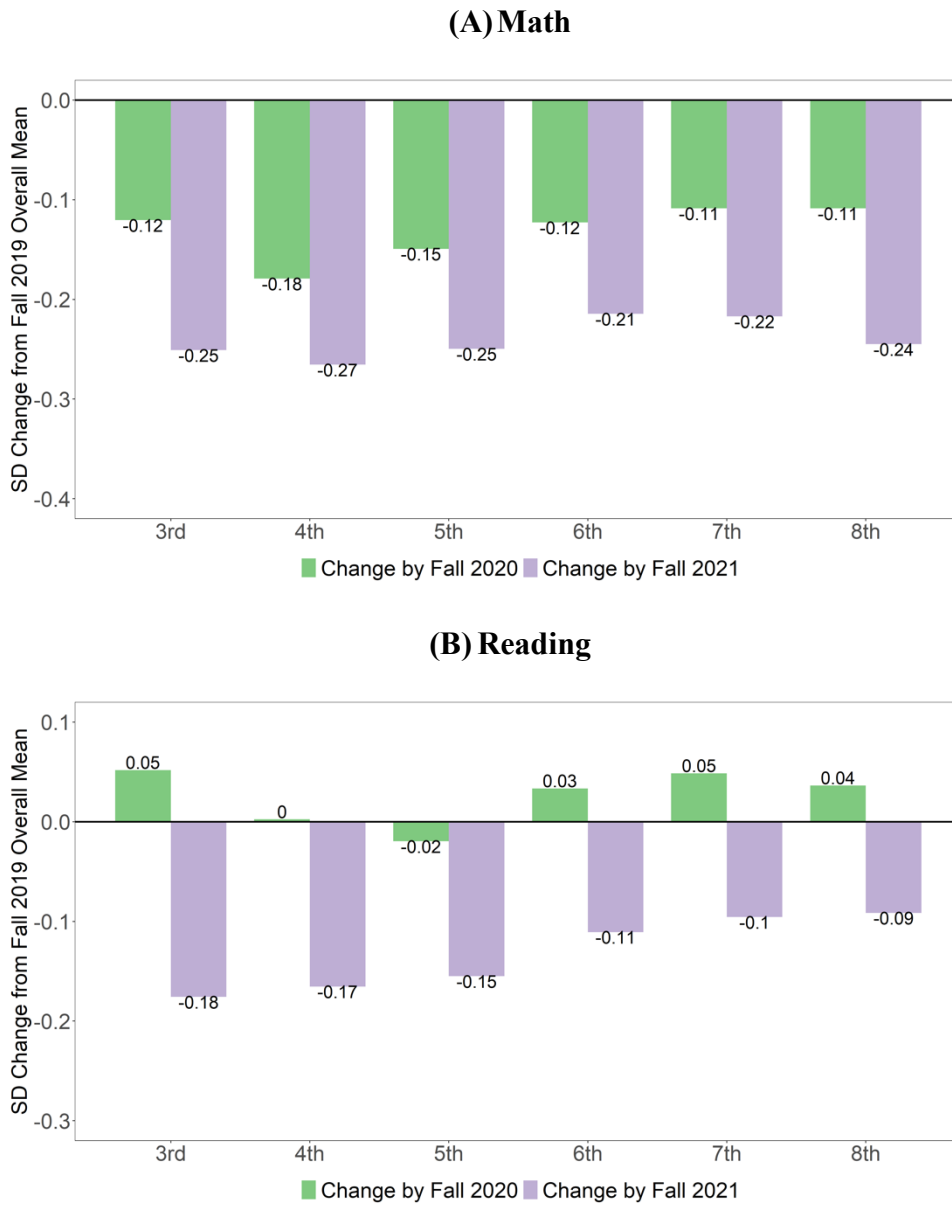
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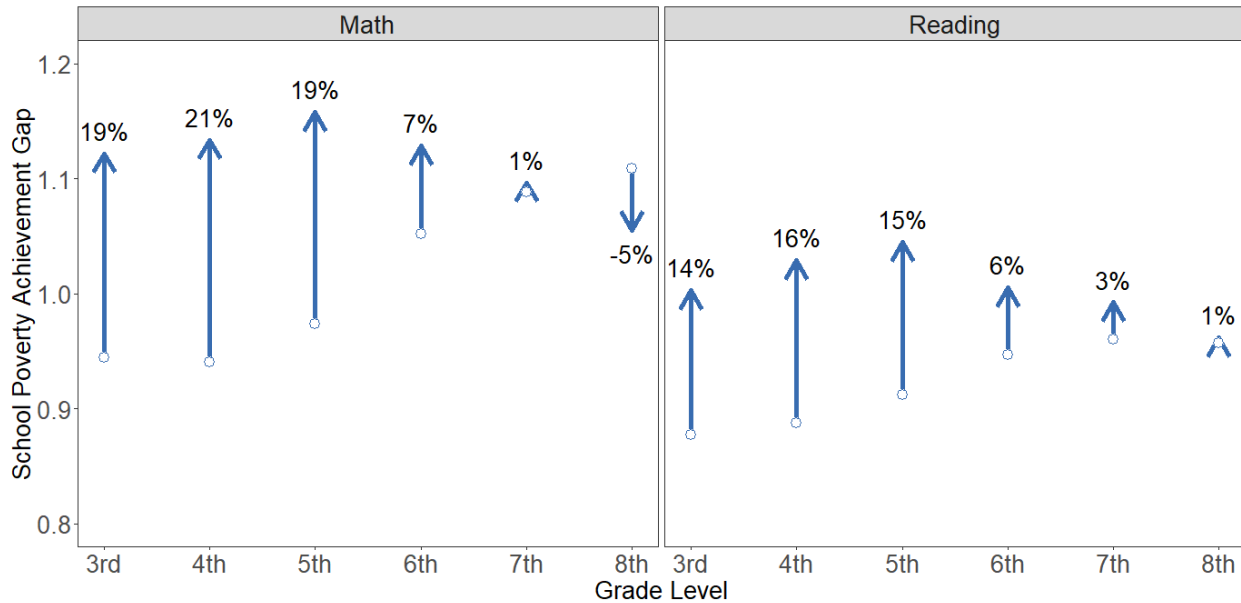
Figure 1

Trends in MAP Growth test scores in fall 2020 and fall 2021 (relative to same-grade peers in fall 2019)



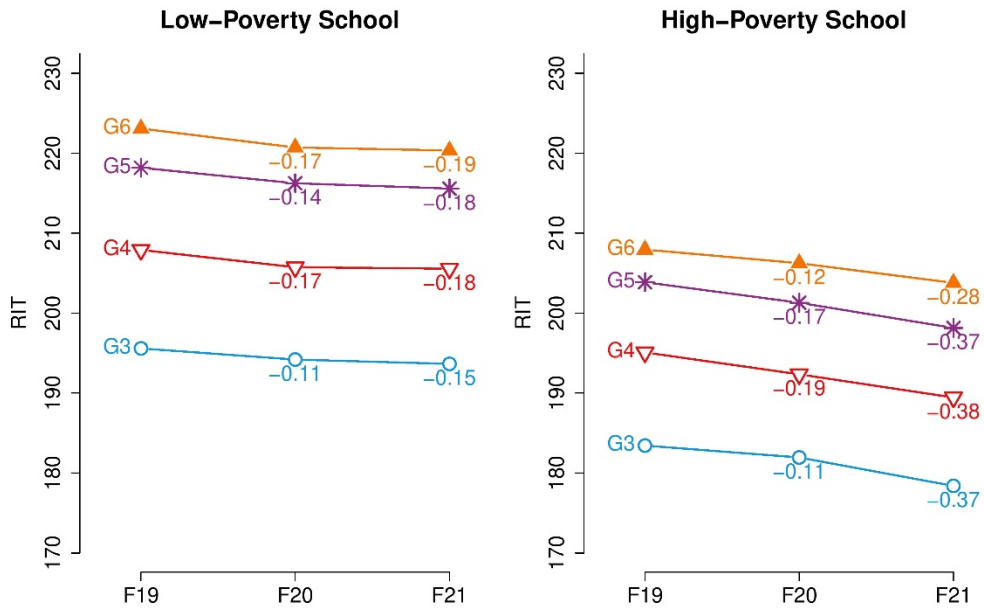
Note. Reported estimates are calculated based on the fall 2019 mean and standard deviation (SD) in a given grade/subject.

Figure 2. Changes in Achievement Gaps Between Low- and High-Poverty Schools Between Fall 2019 and Fall 2021 by Grade and Subject

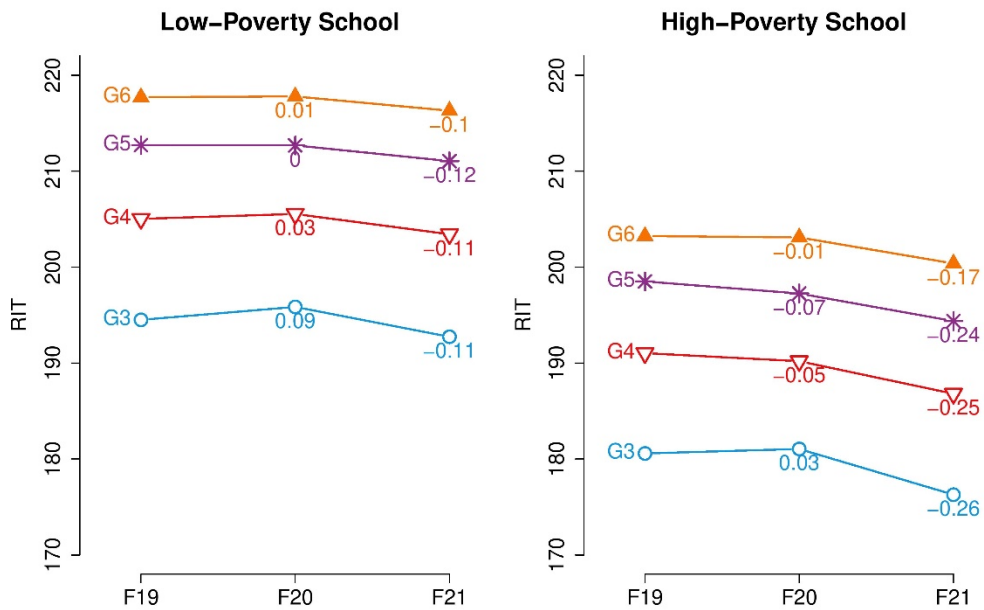


Note. Reported gaps (in standard deviation units) are between students in low- and high-poverty schools, where low-poverty schools are schools with free or reduced priced lunch [FRPL] eligibility less than 25% in 2019-20, while high-poverty schools are schools with free or reduced priced lunch [FRPL] eligibility greater than or equal to 75% in 2019-20. Achievement gaps by school poverty level in fall 2019 are reported as a circle, while achievement gaps in fall 2021 are reported as the arrowhead. Changes between fall 2019 and fall 2021 are shown as the proportional increase or decrease, calculated by taking the difference in the standardized gaps between years and dividing by the fall 2019 standardized gap. Estimated gaps are reported in Table 6.

Figure 3. MAP Growth test score in fall 2019, 2020, 2021 by school poverty in math and reading
(A) Math



(B) Reading



Note. Low-poverty schools are schools with free or reduced priced lunch (FRPL) eligibility less than 25% in 2019-20, while high-poverty schools are schools with FRPL eligibility greater than or equal to 75% in 2019-20. Mean scores are shown on the y-axis in RIT units, while differences across time within each school poverty level (fall 2019 vs. fall 2020 and fall 2019 vs. fall 2021) are reported in standardized units (relative to the 2019 mean and standard deviation for each group). Grade level is shown to the left of each line (for parsimony, only grades that typically correspond to elementary school are shown).

Supplemental Materials – Description of Sample and Methodology

Sample

The data for this study are from the NWEA anonymized longitudinal student achievement database. School districts use NWEA MAP® Growth™ assessments to monitor elementary and secondary students' reading and math growth, with assessments typically administered in the fall (usually between August and November), winter (usually December to March), and spring (late March through June). The NWEA data also include demographic information, including student race/ethnicity, gender, and age at assessment. An indicator of student-level socioeconomic status is not available.

In total, our sample consists of approximately 5.4 million students in grades 3-8 in approximately 12,000 public schools who took MAP Growth reading and math assessments in fall 2019, fall 2020, and/or fall 2021. We limited our sample of schools to a consistent set of U.S. public schools that tested at least ten students in a given grade in fall 2019, fall 2020, and fall 2021. This sample restriction guards against the competing explanation that any differences we observe in achievement over time are potentially driven by systematic differences between schools that did and did not consistently test students in both years. Descriptive information for the students in our sample by grade/subject is provided in Table 1. Overall, the samples of students who tested in 2019 and of same-grade students who tested in fall 2021 were very similar in terms of gender and race/ethnicity, though the number of students tested in each grade was consistently larger in fall 2019.

Descriptive information for the schools in our math and reading samples along with comparison information on the population of U.S. schools is provided in Table 2. Information about U.S. public schools was obtained from the 2019-20 Public Elementary/Secondary School

Universe Survey data file. We define the population of interest as the set of US operational (e.g., school status variable SY_STATUS does not indicate the school is closed or yet to be opened) public schools in the 50 states and District of Columbia serving students in a given grade (based on the GX_OFFERED variable equal to “Yes”). The schools in our sample represent roughly 12-15% of U.S. public schools in any given grade. NCES school characteristics included in our comparison include enrollment by grade, percentage of students receiving free or reduced-price lunch (TOTFRL divided by school enrollment), and percentages of the students in the school who were Hispanic, Black, and White, and Asian (HI, BL, WH and AS) divided by total enrollment, and urbanicity (NCES’ LOCALE codes, collapsed into City, Suburb, Town, and Rural).

Our sample closely matches the national distribution of schools across various locales (urban, suburban, rural, and town). However, our sample reflects schools serving higher average percentages of white students (55% in our sample vs. 49% in the nation), lower average percentages of Hispanic students (20% vs. 26%), and slightly lower percentages of students eligible for FRPL relative to national averages (53% vs. 56%).

Measure

Student test scores from the NWEA MAP Growth reading and math assessments, called RIT scores, were used in this study. MAP Growth is a computer adaptive test that precisely measures achievement even for students above or below grade level and is vertically scaled to allow for the estimation of gains across time. The MAP Growth assessments are typically administered three times a year (fall, winter, and spring) and are aligned to state content standards (NWEA, 2019). Test scores are reported on the RIT (Rasch unIT) scale, which is a linear transformation of the logit scale units from the Rasch item response theory model. We also

reported scores in standard deviation units, which are described in further detail in the following section.

Methodology

RQ1: How did math and reading achievement change during the first and second year of the COVID-19 pandemic? To understand how achievement in fall 2020 and fall 2021 compared to prior to the pandemic (e.g., fall 2019), we standardized the fall 2020 and fall 2021 test scores relative to the mean and standard deviations (SDs) of the fall 2019 MAP Growth test scores (separately by grade level). The resulting estimate \bar{Z}_{21g} represents the standardized difference (in fall 2019 SDs) between the fall 2019 and fall 2021 means:

$$\bar{Z}_{21g} = \frac{\overline{\text{RIT}}_{21g} - \overline{\text{RIT}}_{19g}}{\text{SD}_{19g}}.$$

Standardized mean estimates were calculated in fall 2020 and fall 2021 for each grade/subject. The mean and SDs used to calculate the standardized estimates are reported in Table 3 (math) and Table 4 (reading). The standardized differences are reported in Table 5. Changes in mean RIT scores across years (as well as the standardized differences) are also shown in Figure A1.

RQ2: Did achievement gaps by race/ethnicity and school poverty widen during the pandemic? Similarly, to understand group differences across time, we translated all the subgroup RIT score means into the same standardized unit based on the overall fall 2019 mean and SD. In 2019, the estimate \bar{Z}_{19sg} in grade g and subgroup s represents the difference in SDs between the fall 2019 subgroup mean and the overall mean in fall 2019:

$$\bar{Z}_{19sg} = \frac{\overline{\text{RIT}}_{19sg} - \overline{\text{RIT}}_{19g}}{\text{SD}_{19g}}.$$

In fall 2021, the estimate \bar{Z}_{21sg} in grade g and subgroup s represents the difference in SDs between the fall 2021 subgroup mean and the overall mean in fall 2019:

$$\bar{Z}_{21sg} = \frac{\overline{RIT}_{21sg} - \overline{RIT}_{19g}}{SD_{19g}}.$$

Figure A2 displays a comparison of standardized mean test scores in low-poverty and high-poverty schools across fall 2019, fall 2020, and fall 2021. Figure A3 shows changes in average RIT scores by school poverty level across the three school years, as well the changes across time within school poverty level in standard deviation units.

Additionally, we calculated the standardized gap between average test scores in grade g in each year. For example, the standardized gap for White and Black students in grade g in fall 2019 is

$$ES_{BW,19g} = \frac{\overline{RIT}_{19Bg} - \overline{RIT}_{19Wg}}{\sqrt{\frac{(N_{19Bg} - 1)SD_{19Bg}^2 + (N_{19Wg} - 1)SD_{19Wg}^2}{N_{19Bg} + N_{19Wg} - 2}}},$$

where \overline{RIT}_{19Bg} is the average fall 2019 Black test score in grade g , \overline{RIT}_{19Wg} is the average fall 2019 White test score in grade g , SD_{19Bg} and SD_{19Wg} are the corresponding SD estimates, and N_{19Bg} and N_{19Wg} are the observed sample size in grade g in fall 2019 for Black and White students respectively. Table 6 displays standardized achievement gaps between White and Black students, White and Hispanic students, and low- and high-poverty school students in fall 2019, fall 2020, and fall 2021.

Limitations

There are several important limitations worth noting. Most importantly, we only included schools that tested in fall 2019, fall 2020, and fall 2021. Schools that consistently tested across this three-year span are likely different from schools that tested in just one or the other year. Given the composition of the schools that met our inclusion criteria and the stability inherent in testing consistently across a three-year span, we expect achievement declines in the schools

excluded from our sample would be more severe than what is reported here. Second, higher attrition rates have been documented during the pandemic than in prior years (Kuhfeld et al., 2020b; Schweig et al., 2022). While the demographic characteristics of our sample remain highly consistent across the three testing periods (see Table 1), it is possible that changes in test-taking populations across years that were not captured by the small number of student characteristics we observed could have occurred. Additionally, the number of students testing in a grade seems to have disproportionately dropped between fall 2019 and fall 2021 in high-poverty schools relative to low-poverty schools (see Table 7). For example, the number of 3rd graders taking the math assessment in fall 2021 was nine percent lower than the number testing in fall 2019 in high-poverty schools, but only 3.6% lower in low-poverty schools. If the missing students in high-poverty schools were disproportionately low-achieving, we may be underestimating the achievement gaps by school poverty in fall 2021.

Third, we did not have access to information in fall 2020 on whether students were assessed in-person or remotely, nor do we know whether students had access to in-person, hybrid, or remote instruction through the course of the 2020-21 school year. While other recent work has examined differences in 2021 proficiency rates by access to in-person access (e.g., Halloran et al., 2021), we did not have enough detailed information about in-person instruction availability and attendance to conduct similar analyses. Finally, we have access to limited demographic information on students and are unable to disaggregate our data by student-level poverty, English Language status, or special education status.

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Table 1*Student Demographic Characteristics by Subject, Grade, and Term*

Gr.	Subject	Fall Term	Counts			Race/ethnicity Percentages							
			Students	Schools	Districts	Male	White	Black	Hispanic	Asian	AIAN	Multi-ethnic	Other Race
All	Math	All	5,454,197	12,104	3,487	51.0	48.5	15.1	21.0	4.3	1.4	3.9	5.9
3	Math	2019	587,432	8,010	2,859	51.0	48.4	15.5	20.5	4.3	1.4	4.0	5.9
4	Math	2019	597,244	8,021	2,878	51.1	48.4	15.3	20.8	4.5	1.4	3.9	5.6
5	Math	2019	618,636	7,674	2,855	51.0	48.3	15.4	21.1	4.3	1.4	3.8	5.6
6	Math	2019	611,635	4,712	2,759	51.1	48.8	15.2	20.8	4.3	1.3	3.8	5.8
7	Math	2019	599,757	4,139	2,670	51.1	49.1	15.2	20.9	4.0	1.4	3.6	5.8
8	Math	2019	553,611	3,920	2,545	50.8	49.7	15.0	20.7	3.8	1.4	3.5	6.0
3	Math	2020	537,667	8,010	2,859	51.0	48.1	15.1	20.7	4.6	1.3	4.0	6.1
4	Math	2020	549,148	8,021	2,878	51.0	48.1	15.2	21.1	4.6	1.4	4.0	5.7
5	Math	2020	557,538	7,674	2,855	51.0	48.3	14.9	21.3	4.6	1.4	3.9	5.7
6	Math	2020	537,406	4,712	2,759	50.9	49.3	14.5	20.8	4.5	1.3	3.8	5.7
7	Math	2020	529,948	4,139	2,670	50.7	49.6	14.8	20.9	4.1	1.2	3.6	5.8
8	Math	2020	478,817	3,920	2,545	50.9	49.6	14.9	21.0	3.6	1.4	3.5	6.1
3	Math	2021	558,484	8,010	2,859	51.0	47.6	15.5	20.5	4.6	1.4	4.2	6.1
4	Math	2021	564,971	8,021	2,878	51.0	48.0	15.1	20.9	4.8	1.4	4.1	5.8
5	Math	2021	570,310	7,674	2,855	51.0	48.0	15.3	20.9	4.6	1.4	4.0	5.8
6	Math	2021	552,265	4,712	2,759	51.0	48.2	14.7	21.2	4.5	1.4	4.0	6.0
7	Math	2021	556,341	4,139	2,670	51.0	48.0	15.3	21.4	4.1	1.3	3.8	6.0
8	Math	2021	512,793	3,920	2,545	51.1	48.1	15.5	21.6	3.6	1.4	3.8	6.2
All	Reading	All	5,183,849	11,923	3,437	51.2	48.8	15.4	20.4	4.3	1.4	3.8	5.9
3	Reading	2019	546,718	7,957	2,835	51.2	49.0	16.0	19.3	4.3	1.4	4.1	5.8
4	Reading	2019	544,708	7,877	2,797	51.3	48.7	15.8	20.1	4.3	1.5	4.0	5.6
5	Reading	2019	554,836	7,430	2,767	51.1	48.8	15.7	20.3	4.2	1.5	3.8	5.6
6	Reading	2019	542,326	4,538	2,650	51.3	48.4	15.7	20.9	4.1	1.4	3.7	5.8
7	Reading	2019	529,660	3,961	2,541	51.3	48.4	15.7	21.3	3.9	1.4	3.6	5.7
8	Reading	2019	497,819	3,820	2,464	51.1	49.2	15.3	20.6	3.9	1.4	3.5	6.1
3	Reading	2020	523,997	7,957	2,835	51.1	48.8	15.3	19.7	4.6	1.3	4.1	6.1
4	Reading	2020	521,578	7,877	2,797	51.1	48.6	15.2	20.4	4.5	1.4	4.0	5.9
5	Reading	2020	518,332	7,430	2,767	51.2	48.9	15.0	20.4	4.5	1.4	3.8	5.9
6	Reading	2020	500,028	4,538	2,650	51.0	49.6	14.5	20.5	4.5	1.4	3.7	5.9
7	Reading	2020	497,326	3,961	2,541	50.9	49.4	14.6	20.9	4.3	1.3	3.6	6.0
8	Reading	2020	481,639	3,820	2,464	50.9	50.1	14.3	20.5	4.2	1.4	3.5	6.1
3	Reading	2021	518,020	7,957	2,835	51.1	48.0	16.0	19.9	4.4	1.4	4.2	6.1
4	Reading	2021	492,430	7,877	2,797	51.3	48.1	15.7	20.4	4.5	1.4	4.1	5.8
5	Reading	2021	474,299	7,430	2,767	51.3	48.7	15.8	19.9	4.4	1.5	3.9	5.8
6	Reading	2021	469,230	4,538	2,650	51.3	48.5	15.2	20.7	4.2	1.5	3.9	6.0
7	Reading	2021	469,702	3,961	2,541	51.3	47.9	15.7	21.2	4.2	1.4	3.7	6.0
8	Reading	2021	460,450	3,820	2,464	51.3	48.5	15.2	20.9	4.2	1.4	3.7	6.1

Note. AIAN=American Indian or Alaska Native. All reports the number of unique students, schools, and districts pooling across all grades and years.

Table 2*Sample School Characteristics Relative to U.S. Population of Public Schools*

	Grade	Number of schools	Average School Enrollment	% FRPL	% White	% Black	% Hispanic	% Asian American	City	Rural	Suburb	Town
NWEA Math Sample	3	8,010	480	53%	54%	15%	21%	4%	28%	26%	36%	11%
NWEA Math Sample	4	8,021	481	54%	54%	15%	21%	4%	28%	26%	36%	10%
NWEA Math Sample	5	7,674	487	54%	53%	15%	22%	4%	29%	26%	35%	10%
NWEA Math Sample	6	4,712	557	52%	56%	15%	20%	3%	26%	32%	30%	11%
NWEA Math Sample	7	4,139	579	52%	55%	16%	20%	3%	26%	34%	29%	12%
NWEA Math Sample	8	3,920	580	52%	56%	16%	19%	3%	25%	34%	28%	13%
NWEA Reading Sample	3	7,957	480	53%	54%	15%	20%	4%	28%	26%	36%	11%
NWEA Reading Sample	4	7,877	484	53%	54%	15%	21%	4%	28%	26%	36%	10%
NWEA Reading Sample	5	7,430	492	53%	53%	15%	21%	4%	28%	26%	36%	10%
NWEA Reading Sample	6	4,538	568	52%	55%	16%	20%	3%	27%	31%	31%	12%
NWEA Reading Sample	7	3,961	592	52%	55%	16%	20%	3%	26%	32%	29%	13%
NWEA Reading Sample	8	3,820	594	51%	55%	16%	20%	3%	26%	33%	29%	13%
U.S. Public Schools	3	53,903	453	56%	48%	15%	26%	4%	30%	26%	33%	10%
U.S. Public Schools	4	53,665	453	56%	48%	15%	26%	4%	30%	26%	33%	10%
U.S. Public Schools	5	52,385	456	57%	47%	15%	26%	4%	31%	27%	33%	10%
U.S. Public Schools	6	37,355	482	57%	49%	15%	26%	4%	29%	31%	29%	11%
U.S. Public Schools	7	32,265	484	56%	50%	16%	24%	3%	27%	34%	27%	12%
U.S. Public Schools	8	32,507	486	56%	50%	16%	24%	3%	27%	34%	27%	12%

Note: FRPL=free or reduced priced lunch. The reported samples represent the set of schools that tested at least ten students in a grade in fall 2019, fall 2020, and fall 2021. The sources of the variables are the Common Core of Data (CCD) collected by the National Center for Educational Statistics. The U.S. public school population comparison for each grade was determined by limiting to the schools that were operational in the 2019-20 school year and enrolled students in that grade level.

Table 3*Mean, Standard Deviations, and Sample Sizes for Math Test Scores by Grade and Subgroup*

Grade	Group	Fall 2019			Fall 2020			Fall 2021		
		N	M	SD	N	M	SD	N	M	SD
Full Sample										
3	All	587,432	189.0	13.6	537,667	187.4	14.2	558,484	185.6	14.7
4	All	597,244	200.9	14.3	549,148	198.4	14.3	564,971	197.2	15.3
5	All	618,636	210.2	15.5	557,538	207.9	15.5	570,310	206.4	16.4
6	All	611,635	214.9	15.3	537,406	213.0	15.1	552,265	211.6	15.7
7	All	599,757	221.3	17.2	529,948	219.4	16.5	556,341	217.6	16.9
8	All	553,611	226.6	18.4	478,817	224.6	17.9	512,793	222.1	17.9
School Poverty Level										
3	High Poverty	143,812	183.4	13.4	128,013	181.9	14.1	130,843	178.4	14.2
4	High Poverty	146,650	195.1	14.4	129,895	192.3	14.0	131,540	189.4	15.0
5	High Poverty	149,961	203.9	15.3	130,072	201.3	14.9	129,363	198.1	15.6
6	High Poverty	125,573	207.9	14.6	104,806	206.2	14.2	110,812	203.8	14.8
7	High Poverty	119,469	213.2	16.3	101,391	212.1	15.6	108,921	209.5	15.7
8	High Poverty	109,159	217.6	17.6	93,166	216.8	16.8	102,205	213.9	16.6
3	Low Poverty	125,395	195.6	12.2	118,110	194.2	12.9	120,929	193.6	12.9
4	Low Poverty	125,680	207.9	12.7	120,251	205.7	13.2	121,868	205.5	13.3
5	Low Poverty	128,810	218.2	14.0	122,124	216.2	14.5	125,395	215.6	14.4
6	Low Poverty	120,765	223.1	14.2	111,558	220.7	14.3	113,029	220.3	14.6
7	Low Poverty	115,134	230.6	15.7	105,713	227.8	15.4	111,001	226.7	15.7
8	Low Poverty	103,320	236.6	16.7	90,880	233.6	16.8	95,633	231.5	16.9

Table 4*Mean, Standard Deviations, and Sample Sizes for Reading Test Scores by Grade and Subgroup*

Grade	Group	Fall 2019			Fall 2020			Fall 2021		
		N	M	SD	N	M	SD	N	M	SD
Full Sample										
3	All	546,718	187.3	16.8	523,997	188.1	17.5	518,020	184.3	17.7
4	All	544,708	197.7	16.6	521,578	197.8	16.7	492,430	195.0	17.4
5	All	554,836	205.2	16.5	518,332	204.9	16.5	474,299	202.7	17.2
6	All	542,326	210.1	16.2	500,028	210.6	16.1	469,230	208.3	16.9
7	All	529,660	213.9	16.6	497,326	214.7	16.5	469,702	212.3	17.1
8	All	497,819	217.9	16.7	481,639	218.5	16.8	460,450	216.3	17.3
School Poverty Level										
3	High Poverty	129,064	180.6	16.5	118,792	181.0	17.2	118,210	176.3	16.9
4	High Poverty	131,210	191.0	16.8	118,737	190.2	16.9	112,485	186.8	17.2
5	High Poverty	129,983	198.5	16.9	115,402	197.2	16.9	102,656	194.4	17.4
6	High Poverty	113,235	203.2	16.6	96,121	203.1	16.5	93,281	200.4	17.1
7	High Poverty	109,696	206.7	16.9	95,739	207.4	17.0	93,170	204.4	17.3
8	High Poverty	99,413	210.5	17.2	89,274	211.1	17.3	87,376	208.7	17.7
3	Low Poverty	117,068	194.5	15.1	117,288	195.9	15.5	110,817	192.7	15.9
4	Low Poverty	113,408	205.0	14.4	115,177	205.5	14.2	103,688	203.4	14.9
5	Low Poverty	116,257	212.7	13.9	115,011	212.7	13.7	103,245	211.0	14.4
6	Low Poverty	105,109	217.7	13.8	104,976	217.8	13.6	94,110	216.3	14.5
7	Low Poverty	101,656	221.7	13.9	102,561	221.9	14.0	94,107	220.3	14.5
8	Low Poverty	95,126	225.6	14.0	99,041	225.7	14.3	93,178	224.2	14.7

Table 5*Effect Size Estimates by Subject/Grade/Term*

Grade	Group	Math Effect Sizes			Reading Effect Sizes		
		Fall 2019	Fall 2020	Fall 2021	Fall 2019	Fall 2020	Fall 2021
Full Sample							
3	All	0.00	-0.12	-0.25	0.00	0.05	-0.18
4	All	0.00	-0.18	-0.27	0.00	0.00	-0.17
5	All	0.00	-0.15	-0.25	0.00	-0.02	-0.15
6	All	0.00	-0.12	-0.21	0.00	0.03	-0.11
7	All	0.00	-0.11	-0.22	0.00	0.05	-0.10
8	All	0.00	-0.11	-0.24	0.00	0.04	-0.09
School Poverty Level							
3	High Poverty	-0.41	-0.52	-0.78	-0.40	-0.37	-0.65
4	High Poverty	-0.41	-0.60	-0.81	-0.40	-0.45	-0.66
5	High Poverty	-0.41	-0.58	-0.78	-0.41	-0.48	-0.66
6	High Poverty	-0.45	-0.56	-0.72	-0.42	-0.43	-0.60
7	High Poverty	-0.47	-0.53	-0.69	-0.43	-0.39	-0.57
8	High Poverty	-0.49	-0.53	-0.69	-0.44	-0.41	-0.55
3	Low Poverty	0.48	0.38	0.34	0.43	0.51	0.33
4	Low Poverty	0.49	0.34	0.32	0.44	0.47	0.34
5	Low Poverty	0.51	0.39	0.34	0.45	0.45	0.35
6	Low Poverty	0.53	0.38	0.36	0.47	0.47	0.38
7	Low Poverty	0.54	0.38	0.31	0.47	0.48	0.38
8	Low Poverty	0.55	0.38	0.27	0.46	0.47	0.38

Note. All estimates are calculated by subtracting the observed mean for a given year/subject/grade by the fall 2019 overall sample mean and dividing by the overall sample SD in a given grade.

Table 6*Achievement Gaps by School Poverty Across Years*

Subject	Grade	Low-High School Poverty Gap		
		Fall 2019	Fall 2020	Fall 2021
Math	3	0.94	0.90	1.12
Math	4	0.94	0.98	1.13
Math	5	0.97	1.02	1.16
Math	6	1.05	1.01	1.13
Math	7	1.09	1.01	1.10
Math	8	1.11	1.00	1.06
Reading	3	0.88	0.90	1.00
Reading	4	0.89	0.98	1.03
Reading	5	0.91	1.00	1.04
Reading	6	0.95	0.98	1.01
Reading	7	0.96	0.94	0.99
Reading	8	0.96	0.93	0.96

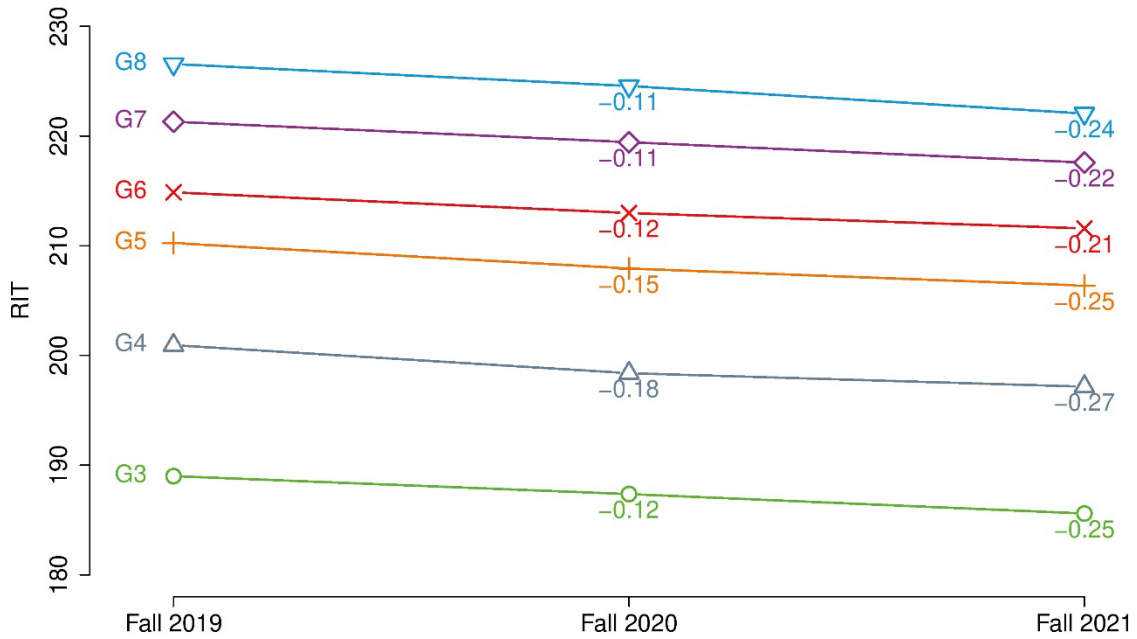
Table 7*Comparison of Sample Size Changes Across Years by School Poverty Level*

Grade	Subject	School Type	Fall 2019 Sample Size	Fall 2019 - Fall 2020		Fall 2019 - Fall 2021	
				Change in # of students testing	% change	Change in # of students testing	% change
3	Math	High Poverty	143,812	-15,799	-11.0	-12,969	-9.0
4	Math	High Poverty	146,650	-16,755	-11.4	-15,110	-10.3
5	Math	High Poverty	149,961	-19,889	-13.3	-20,598	-13.7
6	Math	High Poverty	125,573	-20,767	-16.5	-14,761	-11.8
7	Math	High Poverty	119,469	-18,078	-15.1	-10,548	-8.8
8	Math	High Poverty	109,159	-15,993	-14.7	-6,954	-6.4
3	Math	Low Poverty	125,395	-7,285	-5.8	-4,466	-3.6
4	Math	Low Poverty	125,680	-5,429	-4.3	-3,812	-3.0
5	Math	Low Poverty	128,810	-6,686	-5.2	-3,415	-2.7
6	Math	Low Poverty	120,765	-9,207	-7.6	-7,736	-6.4
7	Math	Low Poverty	115,134	-9,421	-8.2	-4,133	-3.6
8	Math	Low Poverty	103,320	-12,440	-12.0	-7,687	-7.4
3	Reading	High Poverty	129,064	-10,272	-8.0	-10,854	-8.4
4	Reading	High Poverty	131,210	-12,473	-9.5	-18,725	-14.3
5	Reading	High Poverty	129,983	-14,581	-11.2	-27,327	-21.0
6	Reading	High Poverty	113,235	-17,114	-15.1	-19,954	-17.6
7	Reading	High Poverty	109,696	-13,957	-12.7	-16,526	-15.1
8	Reading	High Poverty	99,413	-10,139	-10.2	-12,037	-12.1
3	Reading	Low Poverty	117,068	220	0.2	-6,251	-5.3
4	Reading	Low Poverty	113,408	1,769	1.6	-9,720	-8.6
5	Reading	Low Poverty	116,257	-1,246	-1.1	-13,012	-11.2
6	Reading	Low Poverty	105,109	-133	-0.1	-10,999	-10.5
7	Reading	Low Poverty	101,656	905	0.9	-7,549	-7.4
8	Reading	Low Poverty	95,126	3,915	4.1	-1,948	-2.0

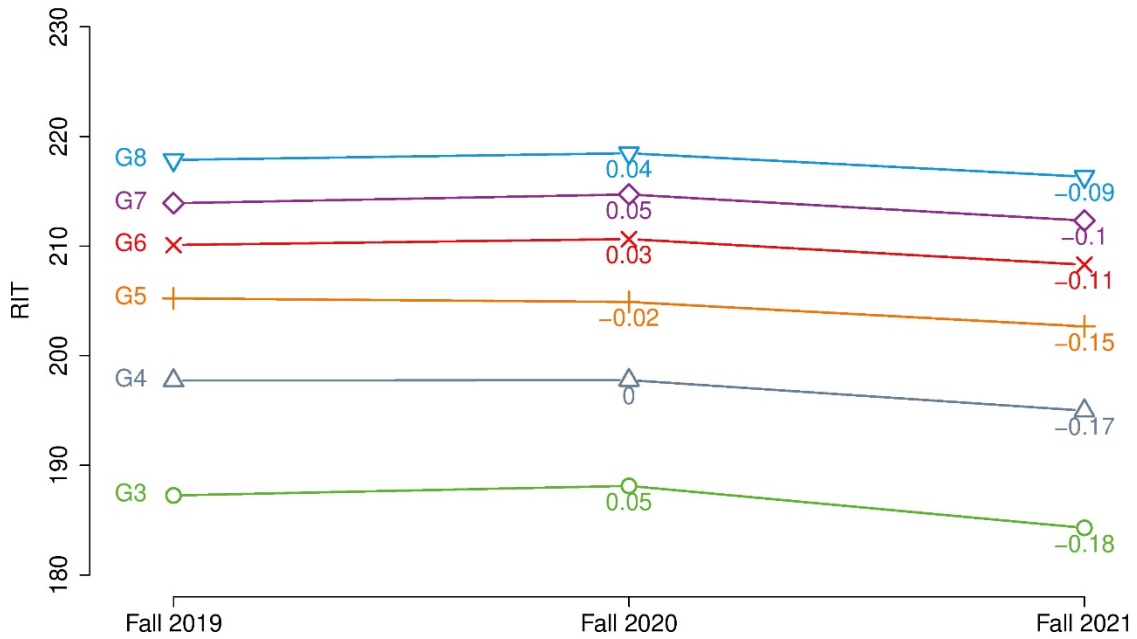
Note. The number of students tested in each term by school poverty, grade, and subject is reported in Tables 3 and 4. Percent change in the number of students tested is calculated by dividing the change in number of students testing in a grade/subject/school poverty level between falls by the number of students tested in fall 2019.

Figure A1. MAP Growth mean test score in fall 2019, 2020, 2021 in math and reading

(A) Math

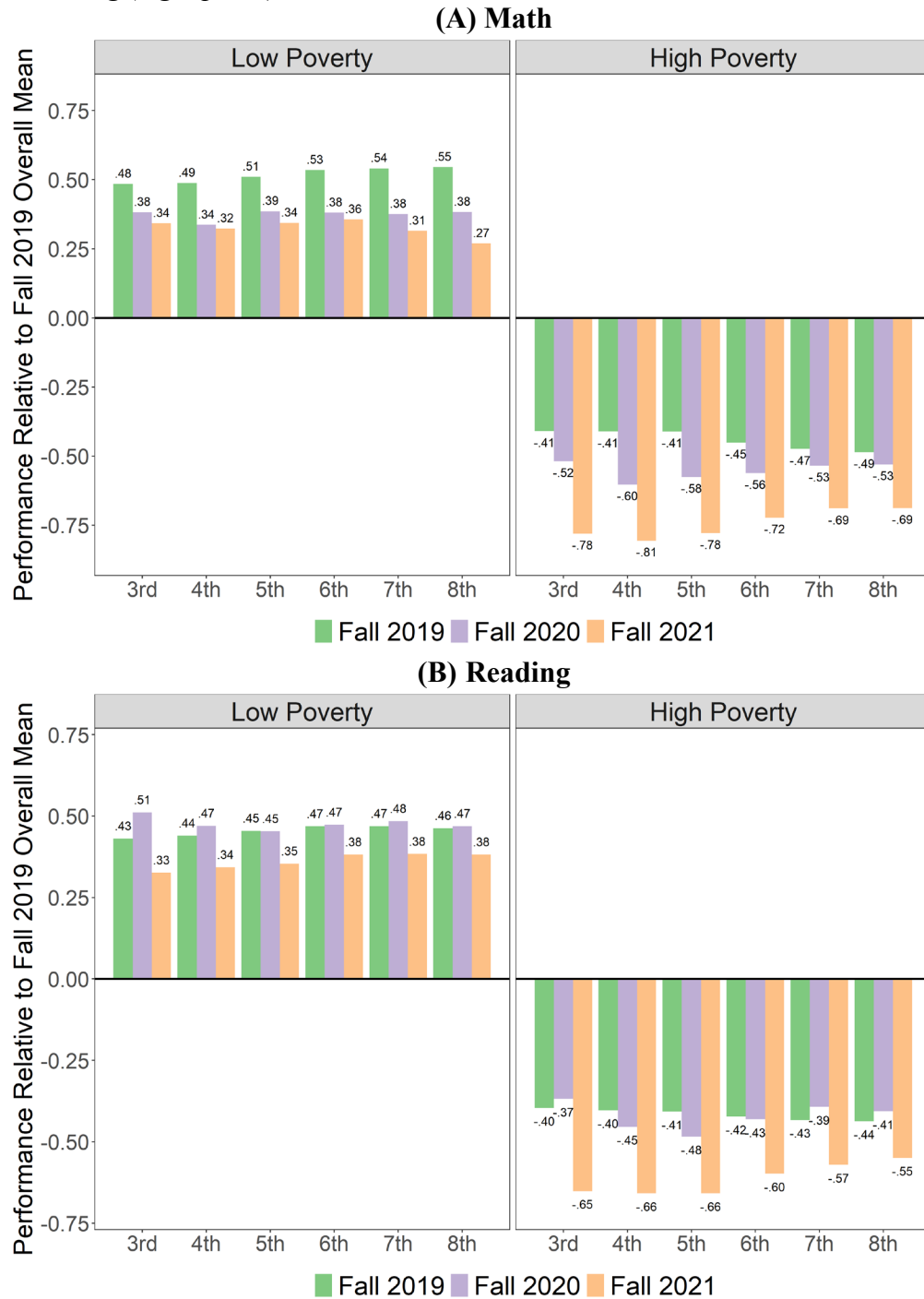


(B) Reading



Note. Mean scores are shown as points in RIT units, while differences across time (fall 2019 vs. fall 2020 and fall 2019 vs. fall 2021) are reported in standardized units (relative to the 2019 M/SD).

Figure A2. MAP Growth test score in fall 2019, 2020, 2021 by school poverty in math (left panel) and reading (right panel).



Note. Reported estimates are calculated based on the fall 2019 overall sample mean and SD in a given grade. Low-poverty schools are schools with free or reduced priced lunch [FRPL] eligibility less than 25% in 2019-20, while high-poverty schools are schools with free or reduced priced lunch [FRPL] eligibility greater than or equal to 75% in 2019-20.